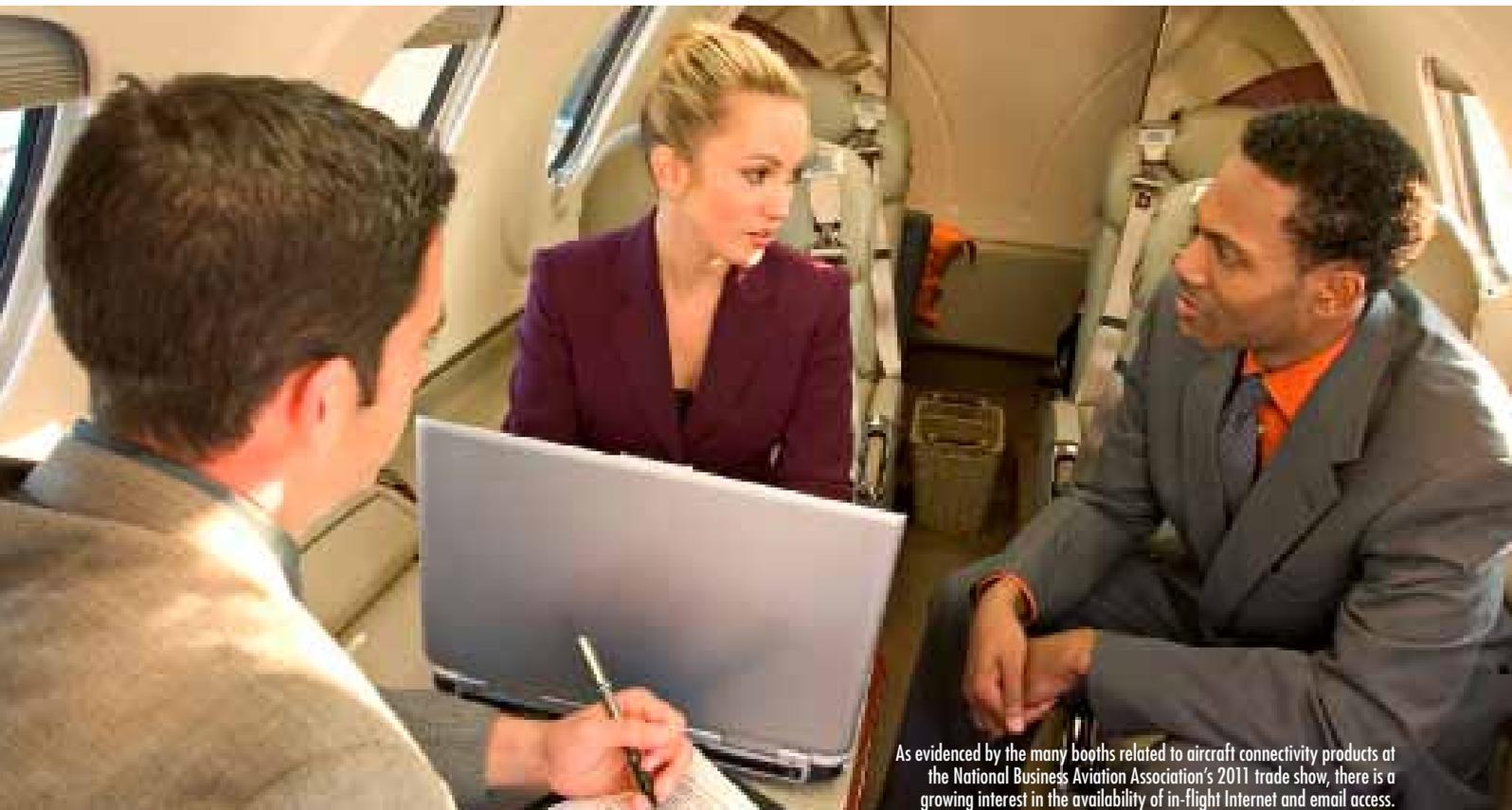


EMAIL, WI-FI & BROADBAND CONNECTIVITY

BY DARYL MACINTOSH



As evidenced by the many booths related to aircraft connectivity products at the National Business Aviation Association's 2011 trade show, there is a growing interest in the availability of in-flight Internet and email access.

INTRODUCTION

Over the past year, I've had an increasing number of inquiries from pilots and aircraft owners who are intrigued by the possibility of in-flight access to their email and the Internet. The ensuing discussions have shown that many flight department personnel lack the knowledge necessary to make an informed comparison of the available technologies. This article is intended to provide an overview of the available systems, their capabilities and limitations. Recent technological advances are now enabling high-speed connectivity to be installed into relatively smaller and lighter business aircraft. Some of these new systems are faster, smaller, lighter, cheaper and easier to install than their predecessors.

Before considering any of the available systems, it's very important to accurately assess the data needs and expectations of the intended user. No one wants to go through all the cost and effort of installing a new system, only to learn that the key user's data bandwidth requirement is larger than expected.

There is a fairly direct (and steep) cost correlation with

system capabilities. For example, a cabin Wi-Fi system connected through the Iridium satellite network will provide text messaging and/or text-based email service with worldwide coverage at a relatively low cost; however, the Iridium system's low data capacity (2.4 kbps) generally limits its use to efficient devices such as the BlackBerry. A high-end SwiftBroadband system will have network capabilities similar to a head office, but the cost could be significantly higher.

CONNECTIVITY MILESTONES

1991: Aero H – First Aeronautical Data Service

In 1991, British mobile satellite company Inmarsat introduced a voice and data service for aircraft (Aero H) which utilized the organization's second-generation satellite network. The Aero H system was capable of providing data services at 9.6 kbps. During the mid-1990s, Inmarsat developed a number of related services, including Aero H+, Aero I, Aero L, Mini M Aero and Aero C. These systems are now known collectively as "Aero Classic Services." Some of

these systems can be upgraded to Swift 64 and/or Swift-Broadband, but the path depends on individual hardware manufacturers.

2002: Swift 64 – First High-Speed Data

The first high-speed data system for aircraft became available in 2002 when Inmarsat launched its Swift 64 service, using the company's third-generation (I-3) satellite network. The system transmits data at 64 kbps, which is roughly equivalent to the data speed of a 2.5G cellular network. The Swift 64 system achieved considerable success with airlines, military and high-end business aviation; however, its disadvantages included high data usage cost, high installation cost, significant weight penalty and the requirement to install a large, high-gain antenna. ["Gain" is a term referring to a measurement of antenna performance which combines directivity and electrical efficiency.]

Many Swift 64 system users are now upgrading to the SwiftBroadband system for increased data bandwidth and lower data costs. The Swift 64 system was impractical for smaller aircraft.

2008: SwiftBroadband Technology

Inmarsat launched its SwiftBroadband service in 2008, after completing a new fourth-generation (I-4) satellite network. It is a high-speed, Internet protocol (IP)-based data service allowing much higher data throughput at a lower cost than the traditional circuit-switched services.

SwiftBroadband service is offered in three performance classes, which are dependent on the gain of the antenna used. The system provides worldwide coverage, except for the polar regions. Hardware is available from a variety of manufacturers.

Class 6 installation:

- o Utilizes a high-gain antenna
- o Provides data rates of up to 432 kbps/channel
- o Maximum 4 channels/aircraft
- o Highest-cost system

Class 7 installation:

- o Utilizes an intermediate-gain antenna
- o Provides data rates up to 332 kbps/channel
- o Maximum 2 channels/aircraft
- o Moderate-cost system

Class 15 (SB200) installation:

- o Utilizes an omni-directional, low-gain antenna
- o Coverage area is limited – does not extend as far north as other classes
- o Provides data rates up to 200 kbps
- o Single channel
- o Relatively low-cost system

The SwiftBroadband system itself is capable of handling email, Internet access, virtual private networking, file transfer protocol, regular voice and voice-over IP, fax and video conferencing. The actual installed features will be dependent on the specific hardware selected and how it's configured. With most systems you can make phone calls, connect your smartphone, log on to your corporate network, email, surf the Internet, or send a fax. Some systems include integrated Wi-Fi, while others do not. Some systems offer cordless handsets, while others don't. Some manufacturers have focused on additional performance-enhancing technologies such as IP optimization, data compression and application optimization. Hardware features and system optimization are important; otherwise, the end user can experience technical limitations, such as time delay due to the round trip transmission from the aircraft to the satellite.

Iridium System Technology

The Iridium network of satellites was designed primarily for voice communications, but it also includes narrowband data capability. The Iridium network's data capability is utilized

by many aircraft operators for automated flight tracking. It is also suitable for text messaging and/or text-based emails, but it would be completely unsuitable for downloading a large email attachment. Some product advertising implies that an Iridium-connected WiFi network would be suitable for browsing the Internet. I'm virtually certain that most any user would find the experience very unsatisfactory.

One key feature of the Iridium satellite network is its low earth orbit, which enables the use of small, easy-to-install antennas. This system is ideal for operators who require worldwide voice coverage, but have only modest data needs.

Iridium system features:

- o Worldwide coverage
- o Limited 2.4 kbps data rate
- o Small and easy-to-install antenna
- o Lower-cost system

Aircell Gogo Biz Service (Air-to-Ground Network)

Aircell offers a broadband system for operators that fly mostly over the U.S. The service operates via Aircell's proprietary air-to-ground spectrum, which utilizes a network of wireless towers in the U.S. The system is a modified version of the same 3G mobile technology used by cell phone service providers.

Gogo Biz Service features:

- o Air to ground service
- o Coverage limited to continental U.S. and parts of Alaska
- o About 500 kbps uplink and 300 kbps downlink speeds
- o Lower-cost system

PRODUCTS & INSTALLATION

After a client's data use requirements have been assessed and an informed decision made about which data link technology is the most suitable, it's time to look at individual hardware manufacturers and their offerings. Some manufacturers are simply suppliers of hardware and leave key system design and integration decisions, with their associated headaches, to the installer; other manufacturers offer near-turnkey engineered solutions. The final product choice will inevitably involve some compromises due to budget constraints, equipment form factor, interface capability, available options, etc. If the aircraft already has a first- or second-generation system installed, it may make the most sense to follow the upgrade recommendations of the original equipment manufacturer. Fleet operators may choose to install a compromise system that they can adopt fleet-wide, rather than have a different user interface in each aircraft.

FINAL THOUGHTS

The world is becoming more connected by the day. It is no longer unusual to hear a passenger ask why they can't receive their email, surf the Internet or log on to their office network while flying. The early adoption period for airborne broadband connectivity is now well past, with systems being installed regularly into a wide variety of business and commercial aircraft.

While attending the 2011 NBAA (National Business Aircraft Association) convention, I couldn't help but notice the large amount of floor space dedicated to aircraft connectivity products. It may not be all that long before we consider an unconnected aircraft to be somewhat odd—sort of like someone who doesn't own a cell phone.

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