

- April 2018 -



At the April KWRAA meeting, Lee Coulman updated the members on the proposed changes to Canadian airspace as related to ADS-B and provided some insight into recent developments in ADS-B equipment for 1090ES and UAT.

## President's Message

The April meeting proved to be a very interesting one for anyone flying into Class C or D airspace. Lee provided us with an update on the recent proposal by Nav Canada to make ADS-B mandatory in all controlled airspace in Canada. This would have led to some very expensive upgrades for many of our members over the next few years. Lee drafted a response to the proposal and sent it to COPA. As a result of the COPA submission to Nav Canada, a few changes were made that lessen the impact for GA.

Although the current plan will bring us four years without major changes to Class C and D airspace, it does nothing to increase pilot safety and unfortunately falls far short of the ideal solution for ADS-B in Canada. Lee is on a crusade to get UAT in Canada and I have joined the cause recognizing that it is not that much of a stretch to see a nationwide network

that is capable of delivering real-time weather and traffic awareness to all GA aircraft.

In this issue you will find another article on ADS-B and why we all should be supporting this initiative rather than just sitting on the sidelines waiting to see what happens to us.

On another note... thanks to Geoff Gartshore's survival presentation in March, I picked up an outdoor vest with lots of pockets and a few survival items I was missing from his list. I will be preparing my survival vest over the next couple of weeks in preparation for a trip north in May to fish with my oldest son Rob. I'm really looking forward to a bit of flying and fishing... if and when the spring weather finally gets here. ;)

2018 will be another great year for KWRAA!

- Dan

## ADS-B Update

*The following is a presentation given by Lee and Dan to about 50 delegates at the Nav Canada YYZ FIR zone meeting last week.*

The Air Navigation System (ANS) managed by Nav Canada employs some of the most current technologies available to manage air traffic within the Toronto FIR. The new Aireon system is the latest tool to improve and expand the capabilities of Nav Canada to execute that role and expand its monitoring capabilities around the world. This is wonderful news for the airline industry as it promises world-wide tracking and the ability to save money by reducing separation and rerouting. Unfortunately, it does little to address the needs of the GA community. Conspicuity is one of the hallmarks of aviation and any opportunity for aircraft to “see and be seen” by other aircraft both commercial and GA is a critical part of a safe operational environment and ANS. Aireon is for airliners with top-mounted or diversity antenna systems specially designed for satellite use. Currently, the GA fleet could not be economically outfitted with the required equipment.

In the recent Canadian ADS-B Out Performance Requirement Mandate study and TOR, the resultant position of Nav Canada is to implement Aireon-based ADS-B in Class A and B and E above FL 600 airspace in 2021 and 2022 and consider all other controlled airspace after that implementation. Most GA pilots and owners will be glad to see controlled airspace in C and D class exempt for now since space-based Aireon equipment would be cost prohibitive for the vast majority of the GA fleet, although we also recognize the safety benefits ADS-B has to offer pilots and ATC. Given that safety and inter-operability are high on Nav Canada’s priorities and the volume of cross-border flights from the USA, we are proposing that Nav Canada consider a ground-

based 1090ES and UAT ADS-B proof of concept trial as a viable option for GA in the class C and D control zones within the Toronto FIR.

In the 2015 AIR NAVIGATION SYSTEM PLAN, Nav Canada outlines an eight year VHF radio replacement program to be completed in 2016. These radios are fully compatible with all current and planned future analog and digital voice and text message formats, to be installed at some 320 sites across the country. These installations also contain Controller Pilot Data Link Communications interfaces that would allow data to be exchanged on other frequencies using the data interfaces. With this new equipment, we estimate that 90% of the supporting infrastructure is already in place at Nav Canada facilities that would allow Nav Canada to deploy a ground-based 1090ES/UAT system that could provide low cost ADS-B to the GA fleet, especially in the busy Toronto FIR.

The benefits of Canada installing ADS-B ground stations with UAT capabilities cannot be ignored as they potentially impact all aircraft, all pilots and ATC units with dual band ADS-B capabilities. Whatever system is finally put in place, it should provide the benefits of enriched situational awareness, enhanced pilot safety, and improved search and rescue capabilities, at a price point that encourages all GA owners and pilots to become enthusiastic ADS-B adopters.

As part of a larger scale roll-out, ground-based 1090ES/UAT ADS-B transceivers could be installed across Canada at very low cost to Nav Canada as the required infrastructure already exists within the FICs and RCOs. This proposal explains how a trial could be employed in a limited coverage area within the Toronto FIR as a proof of concept.

## Rationale for Nav Canada Involvement in a ground-based 1090es /UAT Trial

If space-based ADS-B eventually becomes mandatory in Class C and D airspace, GA stakeholders, small commercial operators, flight schools, recreational flyers and others will be forced to either carry the burden of expensive Aireon-compatible ADS-B equipment or stop flying. If flight schools close, where will the next generation of pilots come from? If smaller commercial operators are forced out of business, who will deliver the services they provide? If recreational aircraft are restricted from entering Class C airspace how will they get their aircraft to maintenance and avionics shops for service? When reasonable options like UAT ADS-B are available, why force an unreasonable option like Aireon on the GA community.

## Why the Toronto FIR?

Not only is YYZ the busiest airport in Canada, it is surrounded by a large number of smaller airports, some with control zones that service class C and D airports as well as a large number of uncontrolled aerodromes. By conducting a proof of concept trial at one of the smaller airports nearby YYZ, it could serve as an excellent testbed to accumulate useful data on the feasibility and practicality of employing further ground-based 1090ES/UAT stations. If the trial works in the busy Toronto FIR, it should work anywhere in Canada!

We propose a 1090ES and UAT trial at smaller airport with ATC such as CYKF that sees both commercial and GA traffic as proof of concept that a combined ground-based and space-based solution is the best way to satisfy the needs of all aviation stakeholders.

## *The Trouble with 1090MHz.*

Historically, 1090 MHz was a frequency envisioned for use in the 1940s as part of a military IFF (Friend or Foe) system. As a result of this legacy system, these are crude coded pulsed signals for Mode A that provide address identity and altitude information on Mode C. Basically, the system measures the distance and heading to the aircraft, and the transponder encodes identification and position information into the response. The cluttered 1090ES environment background replies are often called “fruit”. ADS-B performance is measured by range and capacity, yet both are affected by these so-called fruit.

As the 1090ES clutter (fruit) increases, the range of ADS-B decreases, especially for aircraft-to-aircraft use where Omni-directional antennas are used. Widespread adoption of 1090ES by the GA fleet will only compound the problem from the perspective of ATC and commercial operators. **Therein lays a paradox and the main problem with 1090ES!**

Adding more of the GA fleet reduces the range for everyone else as “fruit” continues to clutter the frequency. 1090 MHz has limited bandwidth and is essentially one-way.

Additionally, 1090 MHz standards only accept high RF power levels. This has the potential to create hazardous levels of RF radiation in some smaller airplanes, especially tube and fabric designs. It also increases the cost of purchase, installation and maintenance, and places higher demands on GA aircraft electrical systems.

## So what is the answer to meeting the needs of GA aircraft owners and pilots?

Universal Access Transceiver (UAT) on the 978 MHz provides a simpler and less costly solution while providing the potential for traffic and weather information.

### UAT, 1090ES, or Both?

UAT allows the use of a lower transmitter power for the similar range capabilities to 1090 systems. Lower power results in a full range of advantages in the aircraft hardware which ultimately leads to lower cost. The price and the simplicity have led to a great number of aircraft in the USA already installing UAT ADS-B systems to take advantage of the FIS-B data, weather and TIS-B traffic it provides, well in advance of the FAA's 2020 mandate.

Market competition in the USA for UAT and dual band ADS-B equipment has driven prices down from thousands of dollars to a couple of hundred dollars for a basic unit as technology develops and the market for lower priced equipment flourishes.

Potential solutions for GA should be evaluated against the following operational objectives:

- **Situational Awareness** – Pilots should be able to see the location of surrounding aircraft, gliders, balloons, and drones and have current weather information available
- **Improved Safety** – Current weather data or maps and critical safety notices on FIS-B (UAT only) and target data on TIS-B (if tracked by ground radar)
- **Search and Rescue** – The WAAS GPS used for ADS-B can provide up-to-date position data on all ADS-B equipped aircraft with adequate ground stations

The need for ADS-B is obvious, but without a solution that works for GA, the overall aviation safety record will likely not improve significantly. Adding 1090ES and UAT features to existing Nav Canada FIC and RCO sites will not be a significant cost, but it will significantly improve air safety in Canada, while providing compatibility with cross border traffic.

### GROUND ASSET TRACKING:

Ground-based ADS-B also provides another means for ATC to track surface vehicles operating within or outside of specified areas on the airport property.

### UAT Internationally:

The FAA initiated a national UAT project for ADS-B to allow GA aircraft to participate in the NextGen Air Transportation System to make flying even safer, more efficient, and more predictable. By including weather and traffic information to pilots, it has encouraged US pilots and many Canadian pilots living near the border to install UAT ADS-B receivers, either as stand-alone units or as part of a complete ADS-B solution. Whether ADS-B in the 1090ES version or the UAT version, it should be noted that ground-based stations are required.

uAvionix has been working with the UK CAA with a demonstration project of providing UAT weather from a simple low power ground station to aircraft receivers.



# The Leading Edge

The photo below gives a good indication of the small size of the UAT transmitters and receivers. There are even smaller pole-mounted units available now. The right side

shows the approximate radiation coverage pattern for this particular unit that was installed in SW England as part of the UAT trials being conducted by the UK Civil Aviation Authority.

## UAT Wx Pilot in UK

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Below you can see the weather information that is broadcast on the UAT system as part of the ADS-B UAT trials being conducted. Below the map you can see the aircraft receiver and

antenna on the left, the pole mounted transceiver in the middle and the unit mounted on a pole at an airport.

## UAT Wx Pilot in UK

- UAT Pilot program with UK CAA and SkyDemon
  - SkyDemon provides weather data
  - uAvionix broadcasting weather from our UAT ground station(s)
  - SkyDemon displays traffic
  - Tested with multiple avionics manufacturer equipment and multiple display apps.
- We have received interest from several other countries.

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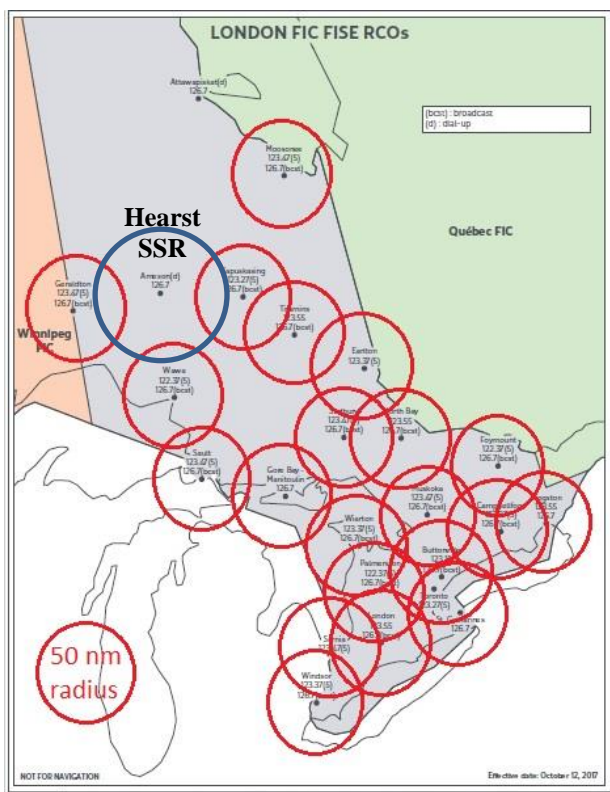
Limited trials of UAT are also being conducted in Japan, Australia, and China as other state

operators recognize the value of a two-way data link such as that provided by UAT.

**We propose a proof of concept trial to explore the capabilities and possible safety improvements associated with installing 1090ES/UAT ground stations.**

What would the ground-based ADS-B coverage look like in the Toronto FIR if ADS-B is co-located at the FIC network sites where 90% of the infrastructure already exists?

The following figure shows the London FIC sites and potential coverage for an ADS-B FIS-B network just for just these sites. A coverage radius of 50 nm is shown as a starting point. This will of course vary by line-of-site restraints and transmitter power.



**ADS-B Network for Toronto FIR / London FIC.**

The following section describes the possible configuration of an ADS-B system for the Toronto flight information region (FIR) and London FIC. This arrangement is based upon the application of ADS-B ground station to each Nav Canada facility with air to ground

communications. The purpose is to provide a reasonable cost effective solution with the benefits of ADS-B to everyone, including GA and the airlines without adding additional ground sites. The sites should incorporate 1090ES and UAT traffic reception to feed into the ATC system and FIS information on UAT. Weather sent to pilots would be a bonus and easily added to the system.

Nav Canada has sites which support the essential voice communications for ATC and FSS operations and associated aviation weather reporting from those sites.

- 2016: 2,000 VHF radio pairs, fully compatible with all current and planned future analog and digital voice and text message formats, are installed at some 320 sites across the country. All radios will be capable of future international standards either VDL digital communications. AIR NAVIGATION SYSTEM PLAN 2015
- This upgrade is a great step forward for digital connections direct to the communications sites, enabling TWO-WAY ADS-B / FIS, in the near future.
- Nav Canada owns the data. METARs, TAFs and radar data is controlled and distributed through Nav Canada.
- Nav Canada can redirect a small amount of the savings realized as they turn off SSRs, PSR and nav aids.
- Nav Canada is already using Sensis-Saab ADS-B equipment at northern ADS-B and Multilateration sites that is compatible with UAT operations.
- Decommissioned Sensis-Saab ADS-B units could be repurposed to conduct the UAT trial(s) reducing some sunk costs and reducing the cost of the ground-based 1090ES/UAT trial(s) at FIC sites. There are 15 ground ADS-B stations in the north and only 9 FIC's so there should be 6 available soon. (Alternately, use repair spares and temporarily re-assign one or two to this proof of concept project.)

## Conclusion:

The benefits of Canada installing ADS-B ground stations with UAT capabilities cannot be ignored as they potentially impact all aircraft, all pilots and ATC units with dual band ADS-B capabilities. Whatever system is finally put in place, it should provide the benefits of enriched situational awareness, enhanced pilot safety, and improved search and rescue capabilities, at a price point that encourages all GA owners and pilots to become enthusiastic ADS-B adopters.

Please consider reviewing UAT as an option for the GA fleet in Canada and start with a proof of concept trial project in the Toronto FIR. Preference should be given to an airport like CYKF that services commercial passenger and cargo traffic as well as mixed general aviation traffic, such as an active flight school, helicopter school, recreational flyers, drone educational programs, nearby commercial balloon operators, nearby glider clubs and dozens of uncontrolled and private airstrips in close proximity. With multiple potential stakeholders and benefactors, a UAT trial would show its greatest potential for all pilots and Nav Canada ATC.

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## Editor's Note:

The article above is a shortened version of the document we supplied to Nav Canada to try to convince them that they should run a ground-based 1090ES/UAT trial to determine the feasibility of having a ground-based system for GA in addition to the satellite-based Aireon system being mandated for airliners and other commercial traffic flying in Class A and B airspace in Canada.

We believe that the addition of real-time weather and traffic information in the cockpit will improve the safety of GA. As we see it, traffic and weather information are the only real incentives for most pilots and owners to install ADS-B in GA aircraft. Additionally, UAT is the only logical path to achieve this end as it makes this information universal and does so at a reasonable cost for all stakeholders.

As a result of this presentation, Lee and I have another meeting scheduled later this week with Nav Canada to discuss our ideas with

managers and technical staff in an attempt to get a UAT trial, preferably in a nearby control zone as a proof of concept that ground-based ADS-B would benefit ATC in, and near, Class C and D airspace as well as pilots throughout the entire coverage area. Nav Canada was considering doing some 1090ES tests in 2023 with GA, but given the benefits of a combined 1090ES/UAT system to GA, we are pushing to get a UAT trial later this year.

Being so close to the border of the USA has given us the opportunity to experience the value-added services available on the UAT portion of their ADS-B network and we believe Canada should offer those same services to pilots. We can sit back, do nothing and just wait to see what happens after Aireon is in service or we can be proactive and find out our options now in the hope that we get a system in place much sooner to address the needs of GA pilots, especially those of us in uncertified aircraft.

Lee and I chose to do the latter! Wish us luck.

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To see some of the newest ADS-B gear on the market and learn more check out these links:

<https://www.uavionix.com/> and <https://levil-aviation-powered-by-tucan.myshopify.com/collections/all> also, <https://www.planeandpilotmag.com/article/ads-b-buyers-guide-final-countdown/#.WtOiN4jwBIU>

For certified aircraft owners, you will need a certified solution so check out the mainstream manufacturers or the one I used from Appareo, which is now available in the certified version...

<https://www.appareo.com/stratus-esg-now-certified-and-available-with-ads-b-in-kit/> and also note that some currently uncertified products are getting certified in 2018, so shop around.

Whatever you chose, you will find that ADS-B is a welcome addition in the cockpit of your aircraft.

# The Leading Edge

## Upcoming Events in 2018: (Highlighted lines are KWRAA Events\*)

May 14	-	May Meeting at 7:30 in the Cadet building at CYKF
June 5 (KWRAA invited)	-	London RAA Fly-in at Roy Rader's <a href="#">43°10'43.0" N 81°06'35.0" W</a>
June 16	-	KWRAA Largo Woods Fly-in near Winterbourne
June 21-24	-	COPA National Convention in St. John, NB
July 7	-	KWRAA Fly-In at at CMZ2 – Metz/MacPat Field in Arthur
July 14	-	Zenair Open House – Midland ON at CYEE - Huronia Airport
July 23-29	-	Air Venture Oshkosh in Wisconsin
July 28	-	KWRAA Fly-In at Roger Deming's – Kenilworth ON
August 11-12	-	Gathering of the Classics in Edenvale, ON
August 17-19	-	UPAC Convention – Lubitz Field, Plattsville ON
August 25	-	Aviation Fun Day at CYKF – Waterloo Region International Airport
September 1	-	KWRAA Fly-In at Tom Shupe's in Mount Forest
September 10	-	September Meeting at 7:30 in the Cadet building at CYKF
October 15	-	October Meeting at 7:30 in the Cadet building at CYKF
November 12	-	November Meeting at 7:30 in the Cadet building at CYKF
November 30	-	KWRAA Christmas Party – Details to follow later in 2018

\* KWRAA events are fly-in and/or drive-in (Please advise the host in advance if you plan to attend whenever possible.)

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RAA Canada:	Gary Wolf	(519) 648-3030 <a href="mailto:garywolf@rogers.com">garywolf@rogers.com</a>

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### FOR SALE

#### Fuel Tank Caps and Parts

2 - RIEKE, 3" composite tank filler neck and cap (asking \$10.00 each)

2 - SHAW AERO, Aerobatic fuel stopper, non-vented adjustable type (asking \$25 each; current list price \$66.75 at ACS) Contact: Clarence Martens at [cemartens@rogers.com](mailto:cemartens@rogers.com)

#### Rotax Heat Monitor Strips

Mac has a number of Rotax Heat Monitor Strips that can be applied to sensitive areas to monitor for extreme heat readings. They are presently being recommended by Rotax to monitor the ignition modules. He is offering them individually for \$15 each incl. HST. or two for \$28 incl. HST.

Contact: Mac McCulloch at [macpat@live.ca](mailto:macpat@live.ca)