



Market Requirements for Broadband Airline Passenger Communications

AirCell, Inc.
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The information below supports AirCell's view that there is an attractive and growing market opportunity for a variety of passenger and airline ATG services sufficient to support up to four licensees of the ATG band in Docket 03-103.

The Demand for "Broadband" Connectivity on Commercial Aircraft

The market for broadband ATG services is weighted with pent-up demand, since consumers are now trained to expect broadband services on the ground and those services are not available during flight. Personal mobile connectivity is growing faster than almost any other technology. There are now over 1 billion mobile phone subscribers worldwide, and there is a growing trend toward data services. Over a billion text messages are sent each day, with new applications continually coming to market.

In 2003, the Cellular Telephone & Internet Association (CTIA) reported that 159 million U.S. consumers used 829 billion minutes of wireless services on the ground. In that same timeframe, the FAA reported that 587 million passengers flew domestic air routes, while approximately 75% of those passengers carry personal wireless devices. The total potential wireless traffic by those passengers is estimated at 53 billion minutes of use, a figure equivalent to 6.4% of the domestic wireless traffic, or \$5.8 billion. As reported by the CTIA, 2003 results reflect a 34% growth rate that is expected to continue. A reasonable expectation of market penetration and growth would suggest that, based on current wireless, aircraft and passenger statistics, annual revenue of between \$510 million and \$1.8 billion will be realized.

AirCell's extensive discussions with airlines have confirmed that this trend has not gone unnoticed by the airline industry, and that airline passengers want access to these services while flying. The World Airline Entertainment Association (WAEA), the airline group dealing with inflight entertainment and communications, formed their Wireless Working Group (WWG) several years ago. The WWG's expressed charter is "To advance the approval and use of consumer wireless devices (intentional RF emitters) onboard (aircraft) and in the traveling environment." The WWG has subcommittees dedicated to Operations, Certification, and System Description (details on the WAEA can be found at www.waea.org). It should be noted that the WAEA, as well as the AEEC (Airlines Electronic Engineering Committee) have always strongly stated their desire for "freedom of choice", or competition among suppliers, when selecting airborne electronic systems.

The increasing importance of passenger communications to the airlines is evidenced by the number of well-attended industry events – with as many as 55 airlines in attendance at each – dealing with onboard wireless communications. They include:

- WAEA Annual General Sessions. Held annually, the next conference is the week of September 20, 2004, in Seattle
- Inflight Passenger Entertainment and Communications (IPEC). Held annually, the next conference is Spring 2005 in London
- WAEA Wireless Onboard Aircraft – Single Focus Workshop. Held November 2002 in Washington, D.C. (attended by Julie Knapp of OET)
- WAEA Wireless Onboard Aircraft – Single Focus Workshop. Held November 2003 in Hamburg, Germany
- Inmarsat Aeronautical Conference. Held July 2004 in Montreal

At the recent Inmarsat Aeronautical Conference, a variety of speakers presented material on the next-generation passenger communication services that will be of the greatest benefit to airlines and the flying public. Virtually all of these services will require having a broadband link between the aircraft and the ground. Speakers of note included:

Dan Murray, Senior Manager 7E7 Avionics – Boeing Commercial Airplanes
Bryan Haynes, Flight Standards – United Airlines
Philippe Chenevier, VP Connectivity Flight & Ground Info. Services – Airbus
John Little, Technical Director – ARINC/Telenor
Dr. Axel Jahn, DLR – German Aerospace Center (Wireless Cabin, EC Project)
Jags Burhm – Inflight Management Development Center
Brigitte Renaud – SITA
Alex McGowan, VP Sales & Channel Management – Tenzing

Findings from these presentations include a wide array of connectivity requirements, which were agreed to be of great benefit to airline passengers:

- Instant Messaging (IM), Email/VPN, Internet Access
- Full service suite requires 432 kbps (SMS 2.4k, Email & Messaging 64k, Multiple VPN 128k, Web browsing 432k, and distant future for Live TV 864k)
- Mobile phone services will enhance passenger in-flight experience and thus increase airline competitiveness
- 20 other data/com applications serving the Cabin Crew, Flight Operations & Maintenance
- Mobile connectivity is widespread:
 - 99.6% check email on the road
 - 26% of the mobile PCs are wireless enabled
 - 36% of business passengers carry a PDA
 - 15% of the PDAs are wireless enabled

- Highest demand applications (according to passenger surveys) – Full Internet Access (63%), Info for Connecting Passengers (61%), Real-Time Weather (55%), Ability to Use Own Mobile Phone (53%), Live Television (52%), Access to Select Websites (48%), Live Text News (48%), Email (23%), Stock Market Info (20%) and Fax (20%)
- Most important data applications (passenger survey) – Send/receive personal email (80%), Business email (78%), Get maps/directions (67%), Online news (65%), Weather reports (64%)
- Travelers are mobile phone users:
 - 90% of passengers departing on transatlantic flights carry a phone
 - 98% of all frequent travelers carry a mobile phone
- High demand for mobile communications services (70%) within the following categories - Business Class, Business Travelers, Frequent Flyers and age group 25-34
- High passenger demand – 56% of the surveyed passengers would use inflight mobile phone services

Separately, an industry research group was recently commissioned to study airline communication preferences, and the survey determined that “Airlines want comprehensive services that provide data and voice for operational and passenger services.” American Airlines confirmed this demand for data as well as voice services in their recent letter to the FCC in Docket 03-103.

Only Terrestrial Systems Can Provide Cost-Effective Broadband to the Domestic Market

The aviation industry has for some time had at its disposal the Inmarsat satellite network, which is used for air traffic control communications on most long-haul aircraft. This service has also been made available for passenger communications, but the high cost of both the airborne equipment and Inmarsat services causes the passenger communication cost to be very high, in some cases more than \$20 per minute for a voice call.

The Inmarsat system can currently offer up to 64/128 Kbps services, but equipment and service rates are very expensive. A constellation of next generation satellites is planned to offer higher data rates in the mid-2006 timeframe (up to 432 Kbps), but the proposed service rates will most likely not allow this infrastructure to provide cost-effective passenger services. In a recent presentation, Airbus suggested that the following pricing was targeted for Inmarsat-based services:

Service	Base Price Per Session/Flight)	Incremental Price
Instant Messaging	\$5	n/a
Web-based email	\$8	\$.02 per kB for attachments
Message bundle "A"	\$10	\$.02 per kB for attachments (IM + webmail)
Message bundle "B"	\$18	\$.01 per kB for attachments (IM + webmail + 1MB)
Live IP	\$25	\$.01 per kB for attachments (web / VPN + 2MB)

Connexion by Boeing and others have rolled out broadband communication systems based on Ku band satellites which provide bandwidth sufficient to allow passengers a VPN connection, but these systems are burdened with the same or higher cost airborne equipment (estimated to be \$500,000 to \$700,000 per aircraft) and service (basic price \$29.95 per flight). Lufthansa, Asiana, All Nippon Airways, China Airlines, Japan Airlines, Korean Air, Scandinavian Airlines (SAS) and Singapore Airlines have signed up for this service, but it is only being used on long-haul (over water) aircraft where flight legs are long enough to justify the high cost to passengers. The service has so far only been rolled out on a few Lufthansa aircraft, and passenger usage data is not available. British Airways, one of the two original Connexion by Boeing trial airlines, has not yet agreed to implement the service.

In addition to being very expensive, the airborne equipment required to support these systems is large (the antenna is 92.41" long, 42.27" wide, and 11" tall), heavy (stated at 800-1,200 lbs) and complex, all of which increases fuel costs and drives system reliability downward.

Although these Ku band services could prove to be economically-viable for long-haul over-water flights, airlines have indicated that it is doubtful that this satellite service will be viable for shorter-haul U.S. domestic flights. And even if it were, there are indications that Ku bandwidth capacity may well not be available to support the U.S. domestic airline fleet over North America.

Low earth orbit satellite systems such as Iridium and Globalstar have been successful in offering airborne (primarily voice) communications at a relatively low cost. However, available data rates with these systems are very low (below 9.6 Kbps) – in fact, too low to support the services that will be required by the airlines and their passengers.

Thus, although aeronautical satellite services offer a broad range of services at vastly varying costs, none of them are suited to providing the cost-effective broadband solution required by U.S. airlines and their passengers. Low-cost, terrestrially-based broadband

services are the only logical solution to serving the vast majority of U.S.-based airline aircraft, and satellite services cannot be viewed as competitors to this approach.

Competition Can be Established for Broadband ATG Services

There can be little doubt that competition will restrain pricing power and lead to newer and better ATG broadband services. Although it will not be technically possible in the foreseeable future for more than one ATG system to co-exist on a single aircraft, meaningful broadband ATG competition can be established and come in a variety of different forms.

Past failures in creating competition in ATG services need not be duplicated in a new generation of broadband ATG services. First generation ATG systems were costly, heavy, complex and required extensive wiring throughout an aircraft. The cost of the hardware and installation was borne by the service provider, and to help recoup these costs, the airlines generally agreed to exclusive long-term contracts (up to 10 years). With today's technology, ATG systems will rely on customer-owned wireless devices instead of hardwired telephone handsets, and off-the-shelf wireless technology will deliver lightweight systems that will be easy and inexpensive to install, thus reducing costs. Service providers thus will have less leverage to demand long-term contracts, and airlines likely will sign shorter-term contracts and have continuing opportunities to choose among multiple service providers offering newer services and better pricing plans.

With lower cost wireless systems and contract flexibility, airlines will be able to select providers based on the most appropriate system for different aircraft types. Airlines may seek more feature-laden systems for aircraft used on long-haul routes and a different no-frills system for aircraft that serve their short-haul routes. These different systems may be offered by the same licensee or they may be provided by different licensees.

In addition, the airline industry has seen a wave of new airlines, many of them becoming the most financially successful players in the industry. Multiple ATG providers will also insure that these airlines are able to find the same or better passenger communications services without concern that the larger dominant airlines will induce a monopoly provider to restrict service to their low-cost competitors.

AirCell, as the fastest growing provider of terrestrially-based (narrowband) air-to-ground services, is well-positioned to support the move to terrestrial broadband ATG services.