Technology in the cockpit

Avionics trends are being driven by impending regulatory requirements

By Steve Nunn

Though it's a traditionally cautious industry, lately the avionics sector is evolving at a quick pace, embracing new technology and innovative solutions.

This rapid development is being driven by the need to meet looming regulatory requirements, deadlines that keep both avionics shop managers and aircraft operators up at night.

Here are a few of the industry's biggest concerns.

ADS-B Out

The biggest challenge on the horizon, as many know, is the January 2020 U.S. equipage deadline for Automatic Dependent Surveillance—Broadcast (ADS-B) Out compliance.

"We're working hard to get the word out that the U.S. ADS-B Out mandate for Jan. 1, 2020 is like nothing we have seen before," said Norm Matheis, Universal Avionics' regional manager for Canada.

"All aircraft [including Canadian-registered aircraft] must be ADS-B Out equipped to operate in any airspace in the U.S. where a transponder is required today," he continued. "Shops will be stressed and we are seeing mod slot assignments being sold in advance. We're doing our bit with early-adopter stimulus packages."

ADS–B Out Incentive Program by Universal Avionics and Rockwell Collins

The Federal Aviation Administration (FAA) ADS-B Out mandate is only three and a half years away, and according to the Aircraft Electronics Association, completions are falling short of the necessary rate required to equip all aircraft by the end of 2019.

FAA leadership has repeatedly said the January 2020 date will not slip. Operators need to be talking to their avionics shop now and planning for this upgrade, as every shop in North America will be booked up years in advance of the deadline.

A compliant ADS-B Out system requires:

- An approved position source (WAAS GPS/FMS);
- A mode S transponder with extended squitter capability; and
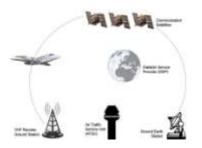- Approved data certifying both systems together as meeting the regulatory requirements.

TCAS II version 7.1

Although the European Traffic Alert and Collision Avoidance System (TCAS) II version 7.1 mandate for airborne collision avoidance systems went into effect Dec. 1, 2015, many aircraft have yet to equip. Thankfully, if an operator is equipped according to TCAS II version 7.0, it's a fairly straightforward upgrade.

Controller Pilot Data Link Communication

The Controller Pilot Data Link Communication (CPDLC) system utilizes a very high frequency (VHF) (or SatCom**)** data link communication system to facilitate clearances and altitude changes, among other applications. CPDLC has been widely implemented across the country by Nav Canada, although there is no requirement for operators to install equipment. In Europe, it was initially expected to be mandatory by 2015 for aircraft operating above 28,500 feet, but that date has now been pushed out to February 2020.

FANS 1/A

Future Air Navigation System (FANS) 1/A is designed for remote areas not covered by radar. It is a form of a CPDLC system that uses the Aircraft Communications Addressing and Reporting System (ACARS) network for air traffic controller to pilot text messaging, position reporting (ADS-C) and voice communication. Primarily, it has been designated for use over the North Atlantic Tracks (NAT) oceanic airspace although the FAA has started implementing it for departure clearances.

It is being mandated over time in different phases for trans-Atlantic flying to help controllers manage the increase in traffic in the NAT system. Aircraft that normally would fly a random route across the Atlantic between 35,000 and 39,000 feet might not be allowed to transition through the NAT system. By January 2020 all aircraft above 29,000 feet need to be FANS 1/A equipped to fly in the International Civil Aviation Organization (ICAO) NAT region

To become technically compliant, aircraft generally require a wide area augmentation system (WAAS) satellite-based augmentation system—flight management system (SBAS—FMS), a communication management unit with VHF data link, a compliant satellite communication system, cockpit annunciators and an upgraded cockpit voice recorder (CVR). An operational approval may also be required

Broadband cabin connectivity

Gogo ATG coverage map

Although not a mandate, the industry is seeing significant interest in broadband cabin connectivity.

"In-cabin communications for light airplanes aren't what they used to be, and that's a good thing," said John Wade, executive vice president and general manager with Gogo Business Aviation. "There are now systems available, including Gogo's own ATG 1000 and ATG 2000 systems, with corresponding predictable hourly rate service plans that make connectivity an affordable reality for turboprops and light jets."

Low bandwidth, high cost satellite solutions for larger airplanes have been around for some time but GoGo's dominance in the market with its air to ground (ATG) technology in North America has been significant for aircraft of all sizes. This technology provides moderate bandwidth at low costs, allows for cell phone text and talk, web access, and cabin entertainment options.

For operators flying around the world, a combined system of satellite and ATG can be implemented. When in the United States and lower Canada, they get the benefit of lower-cost ATG operations and a seamless transfer to satellite when heading north or abroad.

Glass panel upgrades

Rockwell Collins Pro Line Fusion for the King Air

Glass panel upgrades for small to mid-size aircraft have some significant advantages, with the new glass computer technology available. Getting rid of old mechanical gauges that are expensive to maintain and cause significant aircraft on ground (AOG) issues, along with the improved situational awareness of synthetic vision, drive many of these upgrades. The Beechcraft King Air alone has complete glass panel offerings from many of the key avionics suppliers such as Bendix King, Garmin, Rockwell Collins, Sandel, and Universal.

Key considerations

The key building block required to work toward compliance with most upcoming mandates is a modern flight management system (FMS) with satellite based augmentation (SBAS) or WAAS, as it's known in North America.

Operators who are flying older airplanes will have to make some hard decisions. They will need to invest in their avionics to upgrade their aircraft. Otherwise, their hull values will be drastically affected after 2020 by their lack of capability.

Many of these systems have considerable overlap. Often, it will make sense to complete upgrades at the same time, or at the very least install provisions for the next upgrade phase. Operators also need to consider down time, as many of these jobs require significant interior removal. It's far better to do this once rather than many times. Therefore, it's often possible to coordinate a cabin upgrade while avionics work is taking place.

The best advice for operators is to work closely with an avionics shop to understand which mandates apply to the type of flying they do; which new avionics features might benefit both the cockpit and the cabin; and how the installation schedule may affect their operation. It's essential to work together to create a long-range avionics plan that keeps both pilots and aircraft in the air.

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