



## About ADS-B . . .

Automatic Dependent Surveillance - Broadcast (ADS-B) – it is an important emerging avionics technology and a key part of air traffic control modernization. As many governments implement plans to transition their ATC Systems away from conventional radar-based technology and over to advanced satellite-based systems, ADS-B allows them to gain enhanced ATC performance and safety, coupled with much lower operating costs. ADS-B is a cornerstone of FAA’s NexGen ATC modernization program.

With ADS-B, aircraft and controllers realize the benefit of enhanced precision and reliability as they move through the skies and “exchange” information. Better yet, it is applicable to all aircraft that use the National Airspace System.

While ADS-B will bring a new level of safety to flying, it is not the simplest subject to understand. So what follows is an **ADS-B 101 – in plain speak**. As with anything avionics related, each individual aeroplane or rotorcraft and its current equipment will dictate to some extent how this new system will be integrated into that aircraft. The associated costs will also be varied – once again dependent upon what you are starting with and what needs to be added or modified.

It should also be noted that some of the newer Traffic Awareness & TCAS Systems have an input for ADS-B. These will support a blended Traffic Solution to provide the most accurate possible picture of surrounding Traffic. There is great promise for ADS-B, but it has some limitations as a traffic detection safety system, especially during this critical mixed-equipage period. ADS-B will not be a replacement for TCAS where TCAS equipage is mandated.

## How does it work?

ADS-B allows air traffic controllers to see traffic with more precision than ever before. It does so by using a Transponder Datalink of highly accurate, GPS-derived information. Accordingly it works where radar often doesn’t - especially in remote areas or mountainous terrain. ADS-B also functions at low altitudes and even on the ground, allowing monitoring of traffic on airport taxiways and runways.

**ADS-B Out** is basically an enhanced 1090 Mhz Mode S Transponder with an ES (Extended Squitter) that “squawks” ADS-B data out to the ATC system. An approved GPS navigation source (likely WAAS GPS) will provide the required position, vector, altitude, and velocity data. **1090ES ADS-B Out** is the globally accepted system for ADS-B compliance.

One note here though - the FAA has uniquely adopted a “Dual-Link Architecture” for ADS-B compliance in the USA. This allows for a second equipment option.



## ADS-B in the United States:

The second or optional system is called a **UAT** (Universal Access Transceiver). It is only applicable to aircraft operating in US airspace under 18,000 feet. The **978 Mhz UAT** devices provide **both ADS-B Out and ADS-B In**. This can therefore provide the pilot with access to free traffic, weather, and potentially other services on a compatible display. Currently there is not an “ADS-B In” component for the 1090ES “ADS-B Out” System. Most of the ground infrastructure required for UAT ADS-B is in place now, and full coverage of the US is expected during 2013. The DataLink Weather and Traffic Services are in fact available now. An aircraft equipped with a TSO'd UAT would not require a Transponder upgrade.

**Note:** a 1090ES ADS-B Out System is an absolute requirement for all aircraft that operate above 18,000 feet in US airspace and internationally.

Anyone flying into US airspace has until January 1, 2020 to be fully ADS-B compliant. For Canadians, aircraft with a 1090ES Transponder and approved interfaces will be compliant with US operating requirements; however those who frequent US skies under 18,000' may also opt for a UAT.

## ADS-B in Canada:

NAV CANADA has thus far adopted exclusively the 1090ES (ADS-B Out) format, as have all other countries worldwide. The only exception thus far is the USA with their “Dual-Link” ADS-B program.

ADS-B operations commenced domestically in Canada in January 2009 with implementation limited to airspace over Hudson Bay in Northern Canada. About 35,000 flights each year use this airspace, the majority being polar over-flights of Air Transport aircraft. ADS-B has enabled reduction of the separation minima for “equipped aircraft” and allows more of them to follow the most fuel-efficient routings. Controllers currently use ADS-B tactically by applying reduced separation between equipped aircraft on an “opportunity basis” within the Hudson and Minto sectors. This means that each aircraft will have the appropriate protected airspace around it, that being applied based on its unique capability.

In March of 2012 NAV CANADA extended its surveillance to cover a 1.3 million square kilometre portion of airspace over the North Atlantic; the busiest oceanic airspace in the world. ADS-B surveillance has enabled the Gander Area Control Centre to safely reduce separation standards for properly equipped aircraft from approximately 80 nautical miles (NM) to initially 10 NM. This gives air traffic controllers the ability to handle far more aircraft in the airspace safely, and provide these aircraft with more cost-effective flight profiles, including earlier climbs to fuel-efficient altitudes.



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At the time of writing we are not aware of any timetable for implementation of an ADS-B requirement across Canadian Domestic Airspace by NAV CANADA. If and when that does occur we believe that they will opt to stay with the **1090ES ADS-B Out** requirement. NAV CANADA's partnership with Iridium on the Aireon program (read on) would appear to signal their intent to move forward with full domestic ADS-B implementation in that manner. If so the dates may just more or less line up with the FAA's 2020 deadline.

If this assumption is borne out at some future point, Canadian aircraft will be required to be equipped with a 1090ES Transponder. We are now urging customers that are considering Transponder upgrades to consider opting for a 1090ES Transponder in order to position themselves for future ADS-B compliance in both Canada and the USA.

### **Certification of ADS-B Installations:**

ADS-B Systems are considered critical to safety in the National Airspace System. Accordingly to be compliant with the ADS-B requirement(s), all hardware will have to be TSO'd, and all interfaces approved at both the hardware and software levels. Certification is expected to be rigorous, and installation will almost certainly be the domain of the appropriately rated avionics Repair Station or AMO.

**Portable UAT ADS-B** hardware is emerging into the market. Such hardware is not TSO'd, and is for "situational awareness" only. A portable UAT system will not comply with the FAA's ADS-B requirements. These systems are "listen-only" and still generally require that the host aircraft be "participating" in the ADS-B System. That means that the aircraft would still be required to have a certified 1090ES Transponder System in order for the portable UAT equipment to function to its fullest capability.

### **The Difference between 1090ES and Current Mode S Transponders . . .**

Legacy Mode S Transponders "squit" only the most basic aircraft ID, system status and pressure altitude information, which ground computers must then correlate with radar tracking information to derive aircraft position, direction of flight, airborne velocity, vertical climb/descent, and so on. With ADS-B each aircraft's approved GPS navigation system will generate all of this data, and then transmit it at least once per second by means of a 1090ES Mode S Transponder with "extended squitter" – hence the ES. This allows ground controllers and other aircraft in the vicinity (so equipped) to track each airplane's flight path with much greater precision and accuracy.

The ES format carries much more data than the basic "short squat" Mode S version. In fact, some 49 individual parameters can be sent over the extended squitter, compared to three for Mode C and seven for basic non-extended Mode S. (Note: The 978 MHz UAT "Out" has the same basic data transmission elements as ES — however, it uses a different frequency in the radio spectrum to broadcast the information.)



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# Avionics Update & Report

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The higher capacity ES DataLink will allow controllers to see not only what each aircraft is doing, but what it intends to do. The route entered into the navigation system will be broadcast on the ES so controllers and other pilots can see where you intend to fly.

## Looking ahead . . .

In July of 2012, Iridium Communications and NAV CANADA announced a planned joint venture. This new relationship promises to offer worldwide ADS-B-based air traffic surveillance services using the upcoming Iridium "Next" satellite network. These satellites begin launching in 2015 and will be completed in 2017.

The Iridium-NAV CANADA joint venture is called Aireon. It will add 1090ES ADS-B receivers to each of the 66 satellites (and backups) destined to form the Iridium "Next" constellation. The low-earth-orbiting Iridium satellites will offer worldwide coverage, including Polar Regions, and with the ADS-B payloads will provide complete visibility to all aircraft everywhere. This will help ANSP's (air navigation service providers) increase efficiencies. This new capability will extend the benefits of current radar-based surveillance systems (which presently cover less than 10 percent of the world) to entire planet coverage. Aireon is expected to become operational in 2018 - two years before the FAA's ADS-B out equipage mandate takes effect.

ADS-B ground stations are currently being installed all over the world. The entire US airspace will be covered by 2013. There is however no way to provide surveillance over oceans or remote areas that lack radar coverage without using satellite communications. Aircraft are already broadcasting GPS-derived position information over satellite networks on oceanic routes. The Aireon system adds the ADS-B ground station technology to a worldwide satellite network and makes it possible to deliver comprehensive surveillance data to the ANSP's like NAV CANADA that plan to work with Aireon.

## KAHV Background

Kitchener Aero's focus is the corporate, commercial, and general aviation avionics markets. In the 30 plus years that KAAV has been in business, they have been responsible for many industry *firsts*. In addition to conventional avionics sales, installation and repair, the firm have become highly regarded as Canada's *Special Missions Specialists*. The company has developed a strong niche in helicopter avionics and provides some unique mods and STC work over and above the conventional avionics sales, service and support.

For additional information about KAAV, consult our website – [www.kitcheneraero.com](http://www.kitcheneraero.com). Or feel welcome to call Barry Aylward at 1-800-928-4669.



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