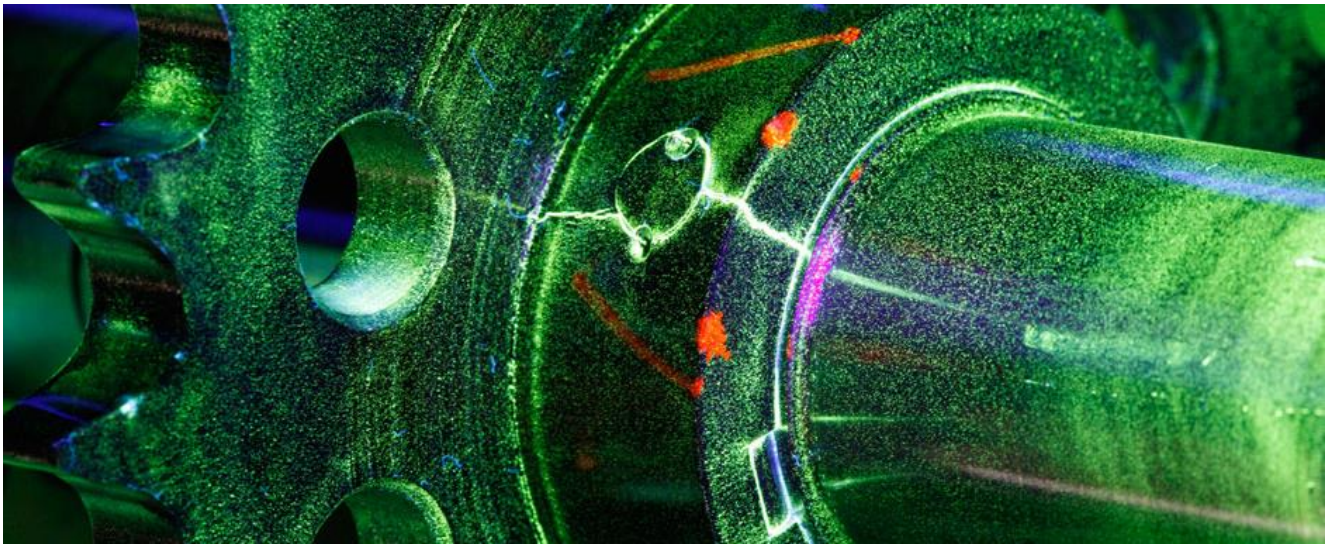
RAA
RECREATIONAL AIRCRAFT ASSOCIATION
RÉSEAU AÉRONEFS AMATEUR CANADA

The Leading Edge

Monthly Newsletter of the Kitchener-Waterloo RAA

- February 2018 -



This is an example of a steel part being NDT tested using a magnetic flux technique often referred to as Magna-flux testing. At the January meeting, we had James Anscomb and Barry Speiran from Perfection Inspection talk to our group about several different techniques used to test aircraft parts non-destructively.

President's Message

In January, we had an opportunity to learn a little about non-destructive testing of various types of aircraft parts from composite to metallic. Aluminum and other non-ferrous parts cannot be magna-flux tested like steel can, but there are a variety of other techniques available. In this issue I will cover the four main techniques used in NDT.

In February, Fred Grootarz of Toronto RAA conducted the annual recurrent training for our chapter and handed out stickers for participants' log books as proof of currency. Since the changes at Transport Canada a while ago, recurrent training has been difficult to obtain so it's good to have people like Fred who are willing to help our local RAA chapters keep their mandatory training up to date.

V.P. Lee Coulman has been researching information on ADS-B systems globally and writing a number of articles to keep us informed of the need for an affordable ADS-B system here in Canada. His first article appeared in the December issue describing the cost-effective system he installed in his Searey this fall. The second article appeared in the January issue of this newsletter. It was basically a copy of the letter Lee sent to COPA to describe some of the shortcomings of the AIREON system compared to a robust ground-based ADS-B system like the one in the USA as it relates to the needs of General Aviation.

In this issue you will find the third article in the series. This one builds on the first two by highlighting several reasons we should not only be embracing ADS-B, but fighting for a robust ground-based system similar to the one south of the border. Although the value-added benefits of in-flight weather and data in the USA are great features, the primary benefit is safety for all GA pilots. Thanks Lee for another informative and inspiring article on ADS-B.

Note: The 2018 schedule has been updated!

2018 will be another great year for KWRAA!

- Dan

ADS-B, to-Be or Not-to-Be

Nav Canada asked the General Aviation (GA) stake holders like the RAA and COPA what we thought of the proposal for making ADS-B mandatory in former transponder Mode C airspace. They implied that the whole country, indeed the whole world, would be covered by the space-based AIREON and we would be living in a new space-age.

AIREON is for AIRLINERS.
The supposed free ride with AIREON was short lived as we found out that AIREON had some significant limitations:

1. AIREON is receive-only. There is no downlink for traffic or weather information.
2. AIREON satellites are 350 nm above us and require a dedicated aircraft antenna pointing upwards. This is a normal configuration for airliners and turbine aircraft with TCAS, but there is no inexpensive solution for our GA aircraft.

So much for the idea of AIREON-ALERT notifying us of missing aircraft as we originally thought. AIREON is not going to replace a SPOT transceiver for tracking, or reduce the need for an ELT in GA aircraft. AIREON is for Airliners flying in Class A airspace.

So far, this was sounding like the other “mandatory” restrictions like ELTs and Mode C transponder airspace. These innovations were going to save money and make the skies safer. The Mode C requirement came to us in 1989, but there were no incentives, concessions or rebates. As a result, transponders are still expensive, not universally adopted by pilots and anyone that installed one needs to pay for bi-annual certifications to keep them current. The 406 MHz ELTs were going to save the military money but that didn’t result in a savings to us. So how many of us actually have 406 ELTs even if they are more effective? Additionally, we are reluctant to have them serviced, tested and recertified annually as specified in the CARs, primarily because of the added cost involved.

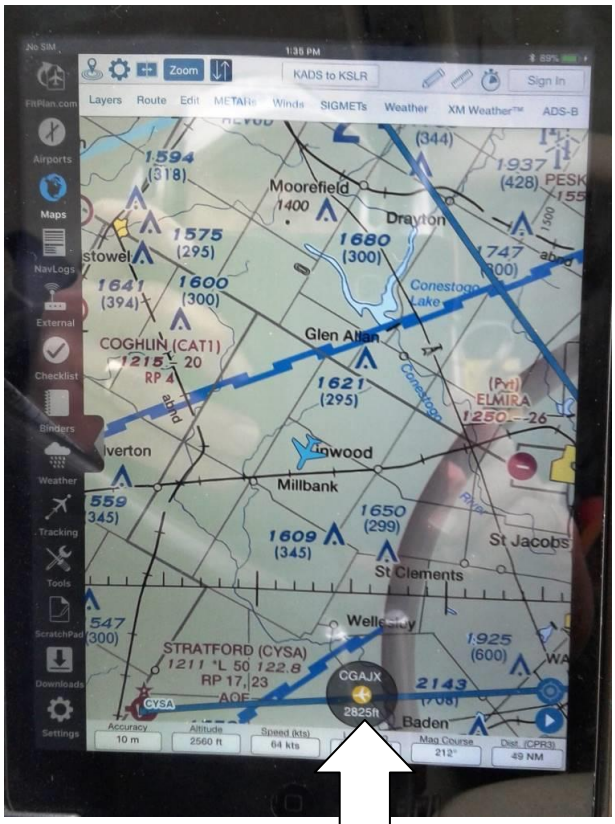
So why should we embrace ADS-B?

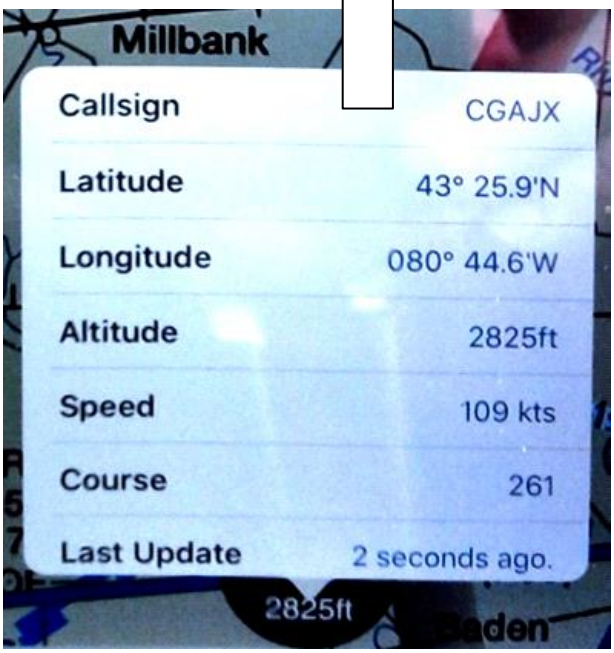
Basically, ADS-B can bring an added level of safety to our view out the window by providing enhanced situational awareness, thereby allowing self-separation from unseen aircraft. Unlike controlled airspace where pilots trust ATC to advise us of other traffic, ADS–B is "automatic" in that it requires no pilot or external input. Other aircraft with ADS-B out are displayed on screen relative to your own location. It is "dependent" in that it depends on data from the aircraft's navigation system, so proper installation is required, although newer self-contained systems operate independently from the other equipment installed in the aircraft. Self-contained systems only need an iPad or android tablet to display the ADS-B data in the form of a moving map with traffic icons.

To illustrate the benefits of ADS-B, I will provide you with one of my first-hand experiences. I installed ADS-B in my Searey last November and wrote an article about it for our Kitchener-Waterloo Recreational Aircraft Association December newsletter. In the article, I said that my primary objective was to keep track of my buddy flying circles around me in his faster Highlander. Having flown with him several times, I was often losing sight of him in as little as one half to one mile of separation. With ADS-B, I was hoping to not only know where he was, but also use the screen information to know where to look for his aircraft. The very next day after submitting the article, I had to fly to Stratford for a very important lunch with friends.

The ADS-B avionics were fired up and picking up traffic and US weather not far out of Palmerston Ontario (CPR3) at about 2000 AGL. My uAvionix echoUAT was transmitting my position on 978 MHz. (UAT) providing position reports to other aircraft. Stratford is my favourite airport, but trouble always seems to find me in the pattern. Maybe it’s the right hand circuits or maybe the training flights that attracts trouble, or is it simply me? As I approached Stratford from the north-east, I could see a target show up on my iPAD (FltPln GO) screen. “CGAJX” was coming toward Stratford from the east, and that registration

sounded familiar. It was in fact my friend Steve in his C182 coming in from CYKF. His airplane had recently been outfitted with new avionics, including ADS-B (1090ES). He was clearly the "target" and he could see my UAT position on his iPAD (Foreflight). This was great! Not only did I see the traffic on screen, I knew who it was too!





Soon after, I could hear Steve calling Stratford Unicom, confirming my iPAD observation. I could also click on the "target" and see further information on my FltPln Go screen.

This provided me with at least three useful bits of information:

First, I knew C-GAJX was a minor threat as his target colour was amber. If he were red then I should be thinking of evasive action.

Second, C-GAJX altitude was 2825 ft. This was confusing at first as this wasn't what I expected for his announced altitude or from his transponder pressure altitude (PA). The Mode C altitude would have been in increments of 100 ft because of the way the encoder works, so this had to be the GPS altitude. This makes sense as this is probably the most precise of all the altitudes and it's a good thing that a high quality WAAS GPS is required for ADS-B compliance.
What I have found is that if the horizontal accuracy is 30 ft (10m), then the vertical is always worse by 2 to 3 times, or 70 to 100 ft in this case. My corresponding GPS altitude was 2560 ft and I have found some displays that show the relative difference, in this case 265 ft (+/-100 ft !).

Third, his speed was a respectable 109 kts on a course of 261 (deg). This compares to my paltry 64 kts on a course of 212 (deg), so he's going to get there first and I'll be way behind him.

Pretty simple so far; he's way ahead of me and not much of a threat. That changed very quickly after I called to the Stratford UNICOM.

I announced that I was arriving from the north. Sometime after that, someone also called in from the north, behind me. Then, as I approached overhead the airport, I called traffic, only to find out the airplane behind me was VERY close, as he called overhead as well. To complicate this, my buddy (now red CGAJX) was doing circuits and was on right downwind for "23". But, I could see him quickly after a flash reference to the iPAD display and then out the window. I still didn't see my

overhead traffic. We ended up negotiating that I would go first. I never saw him, and worse than that, he didn't admit he'd seen me, for example saying “with the traffic”.

The take-away here is that is very difficult to see traffic if you don’t know where to look. I have heard; “**it is 8 times easier to spot an aircraft if you know what direction to look**”. In controlled airspace, ATC helps us with traffic advisories at something o’clock if they have time and we remember what a dial clock looks like under stress.

What would have happened if everyone had ADS-B in this case?

I think that the mystery airplane and I would have negotiated an arrival plan earlier as we saw each other’s relative position and speed. My aircraft is always the slowest, so I probably would have let him go first. ADS-B is great, but it is just another tool to help direct our attention out the window, when and where it really counts!

ADS-B is for General Aviation Aircraft.
Having flown with ADS-B now, I fail to understand the reluctance of other pilots to add it to their aircraft. Even more so, I fail to understand Transport Canada’s and NavCan’s reluctance to implement a ground-based ADS-B system here in Canada, especially in the high traffic areas where the majority of GA aircraft fly. ADS-B avionics must be simple, safe, light weight and cost effective.

Unfortunately, there is no Canadian standard to support such equipment. I believe that someday ADS-B will be more universally accepted here in Canada and possibly even mandated in all GA aircraft because of the extra safety provided. If we get weather and flight data like they do in the USA, that will be a bonus, but the true value of ADS-B will not be fully realized until all aircraft ‘see’ all other nearby aircraft that could pose a flight safety risk.

ADS-B situational awareness can help, but don’t forget that near an airport:

- Keep your eyes out the window for traffic and follow approved arrival procedures.
- Communicate your position and listen for other traffic. Negotiate and cooperate with other aircraft.
- Use the ADS-B and aircraft reported positions to help direct your eyes outside to maintain safe separation from other aircraft for a safe arrival.

FLY SAFELY!

Lee Coulman
Vice President & Director of Airmanship and Flight Safety
Kitchener Waterloo RAA

As a point of clarification, when Lee states “ADS-B is for General Aviation Aircraft”, he is referring to both aircraft to aircraft position information exchange and a ground-based system of towers offering two-way flight information similar to what is used in the USA, preferably including UAT. The AIREON system being supported by NavCan **does not** offer either one for GA!

For more information on ADS-B check out these additional resources:

http://www.kitcheneraero.com/news/2013-01-07_%20Avionics%20Update_ADS-B.pdf

https://www.faa.gov/nextgen/programs/adsb/faq/ ← ← ADS-B in the USA

https://ipadpilotnews.com/2016/06/ads-b-receivers-work-internationally-pilot-report/

Non-destructive Testing

Non-destructive testing (NDT) is the process of inspecting, testing, or evaluating materials, components or assemblies for discontinuities, or differences in characteristics without destroying the serviceability of the part or system. That said, NDT may reveal that the part being tested is not serviceable, but not as a result of the testing process.

In general aviation, NDT is typically used to find cracks, stress fractures and other damage to aircraft parts that have experienced abnormal stresses, usually from hard landings, prop strikes and impacts with other objects. Some of the items typically tested include propellers, landing struts, wing spars and engine parts.

Because of the variety of materials used in aircraft, there are several different types of non-destructive testing available to match the characteristics of the materials concerned.

Current NDT methods are: Acoustic Emission Testing (AE), Electromagnetic Testing (ET), Guided Wave Testing (GW), Ground Penetrating Radar (GPR), Laser Testing Methods (LM), Leak Testing (LT), Magnetic Flux Leakage (MFL), Microwave Testing, Liquid Penetrant Testing (PT), Magnetic Particle Testing (MT), Neutron Radiographic Testing (NR), Radiographic Testing (RT), Thermal/Infrared Testing (IR), Ultrasonic Testing (UT), Vibration Analysis (VA) and Visual Testing (VT).

The most common methods of testing are:

- Ultrasonic testing
- Liquid penetrant testing
- Magnetic particle testing
- Radiographic testing

Ultrasonic testing uses high-frequency sound waves called ultrasonic pulse waves to detect flaws or other imperfections or defects in metal components. It can also be used to identify changes in thickness within the part that may result in failure or other problems in the future. One of the most common uses of ultrasonic testing is to evaluate corrosion in pipelines and enclosed structures. Ultrasonic testing is most commonly performed on metals and metallic alloys, but it can also be used to test composites or wood. This method offers the advantage of deep penetration to evaluate problems within parts, interpreting the results can be challenging since it may be affected by surface imperfections or irregularities.

Magnetic particle inspection (MPI) can be used in metals that have magnetic properties (also called ferromagnetic materials) such as iron, cobalt, nickel and some alloys. MPI works by imparting a magnetic field into the component being tested thereby magnetizing the component. Next, iron particles are applied to the surface where cracks and fissures allow some of the magnetism to “escape”, these particles become attracted to the tiny cracks, providing an “indication” of the defect. The part can be magnetized directly by an electrical current, or indirectly by applying a magnetic field to the outside of the component.

Liquid penetrant testing is one of the easiest and least expensive methods of non-destructive testing. In this method, a penetrant is applied to the surface of the component to be tested, allowed to “soak in” for a prescribed period, and then the surface is cleaned off. Next, a developer combines with any penetrant that remains on the part to help reveal tiny cracks or other imperfections. Liquid penetrant testing is one of the most popular techniques of non-destructive testing.

Radiographic testing uses X-rays or radioactive isotopes to evaluate parts. Radiographic testing works by sending radiation through the part and measuring the amount that emerges on the opposite side. The result is a photographic-type image that represents areas of different densities, including areas where material may be missing or thinned, such as in cracks or areas of weakness. Radiographic testing can be difficult to use on components with irregular surfaces since irregularities influence the thickness of the materials that are being evaluated.

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

March 12	-	March Meeting at 7:30 in the Cadet building at CYKF
April 9	-	April Meeting at 7:30 in the Cadet building at CYKF
April 10-15	-	Sun-n-Fun in Lakeland Florida
May 14	-	May Meeting at 7:30 in the Cadet building at CYKF
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.)

Executive Contact Information:

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Secretary:	*Open*	*(Looking for a Volunteer)*
Treasurer:	Mike Thorp	(519) 338-2768 *mhthorp@hotmail.com*
Director:	Gunter Malich	(519) 747-5066 *gunter.malich@gmail.com*
Director:	*Open*	*(Looking for a Volunteer)*
Director:	Mac McCulloch	(519) 831-0967 *macpat@live.ca*
RAA Canada:	Gary Wolf	(519) 648-3030 *garywolf@rogers.com*

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*

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*

WANTED

Stringer Material

5/16" x 1" rectangular tubing with 0.50 wall thickness in 12' lengths. Contact Ted Welfred if you have some for sale or know of any available.