# TECHNOLOGY TRENDS IN IFE
## PART TWO

By Dan P. Reed

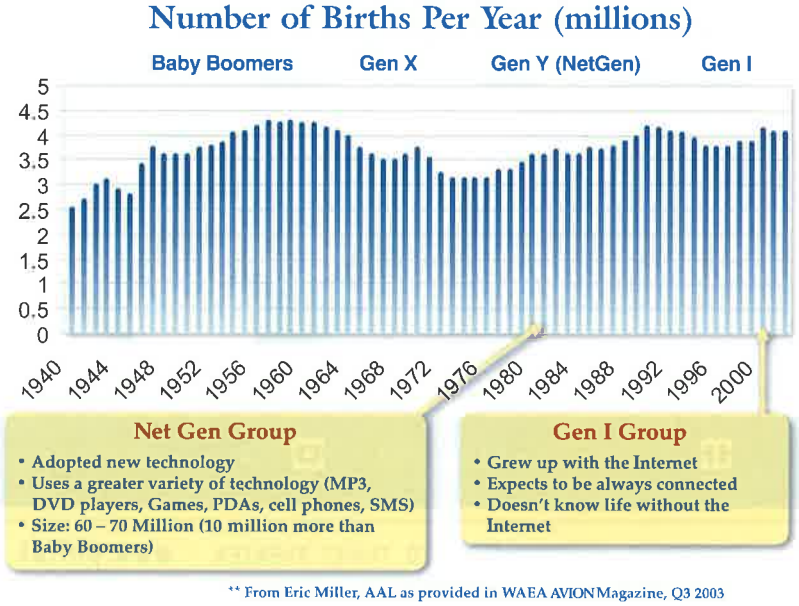
### RECAP

Part One of this series provided a brief history of music and entertainment and how it changed from something you participated in—to a product you owned—to "what you want, where you want it, when you want it" (what I like to call WYWWYWIWYWI which I am sure will be added to the catalog of IFE acronyms in the near future). We also looked at how IFE technology changed, grew, and matured to adopting industry standards such as Ethernet, TCP/IP, and Web-based software and applications.

So where is this all heading? What can we expect? What other factors will drive and change IFE in the future? Part Two will explore some of these factors and suggest some future trends in the IFE world.

### THE "NET" GENERATION

Net Gens were born in the '80s and adopted new technologies such as cell phones, PDAs and Gameboys™ when they were young. The Net Gen group is actually larger in number than the baby boomers. The most recent generation, the Gen I group, which startied in the '90s, was born with headsets permanently attached to their ears. They do not know life without MP3 players, cell phones, and always-on connectivity. Imagine what the expectations will be when these generations become our new business travelers? They will expect to continue to be connected, to continue to use their personal devices, to have not just dial-up speeds, but full broadband services—WYWWYWIWYWI (I knew it would catch on).




** From Eric Miller, AAL as provided in WAEA AVION Magazine, Q3 2003

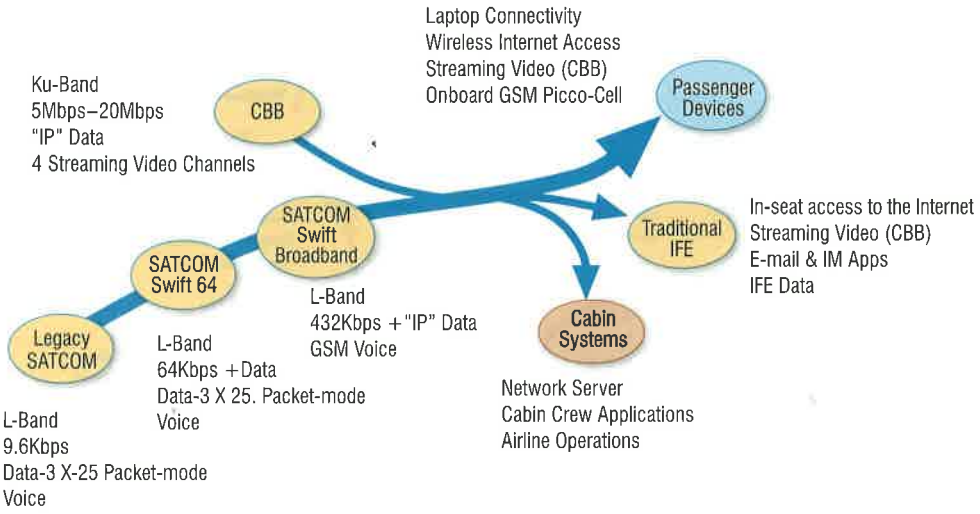
Today, we struggle over the justification of connectivity systems onboard— the costs and impact of installing the satellite antenna, the associated equipment, the cost of the services, and the shared revenue opportunities. But it will be the Net Gen and Gen I generations that will truly drive the need and the justification for these services and systems.

### SATCOM COMES OF AGE

Not to be outdone by IFE, satellite communication technology is finally stepping up to modern times. For over two decades, SATCOM has been sleepily offering the same low speed (and expensive) communication services to passengers. Phone calls were $10 per minute, and the system was limited to four simultaneous calls—and it was the service provider's dream to actually

have four callers at one time, or even throughout the entire flight. Data services were also offered through the in-seat telephones or IFE equipment. Just hook up your laptop, set the time-out parameters for about an hour or so, and log on at a whopping 9.6Kbps … if you're lucky.

Today, several new offerings promise to provide passengers with broadband voice and data connectivity services. ConneXion by Boeing has established a Ku-band system incorporating leased transponders and onboard antennas and equipment that can provide broadband services to the aircraft (on the order of 5Mbps–20Mps, depending on the number of aircraft within a transponder region). This new service will provide broadband connectivity services in the area of 432Kbps. Some SATCOM units, such as the Thales TopFlight SATCOM, have an option for two radios that can be combined to provide 864Kbps of Swift Broadband connectivity.




**Evolution of SATCOM Systems**

With these new broadband connectivity services, Ku and SSBB may merge to provide services to passengers, to the IFE system, and to the growing area of cabin systems.

On the passenger side, the broadband services will allow customers to use laptops, cell phones, and PDAs to connect, access the Internet, watch real-time streaming video, check mail, send messages, or make phone calls using their own cell phones. These satellite-based systems and services can even be seen as IFE systems onto themselves, providing menus, streaming video, and games.

Since the latest generation of IFE systems is not Internet provider-based, it is well adapted to connecting to the Internet. Hence IFE systems are being integrated with the broadband SATCOM connectivity services to provide passengers with seatback access to essentially the same services as their laptops. Specific applications such as e-mail, instant messaging, and SMS messages can be provided at the IFE seat display without requiring the passenger to log on to the Internet. Thales has even integrated TopSeries with ConneXion by Boeing's streaming video to provide live TV channels on the passenger's in-seat display.

## CABIN SYSTEMS – GOING BEYOND PASSENGER ENTERTAINMENT

IFE systems have historically been proprietary designs and were rather limited to providing passenger entertainment and some general flight information. To develop a new application required a room full of software engineers, a constant stream of coffee, and a lot of pizza … I mean a lot of pizza. Then perhaps you'll get something that remotely resembles your original request in a year or two. With today's high-speed networks, Web servers, and Web-based software, new applications and functions are easier to add or integrate. Web software engineers are readily available. This will lead to an expansion of applications that will integrate services and functions throughout the cabin. Passenger applications such as duty-free sales and meal/drink ordering will soon be integrated with the cabin crew at the crew terminal and on their wireless portable handsets. Food carts and duty-free carts will be integrated offering dynamic inventory updates and automated reconciliation. Cabin crews will be able to communicate among themselves, to passengers at their seats, and to the airline operations center on the ground—real time.

The evolution of cabin systems requires a specialized network and server. Not an entertainment system but also not a cockpit control system, the cabin system of the future combines the open-standards aspects of the IFE system with the rigor of cockpit systems to provide a system that can store airline and aircraft operational data, manuals, airline operation applications, and crew reports, as well as applications specific to the maintenance crew.

However, while all of the technology exists, the industry has yet to successfully provide a new cabin system for the airline and aircraft operations—one that addresses the cabin crew functions, provides automated logs and reports, enables the cabin crew to communicate over wireless data and voice links, stores aircraft operational data, loads aircraft navigational data, and the list goes on. Perhaps it is because it is difficult to justify the return on investment, or perhaps no one entity has taken on the overall integration of these systems and services … or both. The OEMs continue to address this area leaving a trail of acronyms in the process: AFIS, OINS, AINS, CINS, ODN, NSS, ALNA, and CSS*. It is this area that will grow into the future, perhaps on the coattails of the new IFE systems.

*AFIS: Airbus In-Flight Information Service, OINS: On-Board Information network System, AINS: Aircraft Information Network System, CINS: Cabin Information Network System, ODN: On-board Data Network, NSS: Network Server System, ALNA: Airline Network Architecture, & CSS: Cabin Services System

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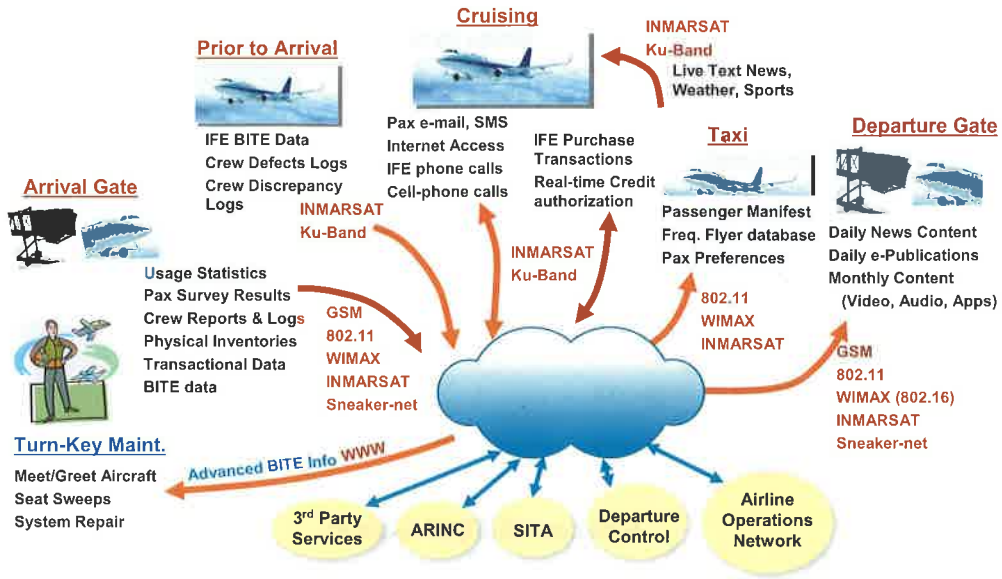


**The Many Facets of a Connected Aircraft**

## THE CONNECTED AIRCRAFT

When ground-based wireless systems are combined with the onboard SATCOM capabilities, the aircraft can now be considered always connected—sitting at the departure gate, taxiing, taking off, cruising, descending, and docking at the arrival gate.

The "connected" aircraft will allow data and content to be loaded at the departure gate, enable real-time Internet access and cell phone services during flight, send BITE data to maintenance personnel prior to landing, and download the results of passenger surveys, usage statistics, payment transactions, and other flight-related data while at the gate.

The industry has explored numerous ways of connecting to the aircraft while at the gate: High speed IR data links (the original Gatelink), 802.11 WIFI, GSM/GPRS, and various proprietary RF links. One of the promising wireless technologies to be exploited between the ground and the aircraft is WiMAX or 802.16. This technology, different than 802.11, promises to offer high speed broadband connectivity to aircraft on the ground and at a distance of several miles. This would allow a broadband wireless connection to be provided to the aircraft without the need to install a wireless infrastructure at the gate. Thales has been researching this technology, internally termed "GateSync™," for some time, and the latest testing shows promising bandwidth and throughput. All of these technologies, once deployed, will allow the aircraft to be loaded with data, media content, daily news videos, and airline operational data prior to takeoff. Once landed, the aircraft can use GateSync™ to off-load performance data, maintenance data, passenger and IFE application data, and even allow personnel to access the onboard systems real-time—and without personnel physically accessing the aircraft.

Wireless technologies have exploded in and around the aircraft. Passenger laptops and PDAs can connect to an onboard 802.11 WI-FI system and onto the Internet. Onboard GSM cell phones will soon be enabled through onboard pico-cell technologies. Blackberrys will be able to continue to connect using the GPRS protocol over GSM. Even IFE displays at the seat will be outfitted with wireless capabilities, eliminating the need for wires running through the seat tracks. Cabin crews will also soon enjoy the same technology and capabilities as passengers through their own wireless terminals, although this wireless network will be secured and separate from the passengers' "open" network.

The all-connected aircraft will also enable new customer relationship management capabilities. Airlines will be able to offer passengers access to the airline Web site and frequent flyer data. The passenger manifest will be loaded digitally and wirelessly and also accessed by the cabin crews' wireless devices. Seat-side services will take a dramatic leap forward. With high-speed networks onboard, it is technically feasible to provide video conferencing between the flight attendants and the passengers via the Web cams on their seatback displays. Flight attendants could provide personalized service to the 300 passengers in economy class without leaving their command post. Now, if we could only get the orange juice to spew out of the back of the seat on demand (OJoD).


**Examples of Advanced Handset & Controller Designs**

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## ADVANCED HANDSET & CONTROLLER DESIGNS

All of these seatback connectivity applications are begging the question: How does the passenger interact with these applications? After all, using the in-seat display to send messages or browse the Internet will require entering data, names, passwords, URL links, payment information, and most importantly, our mother's maiden name. Most applications provide pop-up on-screen keyboards that can be used either through a touch screen interface or by pointing and selecting a character via the IFE handset. Come to think about it, that could be a game in itself—to use the handset game controller to point and select a character from an on-screen pop-up keyboard. The passenger who can successfully navigate through a text message in this manner while bouncing around inside an aircraft deserves to win something.

New handset controllers are now being introduced that are actually small IFE systems in themselves. Incorporating high-speed processors, USB data links, and color LCDs, these handsets can provide interactive menus, run small software applications, and even play MP3 files. New OLED and color LCD technology provides very high quality graphics. Full QWERTY keyboards allow passengers to enter data directly into an interactive application.

Virtual keyboards have been experimented with for several years. These clever units provide a laser graphic image of a keyboard on a flat surface such as a tray table along with an IR sensor that detects a shadow of a finger pressing the area of a virtual key. The beauty of these devices is that they are small, enabling them to be built into seatback displays or handsets and are programmable, offering the possibility of keyboards of different worlds and languages. The drawbacks are that they offer no tactile feedback and are susceptible to typing errors. Perhaps they're not yet ready for prime time.

**The Space-Impaired Economy Class**

## A LAW OF PHYSICS

In the aircraft business and particularly in IFE, there is a certain law of physics. No, it's not the vortex effect of wing design. It's the simple law that Economy Class will always be space impaired. How many people can we cram into as small a space as possible for as long as possible? Give them a tray of food and leave it on their tray table for an hour or so. Add pillows, blankets, oversized carry-on baggage stuffed under the seat in front, headsets (with cords), interactive handsets (with cords tangled up with the previous cords), the seat in front on permanent recline throughout the entire flight, and, of course, the passenger in the next seat who always needs to get out. Now add to this the passengers' personal devices, including laptop or MP3 player with headsets, CD players, portable DVD players, power cords (somehow tangled with the two previous cords. The pioneers traveling across the west probably had it better—at least they didn't have to queue for the lavatory.

All of this silly analysis suggests that there may always be a case for installing some type of IFE system installed in the seat.

So what lies ahead for IFE?

## IFE IN THE FUTURE

IFE systems have progressed and matured through time. Starting from very basic services, interactive systems were introduced, but with rather proprietary solutions. By 2000 IFE systems adopted industry standards that allowed them to be used for other functions in addition to typical entertainment functions. Hence we see a future fragmentation of IFE systems.

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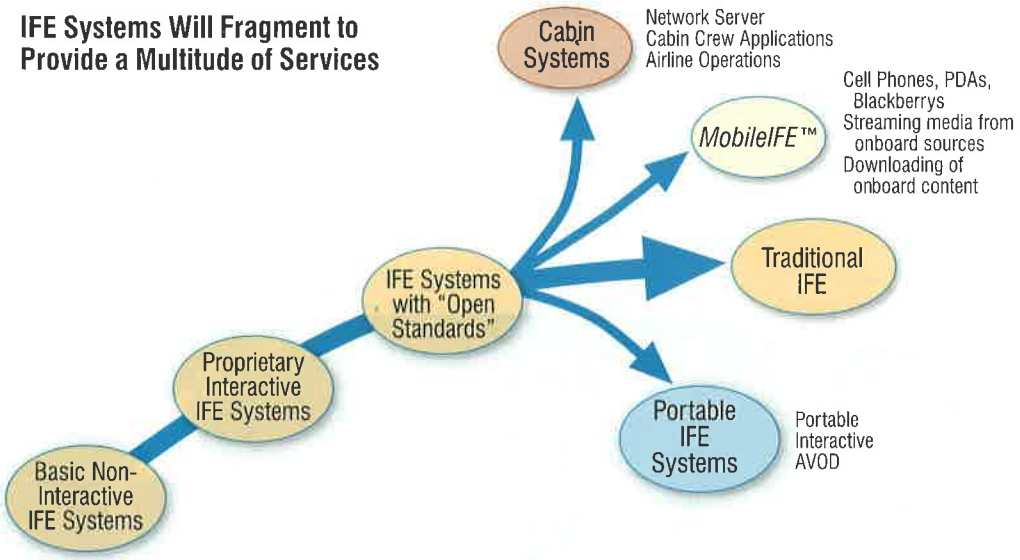


***The traditional in-seat IFE system*** is a good in-seat IFE system with interesting content and an excellent sound system that can make passengers forget about---or at least bear with—the environment. The airline uses this opportunity to control the passenger experience, to market to its customers, to ensure or strengthen its branding, to generate sponsor revenue, and to offer services equal to or better than their competition. The latest generation of IFE systems will continue to enable the in-seat systems with their offering of lower weight, lower cost, no seat boxes, and full functionality.

***Portable IFE systems*** have a niche to offer an IFE experience to some of the passengers without the expense of installing the IFE infrastructure. The portable IFE market allows airlines to continue to extend some amount of branding but comes with the logistics of handling portable devices onboard and off the aircraft.

***Passengers' devices*** will be the future IFE market, and an airline's IFE strategy may be to install nothing at the seat. If you want IFE on your flight ... YOU bring it. It would seem a gutsy move by an airline to purchase new long-haul aircraft for international routes and decide to install nothing for IFE except perhaps a satellite communication system and a wireless onboard network. That day may indeed come. Thales has in the works an evolution of its TopSeries line coined *MobileIFE™*, which not only encompasses its traditional onboard IFE systems but also specifically caters to the passengers' devices by supplying content, applications, and services to those devices. With *MobileIFE™*, bring your MP3 player, your laptop, and your PDA, and the onboard TopSeries *MobileIFE™* system will provide streaming video, a library of audio programs to download, or games that you can access and play, or download and take with you. The system will also serve as the gateway to the Internet world where continued voice and data connectivity is provided.

***Cabin Systems*** utilize the technology of IFE systems (broadband networks, network servers, and integrated applications) to offer applications and services to cabin crews and airline operations. When you think about it, the passengers have all of these new capabilities provided—laptop connectivity, cell phones onboard, SMS, e-mail, and games. Yet the cabin crew have no communication facilities except the vintage '50s telephone handset mounted on the wall. With all of the technology and services being provided onboard, it is inevitable that similar capabilities will be provided specifically tailored for airline operations.

## INDICATORS TO WATCH

To catch a glimpse of where IFE technology is going, there are several indicators we can use. One is the WAEA/ARINC/AEEC Working Groups and Standards Committees that are at the forefront of defining the next generation standard for IFE. Suppliers, system integrators, and OEMs participate in these sessions—the suppliers, integrators to ensure their R&D activity is consistent with

these standards, and OEMs to be able to say that the architecture offered on their aircraft complies to an industry standard.

Another indicator is the new aircraft platforms being planned by the OEMs (Airbus, Boeing, Embraer, etc.). The introduction of a new aircraft model is an excellent opportunity for new systems and technologies to be introduced. The B777 introduced a new architecture with FDDI rings (although short lived), the A340-500/600 introduced the ARINC 628 4c standard adopting Ethernet wiring, the A318 introduced Ethernet and 110 VAC power as the seat network for single-aisle aircraft, the A380 introduced fiber and copper gigabit Ethernet, and the B787 promises to introduce wireless networks for IFE. There are new aircraft models in the works that may again introduce new technology, new architectures, or variations and combinations of existing IFE technologies.

So, what can we expect? What form of IFE technology will we be using in the years to come? Will cabin crews eventually be able to communicate wirelessly? Will portable devices take over for traditional IFE systems? Who will be the first to offer OJoD? Stay tuned—there's a lot more to come.

**Author Dan Reed is Thales Vice President of Product Strategy responsible for the overall product strategy and business development of the company. Dan has been with Thales Avionics Inflight Systems (formally BE Aerospace, B/E Avionics, and Sextant IFS) since 1992. He joined the firm as the Director of Engineering and has held the positions of Vice President of Engineering, Vice President of Technical Marketing, Vice President Sales and Marketing, and Vice President of Business Development.**

**Prior to joining Thales IFS/BE Aerospace, Dan has held senior level technical management positions with high tech firms and as such has led multi-disciplinary engineering teams in the development of telephone communication products, local and wide area network systems, interactive voice-response systems, and real-time process control systems.**