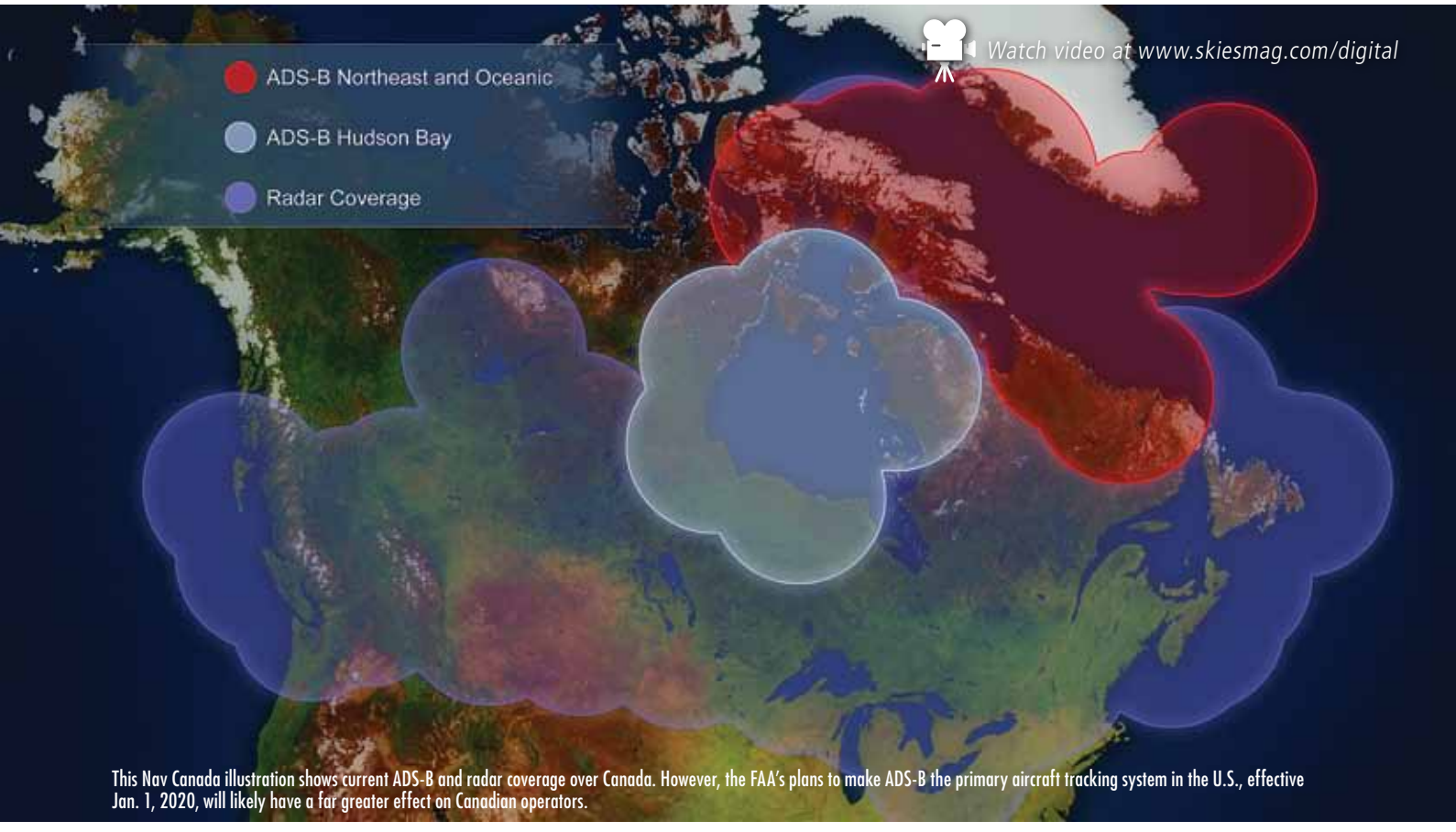
ADS-B: The FAA Rule Affects Canadians, Too

BY DARYL MACINTOSH



This Nav Canada illustration shows current ADS-B and radar coverage over Canada. However, the FAA's plans to make ADS-B the primary aircraft tracking system in the U.S., effective Jan. 1, 2020, will likely have a far greater effect on Canadian operators.

UPCOMING FAA REQUIREMENTS

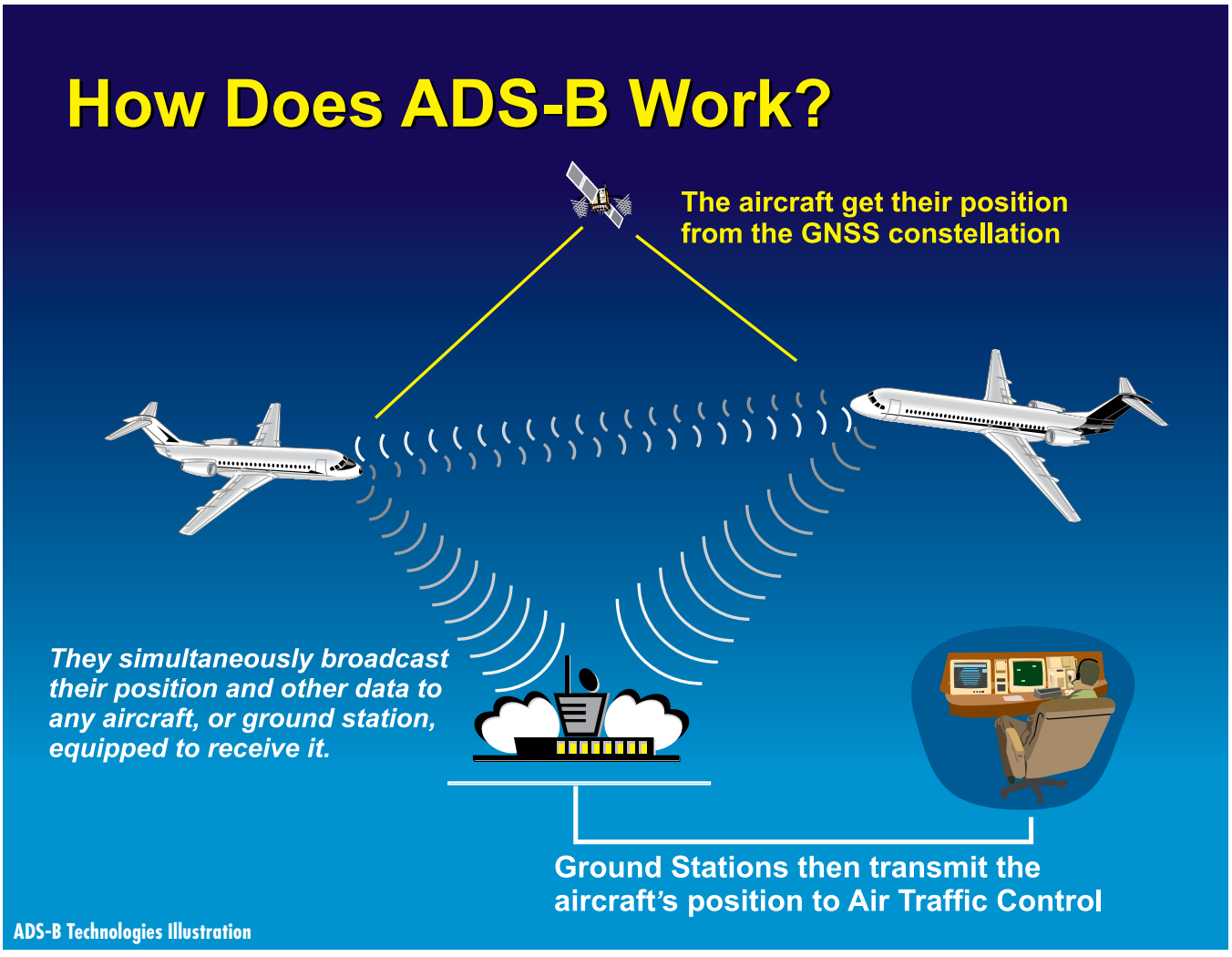
In May of 2010, the FAA published the final rulemaking to adopt ADS-B (automatic dependent surveillance-broadcast) technology as its primary aircraft tracking/locating system. Effective Jan. 1, 2020, aircraft operating in the majority of United States airspace must be equipped with ADS-B Out compliant equipment. Use of ADS–B Out will move air traffic control from a primarily ground-based radar system to a satellite-derived aircraft location system. Benefits to ATC include improved accuracy, wider coverage, better reliability, reduced latency, increased capacity and controller access to more comprehensive aircraft data. The current radar surveillance system that ATC has relied on for more than 50 years has now reached its capacity limits, leading to congestion and delays in some of the busiest U.S. airspace.

ADS-B IN CANADA

Limited ADS-B service was implemented in Canada on Jan. 15, 2009, bringing surveillance coverage for the first time to 850,000 square kilometres of high level airspace (FL290 to FL410) over Hudson Bay. About 35,000 flights a year use this airspace on routes between North America and Europe or Asia.

One of the most significant benefits ADS-B offers for this airspace is reduced aircraft separation. With appropriately-equipped aircraft, controllers can use five-nautical-mile separation instead of the 80-nautical-mile procedural separation required in non-radar airspace. ATC can handle more aircraft in the same airspace at once and controllers can offer route flexibility and approve altitude-change requests more readily.

Nav Canada expanded its ADS-B coverage over northeastern Canada by an additional 1.9 million square kilometres



in 2010, and recently added another 1.3 million square kilometres over the North Atlantic *(see p.18)*. However, the upcoming United States ADS-B requirements will affect many more Canadian aircraft operators than will Nav Canada's ADS-B requirements. Most of us don't need to fly over Hudson Bay, but many of us do regularly fly within U.S. airspace.

ADS-B OUT DEFINED

Automatic: Each aircraft equipped with ADS-B Out will Automatically and continuously transmit its precise position, its velocity (vertically and horizontally), as well as its altitude and other relevant information. The system is always on and requires no pilot action for activation.

Dependent: The overall system is Dependent on each aircraft to transmit accurate data including identification (ICAO 24-bit ID), position, and velocity, together with specific integrity/accuracy quality information.

Surveillance: The system provides ATC with Surveillance capability similar to radar.

Broadcast: Each aircraft will continuously Broadcast the required data. The system does not require interrogation from ATC or from another aircraft.

Out: Although the overall ADS-B system is designed to be bi-directional, only ADS-B Out data capability is becoming mandatory.

ADS-B IN

ADS-B In capability is a key design feature of the overall ADS-B system, but the FAA did not make this capability mandatory. Many operators will, however, choose to install ADS-B In because of the significantly improved situational awareness the available data will provide to flight crews.

TIS-B (traffic information service-broadcast) and FIS-B (flight information services-broadcast offering weather data, airspace information and other services) are available as free uplinks to any aircraft that carries the correct receiving equipment.

EQUIPMENT - TECHNOLOGY CHOICES

The ADS–B Out capability regulation requires operators to install equipment into each aircraft that will provide a data link to ATC to be used for aircraft surveillance. Operators must choose between two completely different types of equipment required under this rule: a 1090 MHz extended squitter (ES) broadcast link or a universal access transceiver (UAT) broadcast link operating on 978 MHz. In addition to the broadcast link, each aircraft must also be equipped with an approved GPS to provide the required aircraft position source data.

Equipment Choice # 1 - 1090 MHz ES

Equipment certified for this option transmits on 1090 MHz, the same frequency as current transponders. Some Mode S
transponders with ES can be certified to meet the latest ADS-B Out requirements. The 1090 MHz ES broadcast link is the internationally agreed-upon standard and is required for aircraft that fly into any other jurisdictions that utilize ADS-B. The final FAA rule requires aircraft flying at and above 18,000 feet MSL [flight level (FL) 180, Class A Airspace] to have ADS–B Out performance capabilities using the 1090 MHz ES broadcast link. This rule also specifies that aircraft flying in designated airspace below 18,000

feet MSL may use either the 1090 MHz ES or the UAT broadcast link. There are two significant disadvantages to the 1090 MHz ES system: (1) A separate 1090 MHz receiver must be installed for ADS-B In capability, as current Mode S transponders do not have ADS-B receiver capability; and (2) The 1090 MHz ES broadcast link does not support FIS–B (weather and related flight information) due to bandwidth limitations.

Equipment Choice # 2 – 978 MHz UAT

The 978 MHz UAT broadcast link utilizes a bi-directional 978 MHz transceiver which supports ADS–B In applications, including traffic information and FIS-B data including weather, temporary flight restrictions (TFRs) and notices to airmen (NOTAMs). The 978 MHz UAT is a proven and mature technology which has provided similar services in Alaska since 2001. The UAT may not be used for ADS-B Out on aircraft that fly above 18,000 feet. The FAA does encourage general aviation (GA) pilots whose aircraft always operate below 18,000 feet to opt for the 978 UAT, in order to minimize frequency congestion on 1090 MHz.

COMBINED EQUIPMENT CHOICE – 1090 MHZ ES OUT WITH 978 MHZ IN

Some operators will undoubtedly choose to install a combination solution utilizing 1090 MHz for ADS-B Out, to satisfy the regulatory requirement for flights above 18,000 feet, and using a 978 MHz UAT for ADS-B In, to benefit from its enhanced data-in capability.

BEST EQUIPPED – BEST SERVED

ATC service has traditionally been based on a policy of "first come, first served" but the FAA is now moving towards a new policy of "best equipped, best served." The FAA has explained that this policy change will help to reduce congestion and delays while simultaneously encouraging system users to equip their aircraft earlier than the regulation requires. By providing operational benefits to the early adopters, the FAA hopes they will then have an incentive to accelerate and expand ADS-B equipage to the rest of their fleets. ADS-B is already providing services in South Florida; Louisville, Kentucky; Philadelphia and out over the Gulf of Mexico. The installation of ground stations to serve the rest of the United States is now well underway and is scheduled to be completed by 2013. The system's 794 ground stations should be substantially operational by 2014. The FAA expects most users will equip their aircraft during the five-year period between 2015 and the 2020 deadline.

ESTIMATED COSTS

The expected cost to equip an aircraft with a compliant system is evolving because most avionics manufacturers are currently working to modify and/or re-qualify their products to meet the latest published specifications. For GA aircraft already equipped with a WAAS GPS and a Garmin Mode S transponder, the upgrade to ADS-B Out is a relatively painless and inexpensive transponder upgrade. Most other GA aircraft owners will need to spend at least $6,000 to meet the minimum ADS-B Out requirements. The fully-installed cost for some GA aircraft will be much higher (perhaps $20,000) when the cost of a new WAAS GPS navigator and/or a new multi-function display is factored in.

The cost to equip Part 25 business and commercial aircraft will likely be much greater (perhaps $150,000) due to much higher equipment and certification costs. Typical modifications will include new (or upgraded) mode S transponders and a modified traffic collision avoidance system. Some aircraft will also require a new FMS and many will require significant wiring modifications.

FINAL WORD

ADS-B is also being adopted by a variety of countries around the world as the new standard for aircraft surveillance. Canadian operators who choose not to equip, because they don't fly to the United States or within other ADS-B airspace, may still be affected by the new U.S. regulations. When it comes time to sell their aircraft, they may find that its value is diminished because it can't fly within the United States. The U.S. ADS-B equipage requirement is real; the deadline is approaching, and it's time for everyone to start paying attention.

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