

- August 2019 -



Lee and I flew down to Long Point today and it's really amazing how high the water is in Lake Erie! The areas near the light house are normally high and dry, but are currently inundated with water. The familiar sand spit that goes out hundreds of feet into the lake is covered with water so deep it seems to have disappeared totally. There is a lot of erosion happening on the Erie shoreline. Watch for more details and lots of photos in the September issue.

President's Message

What? August ...already? Summer is half over and there's still a lot of flying to do. ☺

There is a lot of information in this lengthy issue of the newsletter. In early July, Lee and I attended a COPA 148-sponsored session with Nav Canada at Brantford Airport. Nav Canada is going across Canada looking for input from pilots on the services they provide and what additional services we would like to see from them. Details of the meeting are inside as well as our response and some opinions.

Nav Canada is holding fast on their position that Aireon will serve the needs of the aviation community in spite of our actual needs. A recent announcement from uAvionics seems to support their position and to lesser extent COPA's too. But, this solution fails to address our major concerns about the use of Space-based ADS-B for GA. Lee and I explore this new development and reflect on why it is a partial solution at best and a step in the wrong direction at worst.

As strong supporters of what ADS-B can do for us as GA pilots, Lee and I explored the recent aviation accidents and what difference ADS-B could make in preventing future mid-air collisions. Inside you will find an article by Lee that explains how ADS-B operates in Canada and the USA and what we all should consider if safety is the main driving force behind our own personal aircraft equipage decisions.

978UAT or 1090ES; that's the big question on everyone's mind when considering ADS-B if you live in our area and cost is a major factor. Nav Canada created a 'wait and see' environment regarding ADS-B in the GA community by staging their mandate. Whether it ends up affecting Class C, D and E airspace has yet to be decided, but a lot of local pilots are missing out on the benefits of UAT ADS-B. Consider getting a receiver that works with 1090ES and 978UAT... start discovering the benefits.

2019 is going to be a great year for KWRAA.

- Dan

FSS/FIS Services Review with Nav Canada

*July 4th 2019 at the Brantford Flight Centre
Hosted by COPA 148 (Brantford) – Julie Zarboni Co-Captain*

Background – An invitation had been sent out to local COPA chapters to participate in a meeting with six FSS personnel to determine GA feedback on existing and future FSS services wanted by pilots. This was informal presentation that generally asked questions about FSS services for pre-flight, enroute and post flight. The FSS personnel were from different regions and various levels within Nav Canada. There are seven FICs' in Canada and over 200 Remote Communications Outlets (RCOs).

Jerome Gagnon, Program Director, Service Delivery Incentives, described that the team was sampling responses of pilots, training groups and FSS personnel to plan about the FSS future. He said this was not about closing facilities or services (yet?). However, in the near future, the Aviation Weather Web Site (AWWS) will be replaced by CFBS with interactive map interface. There were about 15 people present from the local COPA chapters. (Only half participated in the discussion.)

Summary of Observations –

- AWWS weather site is complicated and needs significant improvement. Significant changes are coming. Some expressed that their EFB product had more capabilities.
- There were requests for WX forecasts beyond 48 hours into the future. 72 hours is now typical for other services with a 6 hour update. MOS* was mentioned as a tool to get there. MOS weather is available on most EFB packages. It provides summary predictions for aviation weather in 6 hour periods for a particular airport. MOS is available for Buffalo but not for Kitchener or Toronto.
- Most pilots use Foreflight, Garmin Pilot and Flight Plan Go for their weather picture, on the ground and in the air, using the free weather services provided by the FAA on UAT ADS-B when flying in the US, Southern Ontario and Southern Quebec.
- Remote Communication Outlets (RCO): There are numerous complaints about how to contact the appropriate RCO and on what frequency after 126.7 was assigned for enroute aircraft to aircraft position reports. There are 25 RCOs within the London Region and over 200 across Canada. They are identified on the sectional and LE charts but are often hard to locate on the maps.
- Need VHF coverage maps for different altitudes around RCOs. This will help to identify the best station to contact. (The map in the CFS does not provide signal coverage.)
- Requests for non-aviation weather station information on the AWWS. Ex Environment Canada sites of Goderich and Mount Forest, which show up on a lot of EFBs but not the AWWS.
- A number of pilots prefer to talk to FSS personnel for a WX forecast, but some may not have experience using, or the capability to receive, UAT ADS-B weather services in flight.
- Pilots value the local knowledge that the FSS applies to interpret weather products, filter through NOTAMs and look at WX and road cameras.
- Flight Plans – a number of people file their flight plans electronically. Most seemed to use FlightPlan.com as it seemed to work with the best with the Nav Canada site. Some still prefer to file by phone, after they receive a weather/NOTAM update.
- One pilot said that flight weather is the most significant safety factor of ADS-B. She went on to say: "I often see potential traffic conflicts before ATC alerts me."
- ICAO Flight Plans will be used after October 10th. (see AIM 3.15, 3.16)
- We asked why Nav Canada was not enhancing the RCOs to include digital weather products including METAR, TAFs and NOTAMS. They said that their policy is not to include FIS-B products since they are not supporting FIS or TIS products on UAT because it is not an international requirement. RCOs only cover a small percentage of the overall Canadian landmass. (Albeit some of the busiest parts)

Our Response:

- NavCan is working for us and we want these products to improve aviation safety and make cross border travel safer for GA without subscription fees. US-based aircraft flying in Canada would also be safer if UAT was available in Canada too.
- The existing RCOs cover a very large percentage of where GA aircraft fly and would enhance the voice assistance available at the 200 RCO locations. It is not necessary to provide these services elsewhere, except through the internet especially if it means additional fees.

*What Model Output Statistics (MOS) Does...

Model Output Statistics (MOS) is a type of statistical post-processing, a class of techniques used to improve numerical weather models' ability to forecast by relating model outputs to observational or additional model data.

- Objectively interprets Numerical Weather Prediction (NWP) Model based on historical sample
- Predicts events forced by synoptic-scale systems
- Corrects for certain systematic NWP model biases
- Mimics conceptual forecast models
- Quantifies uncertainty in NWP model forecasts
- Accounts for deterioration NWP model skill with increasing forecast projection
- Accounts for some local effects
- Incorporates climatic considerations

SOURCE:

www.weather.gov/mdl/mos_about#skipintro

Personal Commentary:

Although it is good to see Nav Canada conducting this survey first-hand in the pilot community, it is questionable whether the outcome will lead to the requested changes or merely justification of changes already planned at Nav Canada. Pilots need to make their opinions known, not just allow Nav Canada, our revenue-driven service provider, to decide what is best for us.

Nav Canada has no plans to provide the free in-flight weather, data and enhanced traffic services available in the USA on 978 MHz UAT ADS-B. However, with enough pilot support maybe COPA, and eventually Nav Canada, can be convinced that it is in the best interest of GA to follow the FAA lead on ground-based UAT ADS-B for GA. The large numbers of pilots installing ADS-B IN devices like Stratus, Stratux, Garmin GDL, FlightBox, Dual, uAvionix and many others are a testament to the usefulness of this technology in the cockpit. Too bad it is only useful near, or within, the USA for weather and only when other aircraft have ADS-B OUT for traffic alerts. Nav Canada needs to get on board... Aireon is for Airliners!

They should not be implementing single focus solutions and putting all of their surveillance eggs fully into one proverbial Aireon basket. Diversity is applicable to them as well, to ensure they have robust solutions that fit airliners and GA, both in isolated areas and places where we fly near the border. In the meantime, those of us with ADS-B receivers, will continue to make use of the excellent in-cockpit weather services supplied by our neighbours to the south from their 978 MHz UAT ground-based ADS-B transmitters.

- Lee Coulman and Dan Oldridge

Commentary: 406 ELT Mandate Proposal

In the July 4, 2019 issue of E-COPA Flight, there is a short article and copy of the letter from COPA to Transport Canada regarding the proposed mandate of 406 MHz ELTs in all aircraft within 5 years.

Just like the initial requirement for 121.5 MHz ELTs decades ago, this appears to be a knee-jerk reaction to recent events without regard for the current state of technology. However, both Transport Canada and COPA are only presenting partial information to make their argument for or against the proposal.

While Bernard Gervais' statement about a double standard in allowing foreign-registered aircraft to conduct the same flights from the same airports with different, lesser equipment is valid, there are now several new ELTs on the market that do operate with extremely high reliability and accuracy due to internal back-up antennas and integral WAAS GPS. They still need to be securely mounted, of course.

The article states, "Gervais goes on to recommend satellite-based ADS-B as the better solution for search-and-rescue purposes" and "Technologies such as ADS-B offer infinitely more improved tracking capability than outdated and ineffective ELTs ever can". However, COPA just finished arguing with Nav Canada that GA aircraft owners cannot afford the diversity requirement of Aireon's space-based ADS-B.

COPA is walking a dangerous line here in proposing a solution that requires a very expensive and often complex 1090ES ADS-B installation in GA aircraft rather than a simple \$1500 ELT solution. What will COPA's response be in 2023 when Nav Canada decides that they want to have 1090ES ADS-B in all aircraft? Will President Gervais and COPA still be supporting Aireon for GA? Aireon cannot reliably receive bottom-mounted transponder antenna signals from most GA aircraft. Aireon is for airliners.

I agree that we need a performance-based solution for GA and COPA members. Since Aireon cannot provide any downlink information to pilots, for-profit companies like Spot and Spidertracks are providing tracking

and messaging and Sirius Satellite Radio is providing some of the weather and data to Canadian pilots on a subscription basis that our US counterparts are receiving free as part of their ground-based ADS-B system. I believe COPA should be pushing Nav Canada and Transport Canada for the same free FIS-B and TIS-B on ADS-B that US pilots enjoy. Since Aireon is only 1090ES and has no capability to downlink any information directly to pilots, any performance-based solution would likely have to include less costly ground-based 978 MHz UAT ADS-B like the US uses. Anyone with ADS-B that flies in, or near, the US already knows the situational awareness advantages and enormous safety benefits of the UAT ADS-B IN signals provided by the FAA system. If COPA pushes and keeps pushing for UAT, Nav Canada will have to give in eventually ... after all, we are the customer and Nav Canada is the service provider!

A recent document on the AOPA website stated that there was a reduction of midair fatalities by almost 90% due to ADS-B IN. https://download.aopa.org/advocacy/2019/dho_well_jking_DASC2019_V2.pdf Having flown with a full 1090ES ADS-B solution for over 3 years now, I believe that Aireon's space-based solution currently offers nothing of value for most of the GA fleet. As you likely know, I have moved my transponder antenna to the top of my aircraft to get better air-to-air TIS-B coverage, making location tracking by satellite a definite possibility, but certified aircraft may not be able change easily. Regardless, without the ability to receive FIS-B data on ADS-B from the FAA's 978 MHz UAT system, I likely would not have invested in ADS-B. We need to collectively push for a similar system in Canada so all pilots can reap the benefits here while allowing us to use less costly equipment to achieve the "performance-based" results Bernard Gervais speaks of, making flying much safer in the process.

Recently, COPA has assisted Nav Canada and Transport Canada with their surveys and while I certainly recognize the need to work with Nav Canada and Transport Canada, maybe it is time for COPA to ask its members what **we** want and need. Where is **that** survey?

1090ES ADS-B OUT - New Wingtip Solution

uAvionics announced Mid-July that they are working with Nav Canada to produce a 1090ES version of their SkyBeacon product currently available in a 978UAT version for the US market.



This is certainly a step in the right direction if you believe Nav Canada is on the right path by putting all of their resources into Aireon. COPA management supports it wholeheartedly, but Lee and I have been looking at this development closely and it's still a long, long way from what we would like to see and believe Canada needs for GA.

If uAvionics can develop this wingtip mounted solution and sell it at a reasonable cost, it has the potential of working well on the Aireon satellite-based system, but remember this is an ADS-B OUT only device. You will still need an ADS-B IN receiver to get traffic alerts through TIS-B on your iPad or phone in the cockpit. A dual band ADS-B receiver like Stratus, Stratux, Garmin, etc, will also provide you with some weather information (FIS-B) when you are in or near the USA from the FAA's ground stations.

With that in mind, let us look at some of the Pros and Cons of this 1090ES wingtip unit.

This wingtip mounted solution is still in development with the release date unknown as of now. It is supposed to be a low cost Aireon compatible solution for GA, but 250 watt 1090ES transponders in the standard panel mount are not inexpensive, so it will be interesting to see if uAvionics will be able to produce one with WAAS GPS and all the strobe and navigation lighting in a low-cost solution. The current UAT version is 40 watts.

It will be a single source solution that will probably be patented by uAvionics, if it doesn't already fall under the Garmin patent that is currently in the courts under dispute. If the courts rule in Garmin's favour, it could prevent uAvionics from selling or servicing the units. Another possibility would be expensive licencing by Garmin that would possibly make the product unaffordable.

Even if uAvionics wins the 2018 lawsuit, this solution is likely incompatible with existing Transponder installations. The SkyBeacon 1090ES ADS-B wingtip solution will replace your old transponder completely.

For our US friends flying in Canada, this solution is not back compatible with FAA 2020-compliant 1090 aircraft with a bottom antenna nor FAA 2020-compliant UAT aircraft. It merely allows US aircraft to meet Nav Canada/Aireon requirements for surveillance service only.

FAA compliance allows for the use of less costly UAT ADS-B solutions. UAT ADS-B provides some incentive for all aircraft to be equipped since the FAA provides in-flight weather (FIS-B) and NOTAMS and is at a price point that makes it affordable for flight schools, amateur builders, ultralight owners, as well as glider and balloon operators to equip their aircraft with ADS-B In and ADS-B Out.

In spite of SkyBeacon-X possibly being a less costly 1090ES ADS-B solution, it is unlikely that Nav Canada will provide a rebate program like the FAA one in the US as an incentive for Canadian GA pilots and owners to equip with Aireon-compatible 1090ES ADS-B Out.

We see a myriad of other shortcomings related mostly to the one-way path of Aireon ADS-B.

It will be interesting to see the price point when it's released. If they can't get the price down close to UAT prices, the only aircraft I currently see this being a good option for is the 'business' GA fleet, but if any company can do it, it's likely going to be uAvionics.

Either way, the benefit for us is that we will see them too if we have ADS-B In (like Stratus, Stratux, etc.) installed in our planes.

Survey Says: ADS-B Results in Significant GA Accident Reductions

The recent mid-air accident in Alaska has brought some needed attention and concern about flying safety. In that situation, there were two floatplanes returning to the Ketchikan harbour and collided about 8 nm out at 3200ft. Six people were killed. There was also another encounter at Carp airport near Ottawa last year that highlighted a problem around an uncontrolled airport, between a Cessna 150 and a high performance twin engine Cheyenne. One person died. There was another mid-air over St Hubert the year before, but this time at an ATC tower controlled airport. One person died. Clearly, something isn't working. The Transportation Safety Board of Canada explains this in some of their findings for two of the accidents:

“Because of its limitations, the see-and-avoid principle cannot be used as the sole means of preventing aircraft collisions when operating under visual flight rules.” (TSB A17Q0030)

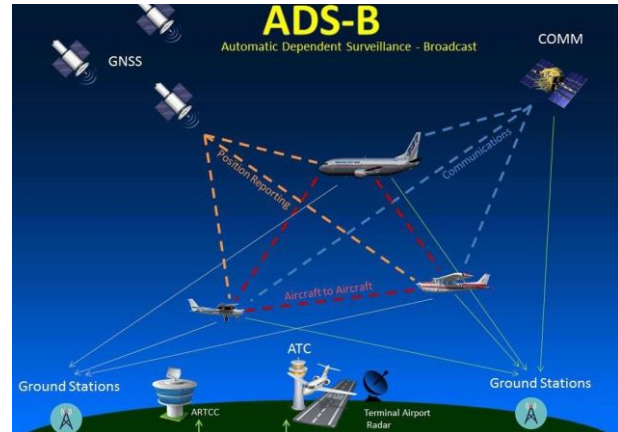
“The Board is concerned that, until technological solutions such as on-board collision-protection systems are mandated, a significant risk of collision between VFR aircraft will continue to exist in congested, high-density airspace areas in Canada.” (TSB A17Q0030)

Aircraft operating under visual flight rules are required to prevent collisions by looking and avoiding. It is clearly the pilot's responsibility. There is help, by following procedures at airports, and communicating intentions as well as positions, on the radio. An ATC tower unit with radar can certainly be an important aid, but it is not the total solution. Surveillance by radar, or even by ADS-B, by a third party such as the FAA or Nav Canada, is therefore also insufficient for VFR collision avoidance. The protection technology needs to reinforce the “see and avoid” principal, directly between the aircraft.

There are technologies available and in use that can reduce the chance of mid-air collisions and provide other important safety features that improve safety and provide the “candy” to entice all pilots to equip. Everyone wants more information and doesn't want to be involved in

close and often hair raising encounters. But, we all play a balancing act of cost versus safety and utility.

Automatic Dependent Surveillance Broadcast (ADS-B) has been in place since 2000 in the USA. The FAA system includes GPS (GNSS) satellites and a network of ground stations.



According to a recent study⁽¹⁾ funded by the FAA, the accident statistics are now reflecting a reduction in accidents and especially fatalities for aircraft equipped with ADS-B IN. Please note that ADS-B mandates are for equipping aircraft with ADS-B OUT. All of these results are for aircraft that have voluntarily installed ADS-B IN receivers and displays. They are able to see other aircraft directly or from the ATC radar via “TIS-B” data link on UAT. Also, these aircraft were able to see the various weather products provided in the USA to allow them to make in-flight decisions about weather avoidance.

This is reflected in the following summary:

Risk	Rate/ M Ops	Rate/ M Ops	Reduction due to ADS-B	Estimated avoided accidents in 5 yrs
	(over 5 years)	(over 5 years)		
	ADS-B IN	Not Equipped		
Mid-Air	0	0.3	++	
Weather Related	3.69	6.64	44%	26
CFIT	0	0.56	100%	5
CFIT & Weather	0.12	0.58	81%	4
Combined:	3.8 (0.22)	8.08 (1.98)	53% (89%)	38 (18)

++ There were not enough accidents for mid-air in ADS-B aircraft.
() Indicates the value for fatal accidents.
CFIT – Controlled Flight Into Terrain

The mid-air accident reduction is probably the most significant as there were no accidents in ADS-B equipped aircraft. But, as the report points out, the normal incidence of mid-air is so low that this is not statistically a slam dunk for ADS-B. Is this still significant? Most certainly yes, but the basic incident rate is 0.3 mid-air per million operations. Obviously, it

takes two to tango with collision avoidance, so ADS-OUT plays a significant part in the equation. The penetration of ADS-B has been significant into the USA airspace as they get ready for the January 1, 2020 mandate deadline. The FAA made strategic decisions sufficiently before the mandate to build up clear equipment requirements and setup a supporting ground infrastructure. They have partnered with pilot organizations like AOPA and the EAA to tailor solutions. They also brought in a lower cost technical alternative that provided in-flight weather and simpler solutions. Further, they retransmitted radar tracked targets (TIS-B) that may not have ADS-B, thereby improving the safety picture. There is a caveat to this whole discussion according to the FAA:

- The ADS-B cockpit display of traffic is NOT intended to be used as a collision avoidance system and does not relieve the pilot's responsibility to "see and avoid" other aircraft. (See paragraph 5-5-8, See and Avoid).
- ADS-B must not be used for avoidance maneuvers during IMC or other times when there is no visual contact with the intruder aircraft. ADS-B is intended only to assist in visual acquisition of other aircraft.
- No avoidance maneuvers are provided nor authorized, as a direct result of an ADS-B target being displayed in the cockpit. (source: FAA -AIM)

Most users of ADS-B are amazed by the number of on-screen targets they do not see with their own eyes.

The study doesn't stop with mid-air, but clearly shows that the information side of ADS-B plays a substantial role in in-flight safety by providing weather, NOTAMs and Temporary Flight Restrictions (TFR) areas. The ability to receive in-flight weather apparently improves the related safety by 44% and reduced the accident rate over the last 5 years by approximately 26. This is due to the FAA innovation of the Universal Access Transceiver (UAT) on 978 MHz, which transmits "FIS-B" data from an extensive network of ground stations. Local weather in the form of METARs, TAFs and Nexrad radar is transmitted

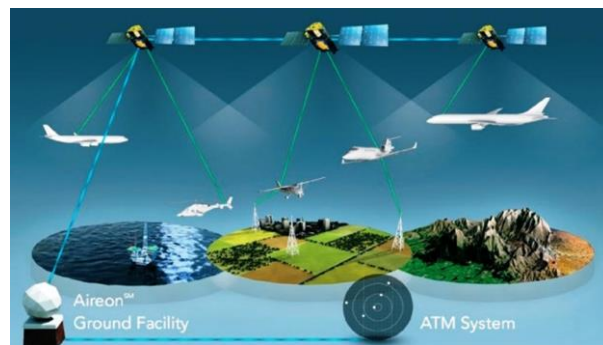
frequently to give a meaningful picture of the present conditions and forecasts. This allows the opportunity to avoid thunderstorms and inappropriate VFR ceilings and visibilities. This data is freely available to anyone with a UAT receiver to be viewed on an EFB tablet or smartphone.

The ability to display weather combined with CFIT from GPS referenced terrain leads to a claimed 81% reduction in accidents. When all the factors are combined, the reduction is an overall 53% and 38 fewer accidents. The most outstanding result is that 89% of the fatalities were reduced, amounting to 18 fewer deadly accidents.

These are all amazing numbers for just 5 years, with just months to go before the 2020 mandate.

How do these results affect us in Canada?

Nav Canada has developed a space-based ADS-B system through Aireon, a US company. The operational network of 66 satellites listens on the conventional 1090 MHz frequency. This is a great achievement to have complete world-wide coverage and provides surveillance for areas that were never covered by radar including Canada's north and the world's oceans. But this system is one-way providing surveillance services only, since Aireon data is only fed to Air Traffic Control Systems.



NAV CANADA has recently submitted an Aeronautical Study to Transport Canada recommending an ADS B performance requirements mandate for Canadian Airspace. If approved by Transport Canada the performance requirements mandate will require the use of ADS B 1090ES* transponders as follows:

- Effective January 01, 2021 in all Class A airspace and all Class E airspace above FL600,
- Effective January 01, 2022 in all Class B airspace, and
- Not before 2023 where required in Class C, D and E airspace.⁽²⁾

*This has been clarified to require a top and bottom mount antenna system (diversity) with 125 W minimum RF power.

Unfortunately, Aireon only receives and provides no data back to the users. It is solely a surveillance tool meant to track airplanes for ATC. To further limit its usefulness, a top mount aircraft antenna is required, which is opposite to the FAA ground based system requirement. This is acceptable for airliners, with top and bottom mount antennae, or antenna diversity, as part of their collision avoidance "TCAS" equipment. General Aviation (GA) aircraft such as those involved in the mid-air accidents do not have the luxury of being able to afford the complexity and cost. Small flying schools have a greater burden and they seem to be the most vulnerable. They fly the most hours, often with in-experienced students who are not completely versed in aviation English. These schools are challenged in keeping up with current avionics technology. The changeover from ground based navigation to GPS creates a significant weight as new equipment is required to train for the next great wave of pilots. A lot of older aircraft are often in a worse situation for technology. The updates may be well beyond the current worth of our airplanes as most have not kept up with the changeover to high precision WAAS GPS navigation. To add compliance for ADS-B seems like an unreasonable requirement. Some may even choose to quit under this technological and financial strain.

The disparity between the clear FAA requirements for ADS-B and the fuzzy Nav Canada proposal is worrisome. What will happen at the US/Canada border and as US GA aircraft transit the west coast up to Alaska? Nav Canada will not see a lot of these airplanes using the Aireon satellites. Aircraft with FAA approved UAT ADS-B will have two issues; they use bottom mount antennae and

the Universal Access Transponder frequency of 978 MHz is not supported outside the USA.

The bottom mount antenna issue is significant. According to a FAA technical paper⁽³⁾ there can be a 20 to 30 dB loss of signal performance. Thus an ADS-B transmitter with 200W output would be effectively degraded to 2 W to 0.2W. The requirement is stated as 125W for a top mount. Similarly, the ADS-B receiver would be degraded for the same antenna. This performance gets worse for aircraft with a lot of obstructions around the antenna. Float equipped aircraft are of particular concern due to the floats, supports and wires restricting performance in a wide arc around the antenna. Ideally, all aircraft would have diversity installations to receive at least ADS-B from the top or bottom of the aircraft for traffic and surveillance, but cost is prohibitive. The Canadian system may see bottom mount installations intermittently at best. This is not the basis for a safe design.

The Universal Access Transceiver frequency of 978 MHz provides all the things that have limited the 1090 transponder environment for GA operations.

1. FIS-B: The biggest benefit is that wider bandwidth allows the ability to send FIS-B data consisting of at least weather and NOTAMS from ground stations. This subscription free service is the single most important item to encourage the equipage of ADS-B on GA aircraft. The alternatives like XM weather are costly and complex.
2. Lower Power: UAT utilizes different sensitivities as it is not restricted by the legacy transponder issues associated with 1090 MHz. A 20 W transmitter on UAT performs as well as a 200 W 1090ES transmitter due to better receiver sensitivity. Lower output power results in lower aircraft power requirements. This gives way to application in gliders or other aircraft without a significant electrical system. If you have a radio, you probably should have an ADS-B system. The lower peak transmitter power and lower duty cycle can also eliminate the RF exposure issues in very cramped aircraft.
3. Better consistent performance: UAT is not affected as 1090 is with responses to radar

and TCAS interrogations effectively interfering with 1090 performance.

4. Simplified Installation: UAT can be added to an existing transponder and WAAS GPS installation without disrupting the integrity of the basic configuration. This can result in a fast turn-around and the lowest overall cost. From a system point of view, it can be just another layer of protection above the transponder. This could be the icing on the cake of aviation protection.
5. Privacy: UAT has an option to suppress the flight identification to hide your identity. The feature cannot be used if you are under ATC control.

Unfortunately UAT aircraft will be invisible to the Canadian system. The existing ground radars or the few ADS-B stations are NOT equipped to receive or transmit on the 978 MHz frequency. In the USA, UAT is allowed in the lower altitudes. The FAA retransmits UAT target reports onto 1090 in certain airspace areas where it is deemed necessary for safety.

Why is Nav Canada not supporting UAT and ground services?

This seems to be all about money and focusing on airliner services. The GA requirements are just not on any priority list in Canada. Aireon is for tracking airliners. We have been told that Nav Canada is turning off a lot of ground navigation aids to save money. This appears to include radar as the 1990s' RAMP radars fade in to obsolescence. The so called "recovery airports" will have some ground based approaches and may have radar. The recovery aspect is required if you consider that just about everyone is using GPS for navigation. We all know how vulnerable a satellite system is to a cyber-attack or just a local spoofing unit to throw you off track. Only large airports will have radar. Here is a response from Nav Canada's National Manager of Service:

"NAV CANADA has invested heavily in space-based ADS B 1090 ES and is scheduled to begin using this system for air traffic control service in high level airspace in 2019." {2}

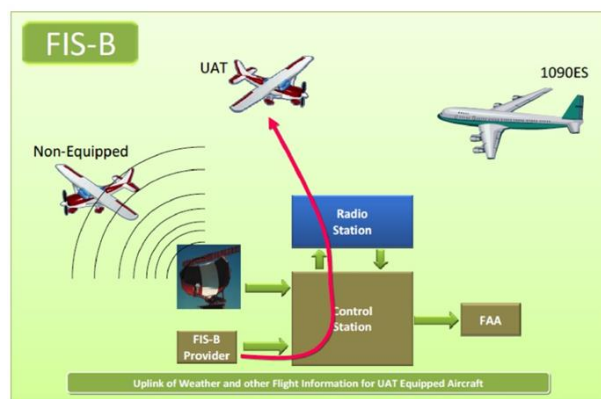
Nav Canada has invested at least \$150M into Aireon, a US corporation and it is in fact the majority share-holder. We, as aircraft owners are required to pay Nav Canada for using air

navigation services for our small GA airplanes. Thus, some of that money is being routed to the USA to support Aireon. Furthermore, the burden for equipping our aircraft is solely at our cost. We have no options but to equip with an expensive option that has no direct safety payback. Their response to that was:

"We expect that there will soon be suitable, affordable products supporting ADS B 1090 ES available for the GA market." {2}

This may be partially true but where is the payback? We had proposed at one point that the Remote Control Outlets (RCO) and other facilities with FSS or ATC communications be equipped with ground-based ADS-B IN and OUT and provide subscription free weather services. Their response was, *"there is an extensive Flight Information Service Enroute (FISE) network that is available to all users. This system provides weather and NOTAM service with a human in the loop for professional interpretation of the data."*⁽²⁾

This just doesn't seem like an adequate response in the new digital age with a solution right under our airplane noses.



The proven safety benefits from in-flight weather are now documented. The irony to the above FISE statement is that there is a significant cost to keeping those RCOs open. They have invested in new digital VHF radios (2005) but have not updated the costly analog communications network to provide FSS VHF radio responses and ATC clearances. An update to the concept is needed that could include ADS-B on 1090 and UAT, with weather and NOTAMS. Nav Canada owns or has right to the data and also needs at least a surveillance ground network backup. These RCOs have been strategically placed to cover

most of the places that we fly. We don't need a total Canada coverage, we just need a strategic safety network.

How should we equip our GA airplanes to support ADS-B Safety?

If you fly in the USA or near the border, the obvious solution is to try to comply with the clear FAA 2020 mandate with a supporting ADS-B receiver on both 1090 and UAT. At least this approach has a very clear payback in safety from traffic avoidance and in-flight weather. We should treat the satellite surveillance as an option due to its much higher cost and complexity. At some point the logic of ADS-B ground support for in-flight services will become obvious to our safety regulator, Transport Canada. We should not delay and wait for clearer requirements from NC or Transport. The FAA requirements clearly lead to a safer aviation environment while the Aireon satellite network provides no safety aspects for VFR operations.

978UAT or 1090ES ADS-B IN?

The answer is yes. For the reception of all airplane targets, the ADS-B receiver should receive both 1090 and 978UAT.

Existing Good Transponder?

If you have an existing newer transponder and aren't planning an enormous avionics upgrade, then you could consider adding a UAT layer. This would consist of a WAAS FAA approved GPS and a 20 W or 40 W UAT transmitter with antenna (DME/transponder). The UAT system will pick up the transponder code and barometric altitude (PA) and rebroadcast it into the UAT message. This could cost as low as \$2500, not including installation or display. You will need to find real estate for the top mount GPS antenna (usually a complete receiver), the UAT antenna (whip or fin) and a place near the antenna for the transmitter. An Electronic Flight Book using Foreflight or subscription free FltPlnGo can be used to pick up the data and display it.

New Install?

If you don't have a transponder, or you have an old transponder, then consider the 1090ES solution. This would consist of a WAAS FAA-

approved GPS, a 200-300 W 1090 Mode ES transponder, barometric encoder, and an antenna (DME/transponder). In an amateur-built aircraft, this solution could start as low as \$4000, not including installation. Consider that you will need to modify the instrument panel and wiring too. If you have a certified aircraft, this figure will be much higher. If you are thinking you already have a qualified WAAS GPS and altitude encoder, you might save money, but probably not. It might actually be better to get a manufacturer's bundle.

If you are still building an aircraft or concerned about jumping the gun and getting the wrong system, uAvionics announced Mid-July that they are working with Nav Canada to produce a 1090ES version of their SkyBeacon product currently available in a 978UAT version for the US market.

If uAvionics can develop this wingtip mounted solution quickly and sell it at a reasonable cost, it has the potential of working well on the Aireon satellite-based system, but remember this is an ADS-B OUT only device. You will still need an ADS-B IN receiver to get traffic alerts through TIS-B on your iPad or phone in the cockpit. A dual band ADS-B receiver like Stratux, Stratux, Garmin GDL, etc., will also provide you with some weather information (FIS-B) when you are in or near the USA from the FAA's ground stations, so you may want to consider getting that portion first since it will work with either 1090ES or a UAT system.

Considerations for achieving the main goals of traffic detection and weather:

ADS-B OUT Antenna – the antenna should be placed to achieve the best clear view of other airplanes, ground towers and radars. This could be a problem, especially with float planes. The top of the fuselage or wing should be considered in place of the traditional under belly installation. A top mount will also help with Aireon performance on 1090 MHz.

ADS-B IN Antenna – the antenna should be the same antenna used for transmitting to achieve the best possible gain and pattern to correspond with the detection of other ADS-B airplanes. If not, then it should at least have an unobstructed view and a good ground plane.

(Whip antennae can have a 10 to 20 dB ERP loss due to a poor ground plane.)

Coaxial connections: Low loss coax must be used to achieve the installation requirements (usually no more than 1.5 dB). Coax lengths may be limited to 3m (10ft). This could result in the ADS-B unit being remotely located, nearer the antenna.

Power: According to FAA rules, the ADS-B OUT should be automatically powered up without operator intervention. This may be a bit of a problem when a GPS unit is shared with other equipment.

Display: The target display should be in a prominent location that allows the pilot to identify and interpret this to "See and Avoid" aircraft without a lot of heads down time.

Audio Cue: A traffic alert should turn into an audio warning and alert you to help keep your eyes out the window, while providing a relative position for the traffic; i.e.: "*Traffic... One mile... 10 o'clock... 100 feet below*".

How do we get Nav Canada's attention?

Money seems like the only solution. NC has at least \$150M invested in Aireon. According to Boyd Barnes "*NAV CANADA has invested heavily in space-based ADS B 1090 ES and is scheduled to begin using this system for air traffic control service...*", "We recognize that there is an aircraft avionics component to the system and will continue to encourage all

users, including GA to equip with ADS B 1090 ES."⁽²⁾

Nav Canada's network of navigational aids, communication systems, and surveillance radars were basically given to the fledgling not-for-profit corporation with the split up of the assets of Transport Canada. Some of these public assets and our NC fees are being divested and money funnelled to a US Corporation. The imposing of costly one-way ADS-B requirements to support airlines is being done on the heads of GA while providing us with no benefits, and is simply not acceptable. It is for that reason I would recommend that we do not pay our annual Nav Canada fees to get the point across. This is not intended as a slight against the current highly regarded competence of NC controllers, flight specialists and support staff. This is simply about the money.

- {1} Measured Impact of ADS-B In Applications on General Aviation and Air Taxi Accident Rates, Daniel Howell, and Jennifer King, Regulus Group, Washington, DC, 20024, USA.
- {2} Letter to The Recreational Aircraft Association Canada, Boyd Barnes, National Manager, Level of Service NAV CANADA, February 15, 2019
- {3} J. S. K. J. Keeping, "Scale model Pattern Measurements of Aircraft L Band Beacon Antennas, Project Report ATC-74," Massachusetts Institute of Technology, Lexington, Massachusetts, 1975

- Lee Coulman -

The Leading Edge

Upcoming Events in 2019: (Highlighted lines are KWRAA Events*)

August 16-18	-	UPAC Convention – Lubitz Field, Plattsville
August 17	-	Aviation Fun Day at CYKF – Waterloo Region International Airport
August 22-24	-	COPA National (Eastern) Convention Cornwall Regional Airport (CYCC)
August 31	-	KWRAA Fly-In at Roger Deming's – Kenilworth Info
September 9	-	September Meeting at 7:30 in the Cadet building at CYKF
October 21	-	October Meeting at 7:30 in the Cadet building at CYKF
November 11	-	November Meeting at 7:30 in the Cadet building at CYKF
November 29	-	KWRAA Christmas Party – Details to follow later in 2019

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

KWRAA Executive Contact Information:

President:	Dan Oldridge	(519) 651-0651	oldridge@golden.net
Vice President:	Lee Coulman	(519) 577-5314	lee.coulman@gmail.com
Secretary:	David Wood	(519) 500-8629	david@davidwoodengineering.com
Treasurer:	Mike Thorp	(519) 338-2768	mhthorp@hotmail.com
Director:	Scott Neufeld	(519) 859-7249	scottneufeld@hotmail.com
Director:	Clare Snyder	(519) 886-8032	clare@snyder.on.ca
Director:	Mac McCulloch	(519) 831-0967	macpat@live.ca
RAA Canada:	Gary Wolf	(519) 648-3030	garywolf@rogers.com

For Sale:

Pegazair-100 STOL project

All metal with fabric covered fuselage is ready for instruments and 100hp engine. Built to plans with exceptional build quality.

Replacement parts cost (unassembled) over \$30,000 USD

MDRA Pre-cover inspection was done in June 2011.

Asking \$15,000 USD or \$18,000 CAD

Please contact Clarence for more information ... cemartens@rogers.com or (519)742-3159.

For Sale:

Corvair Engine set up for aircraft use, but easily converted back.

Contact Clare Snyder for more details and price. clare@snyder.on.ca

For Sale:

Zenair CH701 Partial Kit - Save thousands of dollars and get the professionally completed wings, tail section, slats, and flaperons. Contact Jerry Degen (416)578-8878