Airborne Internet/Collaborative Information Environment: Societal Trends Make *NOW* the Right Time to Create the "*Network In The Sky*"

Ralph Yost, Electrical Engineer
Ralph@alphacompservices.com

The Airborne Internet/Collaborative Information Environment (AI/CIE) was conceived because of recognizing several trends in society. Although these trends were acknowledged to be rapidly maturing and were completely independent of each other, each one makes a substantial contribution to the creation of the Airborne Internet/Collaborative Information Environment. This paper explains AI/CIE, and discusses each trend and its impact and/or contribution on the viability of AI/CIE.

Airborne Internet/Collaborative Information Environment is a concept that overlays computer network theory and principles into the transportation realm. The goal is to create *information connectivity* by providing a general purpose, multi-application data channel for people in transit.

The first trend is that many functions in our society are being digitized to make use of new electronic digital circuits, especially computer networks. Increasing speed and breadth of information connectivity and sharing is a growing trend across the world. More and more networks have been created to connect people who want more than the information at their desk top. High speed broadband network connectivity has been a fuel to feed the hunger for information connectivity, allowing more content rich information to be delivered to the end user, such as video, music, and animation.

The thirst for connectivity carries over into transportation. When people travel, they experience "connectivity down time" in which they are detached from the information that their network provided. Wireless networks, the second trend in society, are rapidly emerging to help fill this void. People that travel with laptops or personal digital assistants can obtain short term network connectivity from a business establishment when they stop for a coffee, hamburger, or to read a book. Airport terminals are becoming popular "hot spots' for wireless connectivity as people have time before and between flights to connect to the wireless network. The "human connectivity imperative" shows us a glaring absence of network connectivity during travel. While in motion on an aircraft, for example, people again lose the ability to connect. We design transportation systems to interconnect to complimentary forms of transportation. But these designs have ignored the information connectivity needs of the people who use it. The time people spend in transit could be turned into more productive time if network connectivity were available.

Having access to more real-time information is also desired in aviation. The problem is that we have created a myriad of systems that crowd the flight deck. Each time we want to provide some new information to the flight deck, we create a new system to do it. This "stove pipe" approach generally means that a new ground system is created, a new avionics system is installed in the aircraft (including another antenna), and probably a new radio frequency is assigned. This evolutionary approach has been founded in the

analog technology that existed 50 years ago, when a new system was the only way practical to provide new information to the flight deck. But today we have a digital world to draw from. Old and new flight deck functionality can be digitized, consolidated in common digital systems, and use a common digital network connection to transfer the information to and from the aircraft. By using a general purpose, multi-application data channel, flight deck functions can be consolidated resulting in cost savings all around.

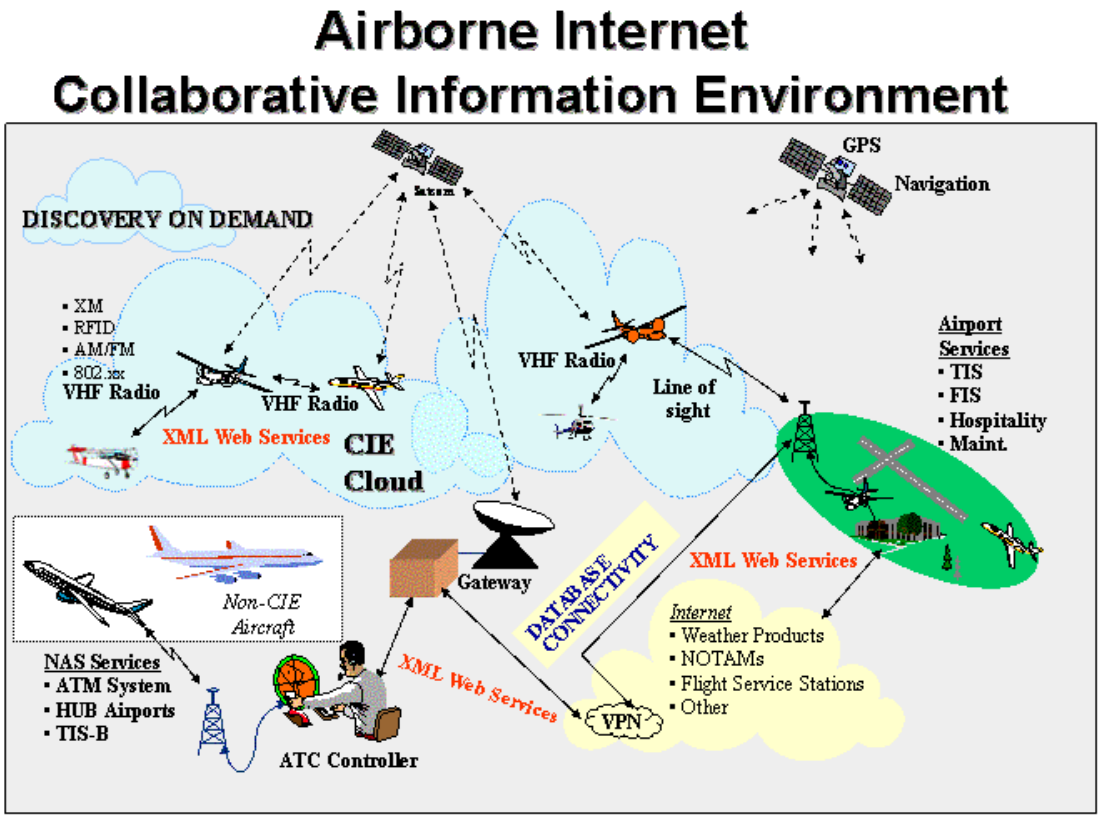
This is the third recognized trend – that businesses are reducing their costs while yet trying to increase profitability. The aviation industry is no exception. The flight deck avionics consolidation proposed by AI/CIE will save the aircraft operator money. When today's analog flight functions are combined and replaced with a digital delivery system, the operator of the National Air Space (NAS) system, the FAA, will save money. And if enough bandwidth can be provided, the AI/CIE data channel could provide aircraft operators with a totally new revenue stream. Aircraft operators could provide network connectivity to passenger services. They could also sell off excess network bandwidth capability to smaller, less bandwidth-needy aircraft in their vicinity.

As these new flight deck designs have evolved, so has a new generation of small jet aircraft. This fourth trend is projected to create a fleet of several thousand new small jet aircraft beginning in about two years. These small jets are costing less than half of that of their predecessors, use 3000-feet runways, and will operate at less than $1 per mile. They are currently the business focus of numerous air taxi operators who will use them in small rural airports to quickly and efficiently transport people without the need to use the large hub airports dominated by the major air carriers. The customers who will use these air taxi services will want to remain connected to their networks as they travel. The value of their personal time will be far greater than the cost to install and operate the AI/CIE. Airborne Internet/Collaborative Information Environment will be such a highly desirable capability for the operators of air taxi service to offer their clients that these operators could be the earliest adopters of the Airborne Internet. The operators could use the AI/CIE to facilitate maintenance monitoring of their aircraft.

The fifth trend is the technology of mobile routing, which is the ability of a network user to move from one network to another without losing network connectivity. It has been developed and has matured to the point that it is ready to be applied to aviation. The current internet protocol (IP) is being replaced with a new version that includes provisions for security and mobile routing. It is specifically designed to accommodate the proliferation of wireless network devices that are easily transportable between networks.

The invention and growth of personalized information services, for example, XML services, is the sixth trend. It is changing the landscape of the World Wide Web as we know it today. Information connectivity is undergoing a complete shift in how information systems are integrated as a result of the advent of XML services, a standard way in which software interacts. These new services provide the opportunity for all information to be published as soon as it is available. This means the end user has the opportunity to receive near real time data, depending on the situation. XML is independent of the platform, operating system, or the device of the information source

and the end user. Currently in aviation, very little information can be updated digitally during flight. At best, some information is updated using the analog voice channel. Using XML aviation services, aircraft operators could receive automatic updates of weather, landing conditions at the destination airport, turbulence ahead, and other information. Being developed by the computer industry, XML services are rapidly being embraced by businesses worldwide. They are using it to better connect their employees to their customers, streamline their business processes, and integrate with their partners. All of this results in a better product in shorter time. Airborne Internet could be the means by which the aviation industry will realize these benefits by providing XML services capability to aircraft.



Original graphic courtesy of Computer Networks & Software, Inc.

Figure 1: Airborne Internet/Collaborative Information Environment (AI/CIE)

The final trend is to create industry standards around new and innovative technological approaches. This has quickly replaced the individual company effort to market proprietary solutions. While the aviation community has long embraced the process of creating standards for new aviation functions, the process took many years to mature a new idea to deployment readiness. Meanwhile, the high tech industry has led the way for the establishment of industry standards with the goal of rapidly completing the industry

agreed upon standard so that products can be brought to market quickly. Over the years, standards have been brought to maturity quicker through the use of industry created consortia rather than through standards setting bodies. For this reason, the Airborne Internet Collaboration Group is forming a consortium to create industry standards for Airborne Internet/Collaborative Information Environment.

In summary, numerous societal trends have emerged to make today the perfect time to create the Airborne Internet/Collaborative Information Environment. Each trend provides a contribution to the AI/CIE that when properly understood and integrated together, will result in a new capability for aviation (and transportation) that will forever change the ability to access information while in transit.

For more information, the reader is encourage to visit http://www.AirborneInternet.com

---

Ralph Yost was an electrical engineer in the Research Division at the FAA's William J Hughes Technical Center. Mr. Yost has over 32 years of experience in aviation and communications systems as a Federal Government engineer. He has worked on landing systems, surveillance systems, navigation systems, and communications systems. He is the former Test Director for Telecommunications for the FAA. Mr. Yost is a licensed pilot with instrument and sea plane ratings.
