Wi Fi IN THE SKY: With Broadband

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Once upon a time, maybe 10 or so years ago, being connected to the Internet was a novelty. We had it at home and at the office, but rarely elsewhere. And when we got online, we usually accessed it over a dial-up modem jacked into a telephone line. Wireless networking, or Wi-Fi, was in its infancy and few of us in the United States had regular broadband Internet access. Those days are long gone — and good riddance.

Today, we carry in the palm of our hand a portable device providing access to our e-mail and almost limitless information. (Sometimes, it also can be used to make the occasional phone call, if the need arises.) Along with Wi-Fi-enabled notebook computers, these devices have become essential tools for anyone attempting to run a business, communicate with far-flung friends or even stay in touch with family members during a normal day.

But when we're airborne, all of this connection stops. Even if we welcome the brief respite not being connected to the rest of the world might bring, our personal and professional lives go on, slightly out of our reach, while we're airborne and cut off from the Internet. Or maybe not.

During the past few years, airborne Internet access, sometimes known as Wi-Fi in the sky, has become a cabin amenity on many airliners. At the same time, the technology is trickling down to business airplanes. Generally, however, it's not available — yet — for the average piston airplane, mainly as a result of cost, space and weight issues.

When it is installed, users have the ability to check e-mail, conduct online business and tell the world they're on a plane headed somewhere. But what technology is involved in getting a Wi-Fi icon to appear on an iPhone at FL450? How does it all work and what does the FAA think about it all? Finally, what equipment is required to check your e-mail from over Fresno?

In January 2010, the Aircraft Electronics Association hosted a Wi-Fi Summit at its headquarters in Lee's Summit, Mo., with the FAA, EASA, TCCA and industry. AEA members requested the meeting to convince the FAA it was being overly restrictive regarding the guidance and policy for installing wireless technologies in business aircraft.

Cutting the Cable

There are two basic flavors of airborne broadband connectivity on the market: terrestrial and satellite. Some terrestrial systems use existing cell phone towers and related equipment at so-called "3G" speeds to allow communications between the airplane and an Internet gateway. Anyone using a smart phone these days probably is familiar with 3G technology, as well as with its relative speed and limitations.

Some of those same issues exist with airborne broadband. For example, line-of-sight requirements in some remote locations can prevent a terrestrial system from establishing an Internet connection until the airplane has taken off and climbed high enough for its installed equipment to "see" a ground-based receiver.

Satellite-based technologies, on the other hand, "talk" to orbiting commercial communications spacecraft. Some satellite-based systems are global in scope and usually can be used on the ground almost anywhere while others might cover only part of the globe, such as the Northern Hemisphere.

One additional difference between terrestrial and satellite systems is geography: If your flight operations primarily remain over the continental United States, a terrestrial system might be the best for you and your application. On the other hand, if your regular operations take you beyond U.S. borders or overseas, you'll probably want a satellite-based system. Even so, be sure your chosen provider offers the service in all regions you intend to visit.

With either of these two basic technologies, installed "black boxes" communicate with their ground-bound or space-borne mates, carrying the necessary data. In the airplane, this equipment in turn connects to either an external or integrated Wi-Fi access point, conventionally called a "hotspot." The access point broadcasts its signal throughout the aircraft, then the smart phone or laptop you brought aboard "sees" it, connects and allows you to e-mail Grandma to tell her you're off on another adventure. Simple, right? Well, maybe.

You Can't Use That on My Airplane!

Anyone who has been on a scheduled airline flight during the past decade or two is familiar with cabin announcements admonishing passengers to turn off any electronic equipment — such as cell phones, MP3 players, laptop computers and electronic toys — either for the flight's duration or during takeoff and landing.

Powering off your portable electronic devices — PEDs, for short — is to prevent the possibility of electromagnetic interference (EMI). All consumer-grade PEDs emit some passive EMI — also known as radio-frequency interference — and turning them off is to ensure the installed avionics can do their job. Under existing FAA regulations, each commercial operator sets its own policies regarding what devices can and cannot be used while airborne. For non-commercial operations typically conducted in the U.S., FAR 91.21 is the relevant rule.

On one hand, this rule prohibits use of a PED on an aircraft operated by an air carrier or under IFR. On the other hand, the very same regulation makes an exception for a PED "the operator of the aircraft has determined will not cause interference with the navigation or communications system of the aircraft on which it is to be used." For non-commercial operations, the pilot in command can make the determination; on all others, the operator makes it, not the pilot.

Unlike the passive EMI PEDs emit, Wi-Fi-enabled cell phones and laptops are designed to radiate an electronic signal. The FAA labels any non-certified, consumer product designed to send and receive radio signals as a "transmitting portable electronic device," or T-PED. While today's installed avionics often have excellent passive EMI rejection characteristics, the idea of several electronic devices aboard an airplane actively transmitting their signals during an ILS approach to minimums can be enough to send even the most-wizened electrical engineer down to the local bus station. Meanwhile, new, more-capable T-PEDs are being brought to market an order of magnitude faster than their EMI characteristics against avionics can be tested.

Right now, there is no other FAA regulation covering the use of T-PEDs, such as your iPhone, BlackBerry or laptop. But just because the FAA allows something doesn't mean doing it is a good idea. So, the first hurdle in making any decision about installing Wi-Fi in your aircraft is affirming you want T-PEDs in active use while airborne. As discussed, the pilot in command of a flight operated under Part 91, including Part 91, Subpart K, determines whether they or any other device can be used while airborne. If you're merely the owner and not the pilot, talk to the pilot.

Installation and Testing

Another hurdle to overcome is installation and FAA approval. As noted, an airborne broadband installation — given the equipment mounting requirements, among other issues — usually will be found only on cabin-class aircraft and larger.

A typical installation can involve at least three main components: an antenna system, a transceiver enabling the aircraft to send and receive data between itself and the satellite or ground station, plus a network router providing the airborne Wi-Fi signal itself. Of course, an installation includes

Continued on following page...

AEA MEMBERS:
Wi-Fi Service & Airborne Communications Manufacturers

AIRCELL
www.aircell.com

CMC ELECTRONICS
www.cmcelectronics.ca

COBHAM
www.cobham.com

EMS AVIATION
www.emsaviation.com

EMS SKY CONNECT
www.skyconnect.aero

GABLES ENGINEERING
www.gableseng.com

HONEYWELL
www.honeywell.com

ICARUS INSTRUMENTS
www.icarusinstruments.com

ICG
www.icg.aero

LATITUDE TECHNOLOGIES
www.latitudetech.com

SAGEM AVIONICS/ARNAV
ww.sagemavionics.com

SATCOM DIRECT
www.satcomdirect.com

ROCKWELL COLLINS
www.rockwellcollins.com

THRANE & THRANE
www.thrane.com

TRUENORTH AVIONICS
www.truenorthavionics.com

UNIVERSAL AVIONICS SYSTEMS
www.uasc.com

WI-FI IN THE SKY
Continued from page 21

routing data and power cables, plus integration into the aircraft's electrical system. Trying to squeeze all this into most piston-powered airplanes isn't for the faint of heart, especially because some antennas can be a foot or so in diameter.

Because airborne broadband is a relatively new technology, installing and certifying it isn't as simple as adding a new communications radio. A recent FAA press release addressing airline-provided Wi-Fi in the sky said: "For each model of aircraft a Wi-Fi system is to be used on, a manufacturer must get FAA certification for the system, and the airline must get FAA operational approval. The approvals include testing to show the equipment performs its intended function and doesn't interfere with any aircraft systems during all phases of flight." The same is true for non-commercial operations: Each airborne broadband installation must be approved, although FAA approvals for a specific aircraft series can be obtained.

While both the agency and installers are becoming more and more familiar with the ins and outs, the approval process isn't fully standardized. As more experience is gained, this likely will change although when is another matter. Until it does, your best bet might be to find an avionics shop with a few of these installations already approved, preferably in the same aircraft type.

All of which are good reasons choosing an airborne broadband system should start with your avionics shop. If you have your heart set on a specific provider, but the shop has no experience installing and approving its equipment, how badly do you want to be the first? In such a situation, your choices are to either forge ahead, knowing you'll be paying for the shop's learning curve; use a different provider recommended by your installer; or find another shop.

The shop's comfort level with your plans and desires also should figure prominently. As with any avionics installation in any airplane, paying close attention to the shop's preferences for equipment, mounting options and the approval process can mean the difference between a seamless, pain-free project or weeks of downtime while installers reinvent the wheel just for you.

Another issue — especially with cabin-class aircraft — involves existing, already-installed equipment. For example, if you already have an in-flight telephone system, you may wish to consider removing it in favor of a new airborne broadband system with voice communication included. Doing so can both simplify installation and ensure compatibility while also enhancing available voice communication features. Another consideration might involve an existing in-flight video and audio entertainment (IFE) system and making sure your airborne broadband provider's equipment will work and play well with it.

Vendor Choices

The airborne broadband provider market remains a relatively young one, with numerous vendors. Typically, a provider markets a hardware solution designed for use with only one type of delivery method: terrestrial or satellite.

One exception is Aircell (www.aircell.com), which provides the GoGo Inflight Internet service on many commercial airliners and offers both terrestrial and satellite-based systems. The Aircell High-Speed Internet service uses ground-based 3G stations to provide coverage throughout the continental U.S., while its SwiftBroadband product offers global access via the Inmarsat satellite constellation.

Thrane & Thrane (www.thrane.com) offers Wi-Fi Internet access to the aircraft's cabin for VPN access, Web surfing and file transfer at broadband speed with its Aero-SB Lite. Passengers can use BlackBerrys or other Wi-Fi devices in all phases of flight to send and receive email.

Satcom Direct (www.satcomdirect.com) also offers Inmarsat's SwiftBroadband service, along with the Iridium Aero service, which uses the Iridium satellite telephone network for voice, data, faxing and flight tracking. According to Satcom Direct, one of the benefits provided by the Iridium Aero service is its light weight and small-footprint airborne equipment, making Wi-Fi in the sky practical for smaller aircraft. The company also offers ViaSat, based on the Yonder Ku-band mobile broadband service, another satellite-based provider.

EMS Aviation (www.emsaviation.com) offers customers a choice of using either the Iridium or Inmarsat satellite networks. The company's eNfusion products provide airborne equipment scalable from working with smart phones and PDAs up to laptop connectivity and can use both networks.

International Communications Group (www.icg.aero) provides a local wireless access point in the aircraft cabin permitting Wi-Fi-capable personal devices, such as a BlackBerry or iPhone, to access conventional Internet protocol, IP-based, terrestrial services.

Meanwhile ARINC — a well-known name in airborne communications (www.arinc.com) — offers its SKYLink service, using Inmarsat satellites.

Getting Your Airborne Connection

Airborne broadband for business, corporate and personal aircraft remains an evolving market, with a growing number of providers and solutions. Only in the past three or four years has this type of in-flight service been available for non-commercial aircraft and, if history is an indicator, this market segment's future looks bright. As with any technology seeking new applications, however, there are some regulatory and practical hurdles.

If you absolutely, positively must remain connected with the outside world while airborne, Wi-Fi in the sky is available. As usual, when considering any changes to your aircraft's electronic equipment, the best place to start asking about service options, what it costs, what it can do and whether your aircraft can accommodate it, is your avionics shop. ❑