

TECHNOLOGY TRENDS IN IFE

PART ONE

By Dan P. Reed

This two-part article investigates how inflight entertainment has evolved, identifies key enablers, and explores past and potential future trends. Part One takes a brief look at the history of entertainment and how technology has transformed the way people experience and use entertainment, and the key technology trends that have had a critical impact on the evolution of IFE. Part Two will examine the aircraft cabin as a whole and how technology and passenger trends are transforming the cabin into a fully connected environment—plus solutions that address the cabin crew and airline operations.



In the beginning –
music was only
experienced live.



MUSIC TRANSFORMATION

In the beginning ... there was music. Music served to record history, tell stories, and simply to entertain. Music was performed live. People played a piano in the parlor, attended concerts, operas, dances, and yes, even hoedowns.

Then in the early part of the 20th century, the phonograph was invented, and it transformed “live” music into a physical product. Music became a product that people could own, trade, lose, break, and listen to at any time. Vinyl records created new industries: radio broadcasts evolved from playing live music to playing pre-recorded music on those vinyl discs; production companies signed artists to recording contracts, and produced and manufactured records; and pop charts tracked popularity of groups and song titles. True ... take it from one who knows ... phonographs suffered from a lack of transportability. Also, once a record was scratched, it required a careful blend of nickels and quarters taped to the turntable’s tone arm to prevent the needle from skipping ... a skill long lost on the current generation.

Portability of audio programs came in two forms: transistor radios that enabled broadcast programming to be heard anywhere within range of the radio station, and eight-track (and later, Philips cassettes) that allowed people to play the music that they owned—any time and anywhere. More recently, CD players augmented the portability of music, and the conversion to digital content has greatly improved audio quality.



Music became a product. Phonographs and tape players provided both ownership and portability.

IMPACT OF THE INTERNET

The Internet brought broadband connections, audio Web sites, streaming audio, MP3 players, and Internet radio. Music started to transform again but this time away from a physical product back to becoming an experience. Broadcast radio programs became available via the internet from any location in the world—no longer limited to the range of the radio station. Radio programs from different countries and in different languages became available to every person regardless their geographic location. If the person couldn't be “online,” then downloading radio programs or music/audio content to their IPOD or MP3 player allowed them to take it with them. And finally, satellite radio enabled the broadcast of a wide range of radio programming—both live and pre-recorded—that could be accessed while mobile.



Portable CD players enabled mobility.

Music is now anything you want, anytime, anywhere. It's portable, transferable, shareable, and of high quality.

It is this latest transformation that becomes a key driver of the future of inflight entertainment. IFE must include “mobile entertainment” in its future. Will the growth of passenger mobile entertainment eliminate the need for traditional seatback IFE? Is there a role that the IFE system should play to enable or support mobile entertainment? This article will explore these and other trends that will or have had an impact on the IFE industry.



Examples of Internet radio sites and satellite radio services

continued on page 11

DIGITAL TRANSFORMATION

Compact discs introduced high-quality digital audio, provided random play capability, and the ability to copy and burn to other CDs. The interesting thing about CDs was that copyright protection was never seriously considered when the technology was developed. At that time a person could do little with a CD player except play the CD. Now computer software programs provide the ability to “rip and burn” a CD.

As MP3 audio became a standard and the Internet evolved with faster connection speeds, downloading audio programs became relatively easy. An audio program of three minutes in length would consume about three MB in MP3 format. With a dial up connection at 56Kbps, it would take about seven minutes to download—and an entire one-hour album might take up to 2.5 hours. Broadband Internet connection speeds made downloading audio programs feasible. A typical three-minute audio program would now take only 15 seconds to download, and the entire one-hour album would take less than five minutes.

This new technology and capability overtook rights protection. Consumers were technically capable of downloading, copying, and sharing audio programs without regard to physical copyright protection. Licensing and payment fees were eventually enforced while consumers were left to their own good behavior.

Movies and video programming also underwent similar transformations. The invention of 16 and 8 mm film projection systems fed the home movie craze. VHS technology (with apologies to the Beta Max people) introduced mass marketing of Hollywood movies for home use. Although pirating of early releases was and still is an issue, the quality of these second and third generation copies was poor. No protection mechanism was provided.

Then came DVDs, digital masters where every generation of a copy retains the same high quality as the original. Hence, copy protection, region controls, etc., were introduced in the design, making it difficult, but not impossible, to create a copy of a DVD. More importantly, the sheer size of the digital video files makes it virtually impossible to download and copy video programs—even with the fastest of Internet connections. A typical two-hour movie recorded on a DVD requires almost eight Gigabytes (that’s 8,000 MegaBytes) of storage. MPEG compression helps somewhat by reducing the two-hour movie to “only” 1.5 to 3.0 Gigabytes—a significant amount compared to digital audio programs.

To illustrate this point, let’s say I wanted to download my favorite two-hour video, SLIM PICKENS PLAYS CARNEGIE HALL recorded at MPEG-1 rates of 1.5 Mbps using my streaming dial-up Internet connection at a whopping 56Kbps. That video file would amount to 1,300 MB in size and take over eight hours to download (do not attempt this dangerous maneuver at home without a professional). With a broadband connection of 1.5 Mbps, it would still take two hours to download ... possible, but not fast enough to satisfy the “I want it now” generation.

Digital audio is significantly smaller in size than video programs, which makes it easier to download, copy, store, and share them. This is why we see a proliferation of audio downloading Web sites, streaming audio, and MP3 players but not as much downloading of video content.

Recently, streaming video and downloading/storing video programs onto PDAs and smart cell phones have become available and popular. New LCDs, along with new processing and memory technology, have enabled video programs on small personal devices. However, the limited wireless bandwidth of cell phones required that video data must be highly reduced compared to DVDs or MPEG. Since the screens are extremely small, there is no need for high quality content. Hence the video programs for these devices are encoded at a much slower rate and file sizes are significantly smaller. For example, a home television operates at 60 fps

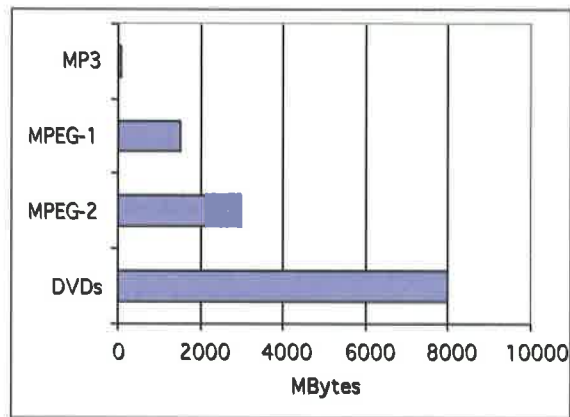


Figure 4. Comparison of File Sizes of Various Audio & Video Formats

continued on page 12

(frames per second) whereas streaming video to phones is much slower at 10–25 fps. The video format is also reprogrammed/reproduced to and for displays having 128 x 108 pixel capacity—a far cry from a laptop screen at 1024 x 768 pixels.

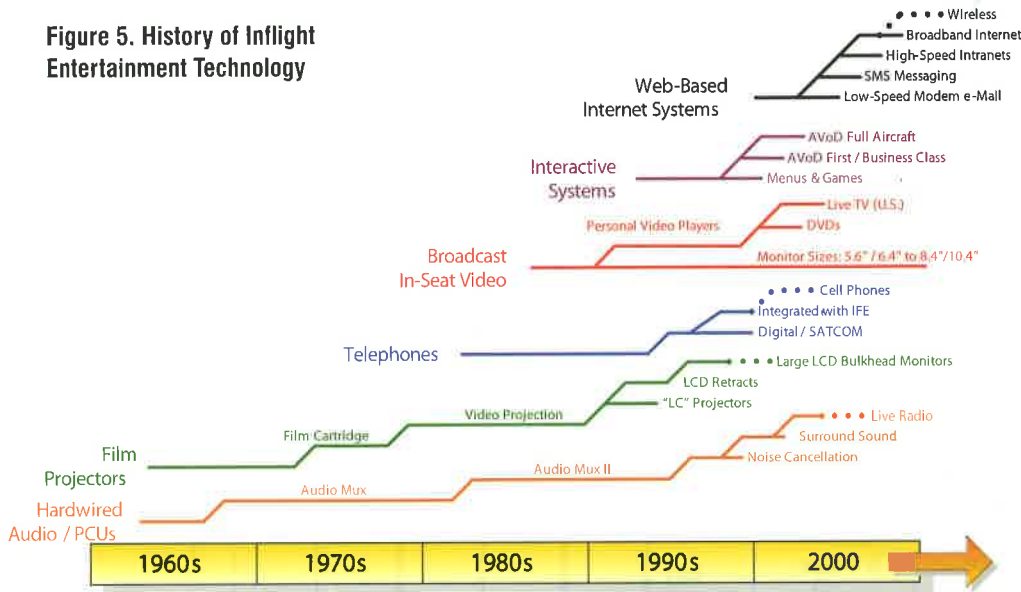
So what we have today is an explosion of entertainment devices and technologies for the consumer and ways to access, store, and play entertainment: portable DVDs, TIVO, satellite and cable TV, IPOD and MP3 players, laptops with read/write DVDs and media editing software, wireless PDAs, WI-FI networks, cell phones with streaming video/audio, SMS and IM messaging, and even remote access of TV over the Internet.

Consumers can now time-shift, place-shift, and essentially have access to entertainment in any form, anywhere, at any time.

TECHNOLOGY TRENDS IN INFLIGHT ENTERTAINMENT

How has the technology of inflight entertainment kept up with the growth of mobile entertainment and consumer technology trends? To answer this question, let's first briefly review the history of IFE technology.

Figure 5. History of Inflight Entertainment Technology



Audio Systems

Systems providing distributed audio throughout the cabin started as hardwired—one wire per channel—and evolved to digital multiplexed technology where multiple channels were transmitted over a pair of wires. In the '90s, audio systems were being provided as part of larger video IFE systems along with new features such as noise-cancellation technologies and surround sound.

Video Systems

Consumer technologies

such as video tape players, video projectors, and LCDs were key enablers of IFE and drove its evolution. Overhead video systems using CRTs and video projectors were prevalent in the '80s and are still in use today. By the late '80s, LCD panels spawning from laptops and other consumer products opened the gates for in-seat video IFE systems. Technologies such as RF/CCTV technology, where multiple video signals are modulated onto a single coax, and hardwired systems, providing one video channel per coax, were used—and are still used today.

Following the adage “bigger is better,” displays have grown in size, and there seems no end to the size of display that can be installed in the aircraft. LCD panels reaching 55 inches are now being certified for bulkhead-mounted applications, and 23-inch screens are being installed at the seat.



Overhead Video Systems

continued on page 14

Telephone Systems

The '80s also brought seatback telephone systems. Using air/ground radios for domestic routes and SATCOM systems for international routes, telephones were installed in hopes that passenger usage would pay for the hardware and services, with a little money left over. Unfortunately, this was not the case—despite the quantity of “Honey, guess where I am calling from” calls.

When interactive IFE systems were introduced, they provided sufficient communication technologies to the seat to support in-seat telephony. Hence, there was and still is a proliferation of telephones integrated within the IFE system. The hardware cost associated with in-seat telephony is buried in the infrastructure of the IFE and SATCOM systems.

In the future, the hopes of onboard pico-cell and GSM technology will revive the cabin telephone business by enabling cell phone usage onboard. Although the technologies exist, frequency rights and other regulatory issues must be and are being resolved. It appears that enabling onboard cell phone usage is inevitable—with the only remaining hurdle being a social one. However, the acceptance of cell phone usage during the flight may represent a major hurdle.

Interactive Systems

By the mid-'90s, the IFE craze turned to interactive systems—the ability for passengers to use interactive menus to select video or audio programs, play games, and generally allow the passenger to interact with the system. Early interactive systems were proprietary: the operating systems and communication technologies were rather unique and not particularly mainstream. It required much effort (and money) to develop these proprietary systems and to add or make changes to the applications. Some of these systems even used Super Nintendo game technology as the platform for the interactive processor at the seat.

www.tradexinc.com
info@tradexinc.com

TRADEX INC. was established in 1976 and has evolved into a full service supplier of cabin, commissary products and amenities which include, however not limited to, headphones, disposable and rotatable salt and pepper shakers, liquid hand soaps and moisturizing lotions, cutlery, chinaware, hollowware, melamine dishes, glassware, woven plastic baskets, pillows and blankets. We are proud suppliers to many of the world's leading airlines as well as railways, cruise lines and the hospitality and tourism industry.

Customer satisfaction is our top priority

The goal of Tradex is to facilitate one stop sourcing for our customers.

To achieve our goal we have in place the following practices, processes and attributes:

- A global network of resources.
- Knowledgeable associates with extensive industry backgrounds and expertise.
- Research, Design and New Product Development practices.
- Universal standard Quality Assurance processes.



TRADEX

Our reputation flies with you...



It is interesting to note that the IFE industry was a late adopter of consumer technologies up to the mid-'90s. Super Nintendo games were available to consumers five years before their introduction within IFE systems. The same is true for video tape players, CRTs, projectors, and small LCD screens. When the IFE industry introduced video and audio on demand in the mid 90's, this was the first time that IFE had offered technology not yet prevalent in the consumer world. While VOD is now available to consumers at home, the VOD functionality of IFE systems continue to have no parallel in any other industry. Nowhere else can we find a closed network system providing high quality MPEG-2 streams to 300+ clients simultaneously.

In the last five years, the IFE industry has seen a dramatic explosion of features and technologies. The growth seems almost asymptotic. IFE systems now encompass a wide range of services and technologies: AOD, VOD, single and multiplayer/network games, telephones, in-seat and overhead displays, touch screens, satellite TV and radio, laptop connectivity, and wireless networks. Where will it all end?



Interactive Systems

Communication Technologies

Probably the most important technology-enabler in IFE is the transformation of the communication technologies used in the systems (Figure 8). The early systems used proprietary multiplex systems and other not-so-standard technologies such as ARCNET, Token Ring, and ISDN. While there were one-off IFE systems in the mid-'90s using Ethernet, it was Thales in 1999, with the help of Airbus, that formally introduced Ethernet as the standard communication technology for future IFE systems with its TopSeries IFE system.

continued on page 16

SKY LINE

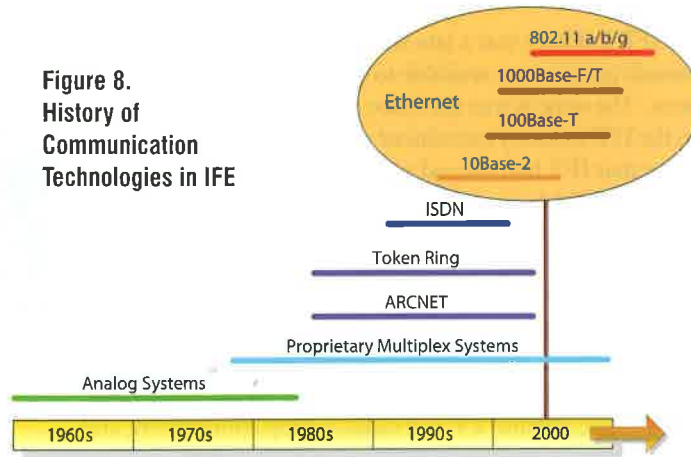
**25
HIGHLY
ENTERTAINING
YEARS**



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 of Sales and Marketing, and Vice President of Business Development.

Prior to joining Thales IFS/BE Aerospace, Dan 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.

Figure 8. History of Communication Technologies in IFE



ease of connecting these systems with the “true” Internet on the ground also has become easier.

Small Aircraft with Big Services

Small, single-aisle, and regional aircraft have traditionally been used as “feeders” to major hubs, or simply for short-haul routes. Today, a four- or five-hour flight on a single-aisle aircraft (domestic or international) is not unusual. This has generated the interest of airlines in providing something more than the traditional in-seat audio or overhead video. This trend for high-end IFE systems on single-aisle aircraft started about 10 years ago and is now experiencing a dramatic rise (Figure 9).

The key technology enablers fueling this trend started in 1995 with the introduction of satellite TV reception onboard the aircraft. The technology provided short programming, “live” broadcast content, and the ability to implement a pay-per-view service. As IFE

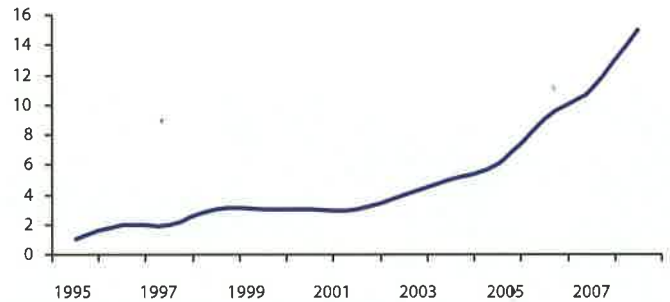


Figure 9. Airlines Selecting or Considering “high-end” IFE systems for their Single Aisle Aircraft



Inseat Interactive/Video-on-Demand IFE system on an Embraer EMB 175 Aircraft

systems became smaller, lighter, and less costly, more airlines began installing in-seat video fueled by digital server-based content and Interactive Video on Demand systems. The Thales’ TopSeries i4500 IFE system with its no-seat-box solution and full-featured functionality will be installed on a 74- seat “regional” aircraft in early 2006. This marks the first time a fullship AVOD system will be installed on this size aircraft.

In Technology Trends in IFE – Part Two, we will explore the evolution of the connected aircraft, wireless communications—in the cabin and on the ground, the future of passenger expectations, and the future trend of the IFE system to address all of these requirements.

