The Global Link

CNS/ATM NEWS FOR THE AVIATION INDUSTRY | October 2002 | Issue Number 23

ARINC HELPS VIRGIN ATLANTIC AIRWAYS' PASSENGERS JOIN THE TEXT MESSAGING REVOLUTION

Worldwide mobile connectivity is booming. An estimated 350 million computers worldwide will have email capability in 2003. Furthermore an estimated 1.1 billion cellular subscribers will be enabled within a similar time frame. 20 billion Short Message Service (SMS) messages are currently sent worldwide a month. People want to be connected — in the office, in the home, and on the move.

An ARINC led alliance, comprising MAS (Matsushita Avionics Systems Corporation) and Tenzing Communications, has recently developed an enabling technology that delivers an unrivalled level of connectivity via the aircraft in-flight entertainment (IFE) system. The solution offers SMS and text email to passengers in all classes. This new initiative further augments ARINC's ability to provide the "one stop shop" approach that many airlines find advantageous. Satellite voice, data communications, and value added IFE applications can now be provided bundled together.

For the Virgin Atlantic program, a branded graphical user interface provides passengers with a virtual keyboard allowing quick and concise message entry using the in-seat handset. Text email and SMS messages may be up to 160 characters in length and are displayed on the seatback screen during message entry. Help screens that include SMS shorthand/abbreviations and international country code listings are an aid to message construction. Passengers do not need to own or use a cellphone or laptop PC to use this service. (*See Photos on Page 6*)

Messages are communicated to the ground near instantaneously using a proprietary messaging format across the ARINC GLOBALink SATCOM network. Once on the ground, messages are quickly processed by a patented SMS & email delivery system. Using this scalable solution, a higher level of message delivery guarantee can be achieved over other more conventional alternatives. Message delivery times of 15 seconds are realistic. Virgin Atlantic, ARINC's launch customer, is one of the first airlines to benefit from this enabling technology.

Peter Tuggey
Business Development Manager, ARINC

The service currently allows passengers to send messages to ground-based recipients at a price set by the airline. Web-based tools are provided to ensure this retail value can be altered on the aircraft from the luxury of a web enabled office PC. The same tools also allow the remote alteration of all branded elements of the service including marketing messages and SMS tag lines. The ability to reply to messages sent by passengers will be implemented later this year. Currently if someone tries to respond to a passenger's text message, they will receive a branded 'comfort' response message advising that the reply feature is currently not available.

The system was launched on the 27th August 02 on a Virgin Atlantic B747-400. Initial customer reaction has been extremely positive. The remainder of Virgin Atlantic's MAS equipped fleet will be deployed over the coming months. This will embrace both the MAS3000 and 2000e platforms. ●

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CUSTOMER ARTICLE

UNITED AIRLINES – FLIGHT PAPERWORK VIA ACARS

Dave Knerr
Manager Flight Dispatch Automation, United Airlines

In September 2002, United Airlines (UAL) completed a project that allows flight crews Aircraft Communications Addressing and Reporting System (ACARS) access to flight paperwork. Products such as flight plans, flight release, text weather briefing, maintenance item list, and runway gross weight data, for both the current and subsequent flights, can be up-linked and reviewed in the cockpit. This paperwork can also be accessed from ground terminals either in flight operations or at the gates. After flight planning, crews can then use ACARS or Ground PCs, to electronically sign the flight release, which constitutes pilot acceptance of the dispatch plan, and satisfies FAR Part 121 rules for Pilot/Dispatcher Operational Control planning.

The project, called Single Segment dispatch (SSD), was designed to change the way we do business, to take advantage of the latest Air Traffic Control (ATC), and obtain weather display technology. This technology allows dispatchers to better plan flight routes, fuel loads and plan for delays or ATC restrictions. By planning closer to departure time, Flight Dispatch can create a better plan the first time, as opposed to the old way of planning all flights that a crew flew at the beginning of their day, and updating as the day progressed.

The benefits from close in flight planning is to give flight crews a plan that better

CONTINUED ON PAGE 2

INSIDE

PRESIDENT'S PERSPECTIVE

John Belcher
President and
Chief Executive Officer,
ARINC

IMPLEMENTING THE CRITICAL LINKS

As the year progresses, the aviation industry is reshaping with new challenges, new mandates, and certainly a new perspective. This new outlook forces us to recognize the critical links missing in our industry. But, what are the links that can provide the "fix?" What can bring the industry and world back to a state of normalcy? Simply answering questions such as those posed can be a challenge in itself. But I've come to believe that the common thread, or critical link, is information. I'll even go a step further to say that information + connectivity = security. ARINC has evolved as the leading provider of both information and connectivity. At ARINC, our approach is to continue to advance the future of aviation by continuing with existing programs as well as turning information (or raw data) into real tools to reduce airline operations costs while promoting safety.

The first of the twofold approach is to improve the technology of aviation by moving forward in a positive light — by maintaining and enhancing secure information and connectivity. ARINC has been very successful in this arena. Since the last issue, we've connected our partners to the north pole by opening high frequency (HF) voice radio service to aircraft on north polar air routes shortening flight times to Hong Kong, China, and Russia by 30 to 45 minutes.

We've also committed to provide a minimum of 40 SkyLink units to Gulfstream. These units will allow passengers aboard Gulfstream G 300, G 400, and G 500 aircraft to receive data at rates of 8 to 10 Mbps (million bits per second) — 10 times faster than other commercial designs. Can you imagine what this type of connectivity could mean for people on board commercial jets and other airline users?

Also, with our partners at the Federal Aviation Administration (FAA), Rockwell Collins, and American Airlines, we activated initial daily use (IDU) for the Controller-Pilot Data Link Communications (CPDLC) program on Monday, October 7, 2002. This program allows controllers to reduce their dependence on voice radio and make more use of data messaging.

Lastly, ARINC and Virgin Atlantic Airways have provided a new service to allow their passengers to send inexpensive emails to those on the ground via the GLOBALink network. These examples of further promoting technological advancements in the industry are prime examples of making it feasible for passengers to travel and to feel the connection to information that the majority of us not only crave, but need at this time.

I have mentioned that information + connectivity = security. At ARINC, we have and are developing product applications that will provide tools to enhance aviation safety. In conjunction with the Transportation Security Administration (TSA) and University of California, Los Angeles (UCLA), we are developing a prototype secure passenger processing system and with the use of our digital trunked radio system, providing the airport connectivity to help airlines implement positive passenger baggage matching (PPBM). We have also prototyped hand held data devices equipped with Global Positioning System (GPS) and Aircraft Communications Addressing and Reporting System (ACARS) capability that can be used to move and display pertinent operational information with full Radio Frequency (RF) capability to enhance security aspects of an airline's operations. The critical link remains that information + connectivity = security, and that formula is part of our ARINC strategy for the future. ●

UNITED AIRLINES – FLIGHT PAPERWORK VIA ACARS (CONTINUED)

reflects the forecast conditions for the flights which equates to better safety, better fuel efficiency, and a better flight experience for passengers.

The system uses custom ACARS application pages to both access an entire flight paperwork package, and individual products such as flight plans or weather briefings. The weather briefing product is customized for the route of flight, and includes hourly and forecast station weather, Notices to Airmen (NOTAMs), Pilot Weather Reports (PIREPs), and Severe Weather Warnings or Alerts.

After the programming in our host computer was complete, the change was activated on a fleet by fleet basis. Starting with the 747-400 and ending with the cut-over of the 777 fleet, pilot training was done via Flight Manual Bulletins, and some classroom training during pilot recurrent classes at our Denver Flight Center. Training for the dispatchers was also accomplished via dispatcher recurrent training classes. A Single Segment Dispatch User Guide was developed and published for both pilot and dispatcher use.

The biggest technical challenge to the project was the Human Factor issues. Numerous changes were made to the procedures and the up-link product list as input was received from pilots on ease of use and ease of incorporation into their flight planning process.

At UAL, data link is an integral part of our flight operations. The Single Segment Dispatch process adds to an already extensive list of up-link products available to the pilot. These include Weight Manifests, Maintenance Release documents, Weather Data, Digital Automatic Terminal Information Service (ATIS), Pre-Departure Clearance, Connecting Passenger information, Flight Schedule information, and much more. ●

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ARINC IN EUROPE

As we approach the final quarter of 2002, ARINC is steadily making progress in Europe. GLOBALink/VHF Europe coverage now extends into Athens, Greece. And, additional stations are scheduled to be added in Greece and strategically throughout Europe by the end of the year. Expanding the GLOBALink/VHF coverage cloud in Europe remains a primary goal for 2002 as we realize that expanding coverage in the South and the East will help to ensure that all of our customers' needs are addressed.

Ben Griffin
Manager,
Aviation Services,
ARINC

Activity elsewhere in the aviation community has been notably high. Significant efforts are realizing true benefits particularly with the implementation of In-Flight Entertainment (IFE) applications with Virgin Atlantic Airways. ARINC was selected in May 2002 to provide all of Virgin Atlantic's Air Ground communications, comprising of GLOBALink/VHF/HF/Satellite data and voice. In addition, ARINC has successfully implemented OpCenter, the Message Management Application that will replace Virgin's previous Aircraft Communications Addressing and Reporting System (ACARS) message manager. The comprehension, design, and seamless implementation of OpCenter was a result of total coordination between ARINC and Virgin Atlantic, and many weeks of hard work from both sides.

Continuing with Virgin Atlantic, ARINC was instrumental in the successful launch of the send only seatback text messaging program — one of the first of its type for any airline or service provider. This service allows the passenger to compose and send short text messages using the seat back IFE system. Messages can be sent to a Global System for Mobile Communications(GSM) telephone or email address on the ground using the ARINC Satellite service and a gateway maintained by Tenzing. Service enhancements already being developed — including the ability to send a message and receive a reply while in-flight — are planned for release during the last quarter of 2002.

The ARINC office in London is responsible for business partnerships in the Middle East region, and in an effort to support our customers and potential customers in the region, we will be staging small workshops. These smaller, customer-focused workshops will help to raise awareness of all ARINC services and products and also to provide our customers with an opportunity to quiz the experts face-to-face. These sessions will not be confined only to the Middle East, but will also take place in key locations throughout Europe. ●

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ARINC IN ASIA

As part of our ARINC strategy, we have moved significantly in the last four years to a global company. And the Asia-Pacific region plays a very important role in our global expansion. Although we have established offices in Taiwan, Japan, China, and Thailand, the time has come to establish an official headquarters and appoint a managing director that physically lives in the region and can oversee daily operations.

Heament Kurian
Senior Program
Manager,
GLOBALink/Asia,
ARINC

ARINC is pleased to announce that Mr. Randolph (Randy) F. Pizzi has been appointed to this role.

Randy will be reacquainting himself to the Asia-Pacific region after leading our Asian business development activity between 1998 and 2001. He joined ARINC in 1987, he currently leads commercial aviation marketing and sales.

With regard to his new position in the Asia-Pacific region, Randy brings significant experience and skills to make this business operation a success. A graduate of the U.S. Naval Academy, Randy served as a P-3 Mission Commander for seven years. Between 1998 and 2001, he led ARINC's Asian business development activity. He also held management positions with Northrop Grumman, SAIC, and Telecommunication Systems.

"Randy Pizzi has already contributed greatly to the expansion of our networking and communications business in Asia," said John Belcher, ARINC President and CEO. "He will now have an enhanced opportunity to develop that market for the full line of ARINC products and services."

Randy will begin his new position in October and will be moving to the region to establish the new headquarters and build a team. He is presently evaluating the region, and is looking forward to the opportunity. ●

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ACRONYMS

ACMS – Aircraft Condition Monitoring System

ADS – Automatic Dependent Surveillance

AOC – Aeronautical Operational Control

AOM – Airport Operations Management

ARTCC – Air Route Traffic Control Center

ATN – Aeronautical Telecommunications Network

ATS – Air Traffic Services

CAAs – Civil Aviation Administrations

CBT – Computer Based Training

CFRS – Centralized Flight Reporting Service

CPDLC – Controller-Pilot Data Link Communications

DRVSM – Domestic Reduced Vertical Separation Minima

FANS – Future Air Navigation System

FMC – Flight Management Computer

FSS – Fixed Satellite Services

GMUs – GPS-based Monitoring Units

GSM – Global System for Mobile Communications

HFDL – High Frequency Data Link

HFDR – High Frequency Data Radio

HSD – High Speed Data

IFE – In-Flight Entertainment

ICAO – International Civil Aviation Organization

ISDN – Integrated Service Digital Network

MPDS – Mobile Packet Data Service

NBAA – National Business Aviation Association

NOTAMs – Notices to Airmen

OOOI – Out, Off, On, In

PPBM – Positive Passenger Baggage Matching

RF – Radio Frequency

RVSM – Reduced Vertical Separation Minimum

SAIC – Science Applications International Corporation

SMS – Short Message Service

TCAS – Traffic Alert and Collision Avoidance System

TSA – Transportation Security Administration

VDLM2 – VHF Digital Link Mode 2

VHF – Very High Frequency

HFDL

GLOBALink/HFDL

Today's sophisticated airborne High Frequency (HF) avionics provide data that allows ARINC to better appreciate the interaction between the ground and airborne components that comprise the High Frequency Data Link (HFDL) system.

What the HFDR Tells Us

Shelle Kyle
Business Manager, GLOBALink/HF, ARINC

The HF data radio (HFDR) gathers metrics during its operation. Information gained is downlinked to ARINC in frequency and performance data packets. It should be noted that this activity happens in the link layer between the airborne HFDR and the ground-based HFDL station. Frequency data is sent when the HFDR logs on to a ground station. Performance data is sent when the HFDR is polled by the ground station.

The HFDL system is currently configured to poll the aircraft every 5 minutes if no downlinks are received the previous 5 minutes. After 3 successive polls are unanswered, the HFDR is logged off the ground station. This practice is used to maintain the activity on the link during periods of non-use, and it allows the HFDR to optimize the speed of the link depending on propagation conditions.

Barbara Carlsson
Business Manager, GLOBALink/VHF, ARINC

Frequency data contains measurements relating to what ground stations were scanned by the HFDR and what frequencies currently in use by the system were received. This provides ARINC with a pseudo metric for HF propagation. For example, if an aircraft flying over the continental United States sends frequency data that shows it received the signal from stations as far away as Thailand, Guam, or South America, this indicates that the HFDL system is achieving extra-long range propagation.

Tom McCullough
Business Manager, GLOBALink/InFlight Communications, ARINC

Performance data packets contain information relating to system function such as the lat/long position of the aircraft, the time (length) that DATA mode was disabled either for voice use or due to flight crew intervention, and speed of the last messages sent and received.

How does ARINC use the information contained in the frequency and performance data? Lat/long allows for route tracking, frequency log-ons help identify possible gaps in coverage or areas of possible interference, uplink and downlink performance can also be determined. Crew interaction with the avionics is revealed through statistics indicating the length of HF voice use, whether the same HFDR was used for DATA for the entirety of flight or whether DATA mode was manually disabled.

Warwick Fairfax
Business Manager, Airport Operations Management, ARINC

This link layer data helps ARINC paint a better picture of HFDL airborne functioning and is used to optimize the HFDL system to achieve the highly reliable performance the system provides.

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VHF

GLOBALink/VHF

The Future is Now

Aircraft Communications Addressing and Reporting System (ACARS) was first implemented over 20 years ago as a means to automatically deliver Out, Off, On, In (OOOI) messages from an aircraft to a terminal on the ground. While at that time the airlines knew that there were many more possible applications for this emerging technology, no one could imagine that one day it could be used for air traffic control communications. Well that day has come. On 07 October, the Miami Air Route Traffic Control Center (ARTCC) of the Federal Aviation Administration (FAA) declared Initial Daily Use (IDU) of Controller-Pilot Data Link Communications (CPDLC). Now, pilots of specially equipped aircraft can send and receive digital messages with controllers using the CPDLC system in the Miami enroute air space.

ARINC designed, engineered, and installed the first air/ground data link system for Aeronautical Operational Control (AOC) communications for the airlines in 1978. 48 Very High Frequency (VHF) ground stations were initially used to provide high altitude enroute coverage for two airlines. Immediately the number of ground stations increased to 75 to meet the on-ground and lower altitude requirements of the growing customer base. Since that time, the VHF network has expanded to over 500 ground stations in North America, with close to 800 ground stations covering 58 countries throughout the world. Network usage has grown from a few thousand messages per month in 1979 to over 20 million messages a month and today, there are 99 Customers using ARINC's GLOBALink/VHF system. Data link has become the primary means by which an aircraft communicates with its company's operations center, and airlines rely on it to send such necessary information as flight plans, weather reports, gate assignments, aircraft engine monitoring reports, and delay and diversion information. The status of data link has shifted from convenience to necessity.

In 1999, ARINC started deployment of the next generation of air/ground data link – VHF Digital Link Mode 2 (VDLM2), which is much faster and higher capacity than ACARS. With over 90 operational VDLM2 stations installed throughout the United States today, a small, but growing number of aircraft equipped with VDLM2 avionics are conducting operational communications using the new air/ground link. In addition to enhancing airline operational control capabilities, VDLM2 enables data link delivery of text messages for air traffic control communications in busy domestic airspace. Data link for air traffic control (ATC) is considered esential for achieving the increased ATC efficiencies needed to accommodate the growing air traffic over the next decades.

Using VDLM2 as the air/ground link and the International Civil Aviation Organization (ICAO) approved Aeronautical Telecommunication Network (ATN) protocol, the FAA began a CPDLC Program for the U.S. National Airspace in 1998. ARINC was selected to provide the VDLM2/ATN network for the first phase, Build 1, in the Miami ARTCC. As mentioned previously, CPDLC service was formally declared operational, with 13 ARINC VDLM2 ground stations providing 360,000 square miles of coverage over Florida, the Gulf of Mexico, and the Caribbean. Now, aircraft equipped with VDLM2 capable avionics are routinely exchanging a set of CPDLC defined messages with air traffic controllers at the Miami ARTCC. The successful implementation of CPDLC Build 1 is a result of a partnership between American Airlines, Rockwell Collins, the FAA, and ARINC. Build 1A, a national implementation, is planned to commence in December 2005.

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IFC

GLOBALink/InFlight

GLOBALink/Satellite Inmarsat Swift64 - High Speed Data (HSD) Offerings

Since Inmarsat has announced the availability of its new 64 kbps high-speed data aeronautical service, the aviation industry has been preparing for its arrival. These in-flight technologies will create significant benefits for business and air transport travelers alike. Business jet applications are starting to emerge, and we expect full commercial availability of this valuable service during the 1st half of 2003. There are two varieties of Swift64 that are planned:

Swift64 Mobile ISDN

Based on the integrated services digital network (ISDN) technology, this service uses a dedicated channel onboard the aircraft through a circuit-mode connection. The service is billed on a usage-based system, where users would pay by the minute for the length of the call duration.

Some of the primary applications anticipated for the Swift64 mobile ISDN product include large file transmission, store and forward video, video conferencing, video streaming, photo transmission, and secure voice and data correspondence.

Swift64 Mobile Packet Data Service (MPDS)

MPDS uses shared channels so the system is "always on," thus continuously available to users onboard the aircraft. The service billing is planned to be usage based with the user billed by the Megabit (Mbit), versus the minute-based method under the mobile ISDN scenario.

Anticipated applications for the Swift64 MPDS product include interactive email, e-commerce transactions, database queries, and IP access to corporate LANs.

Swift64 Equipment

An avionics upgrade is required to the existing Aero-H/H+ equipped aircraft to utilize Swift64 services. Both Swift64 services take advantage of the Aero-H antenna, and do not require a replacement of this expensive device. Cabin service provision for Swift64 for commercial airlines is through an onboard server, which allows access via 100 Mbit Ethernet LAN connection, or future wireless technology. Eventually, flight deck access would be available through specific interfaces to the high-speed data avionics.

Current Aero HSD Avionics Manufacturers

- Ball Aerospace
- EMS Technologies
- Honeywell/Thales
- Rockwell Collins
- Thrane and Thrane

Current Server Manufacturers

- Miltope
- Pentar

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ATS

Air Traffic Services

CFRS

During the fourth quarter of 2002, ARINC will deploy a new North Atlantic (NAT) waypoint reporting service known as the Centralized Flight Management Computer (FMC) Waypoint Reporting Service (CFRS). CFRS allows for the centralized processing of FMC waypoint reporting downlinks from aircraft that are equipped with Honeywell PIP (product improvement package) and Pegasus avionics packages. Prior to the fielding of CFRS, the only aircraft that could participate in automatic waypoint delivery were those aircraft capable of supporting Automatic Dependent Surveillance (ADS).

The design and implementation of the CFRS will enable the participating Civil Aviation Administrations (CAAs) in the NAT to include some of the non-ADS equipped aircraft in the existing data link waypoint reporting system. There are approximately 125 non-ADS equipped aircraft, currently flying in the NAT, which are either equipped, or equipping, with an FMC capability. These aircraft represent more than 10% of the aircraft currently flying in the NAT and this number is expected to climb over the next few years. In 2003, the NAT is expected to see an excess of 5,000 FMC flights per month. The airframes, which will be able to participate in CFRS, include the Boeing 757-200 and 767-300 aircraft, as well as, the Airbus 310 and 319.

TCAS Computer Based Training

ARINC has recently completed development of a Computer Based Training (CBT) program for TCAS II Version 7. The CBT provides a means for operators to train their pilots in the operation of TCAS II. The program covers theory of TCAS operation, discusses display interpretation, provides guidance on responding to resolution advisories, outlines TCAS capabilities and limitations, and provides an interactive quiz at the end to ensure the required knowledge has been transferred to the pilot. At the completion of the training program, a certificate of completion can be printed if required for inclusion in a pilot's training records.

The material contained in the training program is based on the requirements of Advisory Circular 120-55B, Air Carrier Operational Approval and Use of TCAS. The CBT uses a combined traffic/resolution advisory display, but the program can be easily modified to include the specific displays used by an operator. The CBT is designed to run on your personal computer.

This training program can be purchased for US$150 by contacting either Sean Reilly at 410 266 2904/email sreilly@arinc.com or Dan Tillotson at 215 493 8016/email dtillots@arinc.com. A quote for customizing the CBT to meet an operator's specific requirements can be provided by either of the above individuals upon request.

Domestic RVSM

The FAA has issued a Notice of Proposed Rulemaking to announce its plan to implement Reduced Vertical Separation Minimum (RVSM) in US domestic airspace by December 2004. The FAA's Domestic RVSM (DRVSM) program is designed to implement a 1,000 foot vertical separation standard between Flight Levels 290 and 410, to achieve greater availability in the most fuel efficient altitudes. The implementation of DRVSM will also increase air traffic controller efficiency, reduce controller workload, enhance flexibility at intersecting routes, and enhance safety. The FAA estimates DRVSM cost to operators at $634M for the 15-year period 2002-20016. Benefits, based on fuel savings for the commercial aircraft fleet over the years 2004-2018, are estimated to be US$5.8B.

The FAA plans to establish a DRVSM monitoring program that will employ ground-based Height Monitoring Units and GPS-based Monitoring Units (GMUs). ARINC has been providing GMU flight services to the FAA and industry since 1996. Since that time, we have flown more than 1500 monitoring flights in support of the international RVSM program. Today, ARINC has 20 GMU Flight Specialists who provide services to aviation industry customers from three US locations: Washington, DC; Oklahoma City, OK; and San Diego, CA. ARINC will continue to provide GMU flight services in support of the FAA's Domestic RVSM program.

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AOM

Airport Operations Management

Enhancing AirportOpsAdvisor (AOA) Capabilities

"You Can't Manage What You Can't Measure"

The Airport Operations Management (AOM) goal is to design and implement customized airside solutions that enable our Customers to increase revenues and decrease costs. To that end, our team spends numerous hours observing airport operations and listening to our Customers' perspectives on the challenges they face managing day-to-day operations. The information we collect is then used to customize the site-specific components of our AOM solutions. Since the safe and efficient movement of aircraft is a shared responsibility among all airport stakeholders, it is imperative that the partners agree on a data source that can facilitate identification of delays, and when and where the inefficiencies occur. ARINC's first generation AOA system provided Customers with tremendous insight into ramp area operations and detailed data on specific "milestone" events. Our next generation of AOA will take this capability to a new level. With the integration of data link and surveillance data, Customers will be able to collect and analyze additional operational data, creating a profile of each individual flight from touchdown to the gate and identification of constraints. The combination of the improved Performance Analysis features and the existing "gate to gate management" capabilities provides Customers with a powerful tool in which to measure and evaluate the impact of operational situations.

In addition to enhancing the AOA management reports, our engineering team has designed a sophisticated event playback feature. Just as AOA provided end users with a real-time picture of the current surface situation, the playback feature enables managers to highlight trends by reviewing the traffic flow for a particular hour, bank, or day. Airline and airport personnel can observe the traffic flow and identify congestion points and associated problem areas — either on the surface or within their procedures. Additionally, this tool can be used as a recurrent of new-hire training tool for ramp coordinators.

The collection and assimilation of accurate surface movement data, and the new playback feature of AOA, enables airport stakeholders to quickly and effectively respond to changing operational conditions, facilitating gains in capacity, efficiency, and safety.

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TECHNOTALK

FANS is Seven Years Old

Roy Oishi
ARINC Fellow

In June of 1995 the first aircraft type, the Boeing 747-400, was certified to communicate to oceanic air traffic controllers using data link. A handful of airlines and a few more air traffic service providers combined to pioneer the application of an old (at that time 17 years old) technology, ACARS, to a new purpose. As we were told at that time, and continue to be reminded today, the ACARS link was not designed to carry Air Traffic Services (ATS) messages and it is too slow for ATS messages. The many elements of the ACARS data link system, both in the air and on the ground, were neither designed or implemented to the criticality standards normally required of ATS systems.

Notwithstanding all of the doubts and misgivings, FANS 1/A aircraft are making productive use of ATS messaging over ACARS today. In fact, I would defy anyone to try to take away Automatic Dependent Surveillance (ADS) or Controller-Pilot Data Link Communications (CPDLC) in an area in which both pilots and controllers have come to rely on it for routine communications.

From its beginnings in the South Pacific region, FANS has been implemented around the world with hundreds of aircraft participating. Operational or trial implementations have been installed on every continent. Aircraft can routinely take advantage of polar routes to the Far East using FANS. The crowded North Atlantic track system has fewer HF voice position reports these days since FANS ADS messages have been allowed for routine position reporting. The ancient Silk Road has been reopened in the sky above the high desert in western China with FANS technology playing a critical role. The passage across the Bay of Bengal has more reliable communications these days for FANS aircraft. Aircraft types having a FANS 1 or FANS A option, current or planned, include: all Boeing models, Airbus 330/340, several military transports, and at least one business jet.

The ACARS data link was implemented in 1978 to carry aeronautical operational control messages. Those first Aeronautical Operational Control (AOC) messages were carried by a few dozen Very High Frequency (VHF) ground stations in the northeastern US. At its peak, the ACARS network which now includes satellite and High Frequency Data Link (HFDL) air/ground subnetworks, carried 22 million messages in one month. More than six thousand aircraft are equipped with ACARS avionics. Additional non-time-critical ATS messages are being added on a regular basis as the advantages of data link over voice for routine communications is realized.

What is the lesson we can draw from this history? I believe there are two:

- 'too slow' depends on the application and the circumstances. No single standard can be applied universally. A minute or two of message delivery latency can be far better than 10 minutes of fighting the congestion and static of an HF voice channel or the congestion on a crowded ground frequency during an airport push.
- 'not designed or implemented' to a sufficient level of criticality can be addressed by appropriate monitoring, mitigation, and procedures. When communications are mediated at both ends of the communication channel by human beings, appropriate procedures can be implemented.

We will undoubtedly have a decade of data link experience before the first 'real' ATS applications become operational. During that decade many flight times will have been a bit shorter, many pilots will have had fights with an HF voice channel obviated, a few requests for weather deviation will have been granted rather than being deferred, and a generation of pilots and controllers will have greater confidence in the latest 'new tool' in the arsenal of the ATS service providers. ●

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FYI

1986 – Aeronautical satellite data link was demonstrated for air/ground communications and receipt of weather and Air Traffic Control data.

1991 – ICAO approved Future Air Navigation Systems (FANS 2) plan for satellite-based navigation and communications systems over the North Atlantic.

1996 – GPS approved for navigation over the North Atlantic; last OMEGA station withdrawn.

Virgin Atlantic Program Photos (From Page 1)

Once, and Again

The first ARINC Air/Ground Communications Customer Meeting dedicated specifically to address air/ground communications has come and gone. With over eighty (80) attendees from over forty (40) companies, the meeting sparked enlightening discussions, valuable feedback, and the opportunity to share information and experiences with key players in the industry.

"Flight Plan 2010 and Beyond" was the topic addressed by keynote speaker Charles Keegan of the Federal Aviation Administration (FAA). Mr. Keegan opened his presentation by pointing out, "these are complex times…200 million more people are expected to move through the major hubs over the next decade." He stated that the air traffic today in the National Airspace System (NAS) is down about 2-3 % but traffic this summer was close to 2001 levels. He talked about the rise of the low cost carrier and increased use in regional jets, their impact to and proliferation of secondary or mini-hubs, and the new set of challenges they had created to the industry. He emphasized the FAA's commitment to Controller-Pilot Data Link Communications (CPDLC) as fundamental to the long term success of air traffic management.

Gregg Anderson, the CPDLC Air Traffic Requirements Lead at the FAA, added to the discussion by highlighting the team efforts of the CPDLC Integration Team (CIT), including, FAA, American Airlines, ARINC, and Rockwell Collins, and looked forward to adding Delta Air Lines, the U.S. Air Force, and Teledyne to the group. Federal Express and Continental Airlines have also expressed an interest in participating in the program. He talked about the challenges, testing, and training of controllers for the implementation of CPDLC Build 1 at the 7th busiest US ARTCC in Miami. Gregg announced that the CPDLC Build 1 scheduled Initial Daily Use (IDU) date had slipped by one week to October 7, 2001.

Janet Fitzgerald of Continental Airlines gave a joint presentation with an ARINC representative stressing the importance of teamwork to the success of Continental's implementation of VDLM2/AOA. She explained how the team, developed from members of Continental, ARINC, and Rockwell Collins had been formed to tackle the challenges of implementing new technology (VDLM2) and improving performance through very proactive support implementation. According to her, this team effort initiative provided a tremendous learning experience that will benefit both the airline and industry.

Brian Gleason, of Southwest Airlines, discussed Southwest's analysis of data link for air to ground communications. Mr. Gleason talked about the importance of including all key stakeholders within the airline for the analysis and evaluation planning. This evaluation looked at both existing, as well as evolving technologies, and also future technologies including gatelink type services.

Emil Hurtak of Federal Express presented a paper entitled "What Data Link Means to Me" and focused on evaluating the benefits of Aircraft Condition Monitoring System (ACMS). He was able to demonstrate that through system fault monitoring as reported real-time via ACARS, FedEx have seen savings in the $millions for "Slat Disagree" and "Pitot Heater" systems. "Though the real potential of ACMS is untapped, FedEx has already saved millions by preventing delays, cancellations, and use of unnecessary parts."

Frank Cheshire of American Airlines provided a customer's perspective on CPDLC. He talked about how American Airlines got started in CPDLC, their involvement in the FAA CPDLC Build 1 program, and what to expect in the future. He reviewed the importance of the PETAL IIe trials to further promoting the use of data link to support CPDLC. He also explained the significance of the partnership of Rockwell Collins, FAA, ARINC, Boeing, and MITRE leading the successes thus far of the Build 1 program. Frank solicited support for both the FAA CPDLC Build 1A program and the EUROCONTROL Link 2000+ program and suggested that interoperability remains a key factor.

EUROCONTROL representative, Alex Wandels, provided the European vision as set out in the Link 2000+ program using VDLM2 and Aeronautical Telecommunications Network (ATN). He talked about the success and experiences learned from last year's PETAL II trials and has looked at incentive programs for the airlines to encourage commitment and equipage for carriers. He also discussed the potential to include Future Air Navigation Systems (FANS) 1/A aircraft in the program. Alex concluded that the FAA CPDLC Build 1/1A programs and the Link 2000+ are aligned and encouraged airlines to support the programs.

ARINC also provided demonstrations of its core services, as well as new services such as SkyLink broadband communications service, Reduced Vertical Separation Minimum (RVSM), Wireless Dispatch, VDLM2, and several others. Overall, the meeting was a wonderful opportunity to meet with our industry partners and share experiences and success stories.

If you are interested in reviewing materials and complete presentations from the customer meeting, you can view them online at globalink.infocise.com. Any questions regarding the previous customer meeting or any upcoming meetings may be emailed to globalinkinfo@arinc.com.

UPCOMING CONFERENCES

ATCA 47th Annual
Technology
Program & Exhibit
November 3 – 7
Washington, DC
See us in booth 1210

FYI

The ARINC D-ATIS server, which receives, stores, and transmits ATIS messages received from numerous air traffic service providers, handles more than one million messages per month, with an average availability of 99.99%.

In 2000, ARINC helped to open the China West Route, installing seven CNS/ATM systems in China, which established data link communications for properly equipped aircraft across this new airway.

Spotlight on David Hancock

A 14-year ARINC veteran, David Hancock has helped to program, design, and build some of the most innovative products that ARINC has introduced to the industry. Currently, he's the lead for an Integrated Product Team, which focuses on one of our newest services, ARINC Direct℠. This new service brings the benefits of data link to corporate and business aviation. His position as Integrated Product Team Lead is a new concept at ARINC and one that David has warmly welcomed.

As the leader of an integrated product team, David is faced with the challenge of facilitating the various aspects involved in planning, delivering, presenting, marketing, and selling his product. His team is made up of members that are focused solely on this product, and all members share the same goal: success of the service. Very talented and capable of balancing his own diverse talents and experience, Dave is undoubtedly a model match for the role.

Dave actually holds a Bachelor of Arts degree in English Literature – which begs the question – why does he write software and work so well in an engineering environment? Dave's response is,"it's a lot more fun to write software than books." Coming from a man who has a natural instinct for engineering, software, and the whole technical process, the response was certainly suitable. His fondness for computers and software has helped him to advance tremendously. When he's not working at ARINC, he teaches Oracle database, Perl programming, and Internet-related courses at a local college in Maryland.

But, Dave has always been a leader. He served 6 years in the Navy prior to attending college at the University of Texas. While in the Navy, Dave trained colleagues to operate nuclear submarine propulsion plants. After graduating from college, Dave went on to work at Intel for 4 years before joining ARINC.

Once he joined ARINC, his first role was managing a documentation group – that's where it all began. But, Dave's not just about the documents. He's an amateur musician who serves as a tenor for his church choir, and doesn't hesitate to perform solos as well. He plays the clarinet and his other hobbies include reading novels – particularly mysteries and techno thrillers and, of course, computer books. He also enjoys spending time with his wife of 20 years and his two boys ages 11 & 14.

When asked what the greatest challenge is for him at ARINC, David responded, "to pull transportation communications along with the times. It's a constant struggle to keep up with the pace of technology changes." But, with leaders like Dave, ARINC is quite confident that we are on the right track. ●

David Hancock
Integrated Product Team Lead, ARINC

MAKING WAVES AT THE NBAA

This year at the annual NBAA meeting, ARINC made some definite splashes and certainly created a pool of excitement. Beginning with the introduction of a new booth equipped with live demonstrations of some of our most intriguing air ground communications services, the ARINC team kicked off the conference with a formal introduction of two new services — Direct℠ and SkyLink℠.

Direct, a service which brings all the benefits of data link to corporate and business aviation, was demonstrated to expose corporate pilots to the functions and capabilities of the service that most of you are already familiar with — data link.

Although the Direct service was especially appreciated by corporate pilots, announcements regarding the SkyLink service, ARINC's broadband solution, quickly grabbed the interest of the attendees. The first announcement detailed a partnership with SES AMERICOM, a branch of SES Global — the world's largest supplier of Ku-band satellite services. Secondly, the SkyLink team announced Gulfstream's confirmation to purchase a minimum of 40 SkyLink systems for use on their G 300, G 400, and G 500 aircraft.

A true broadband communications service, SkyLink has the potential to receive data at rates of 8 to 10 megabits per second (Mbps) —— up to 10 times faster than other commercial designs. It uses Ku-band satellite technology at ultrahigh frequencies, achieving an order of magnitude higher performance than other systems. In actuality, passengers using SkyLink will have an experience similar to working in the office.

The agreement that ARINC entered with SES AMERICOM covers final development of the SkyLink solution using the SES AMERICOM Ku-band satellite capacity over North America. President and CEO of SES AMERICOM, Dean Olmstead, said,"We're investing in ARINC's SkyLink solution for two reasons: one, we believe that this is an innovative mobile application that works splendidly on our FSS satellites; and two, SkyLink has great potential — not only in North America, but Latin America, Europe, and Asia where business jet travel is rapidly expanding, and where SES can also provide broadband satellite capacity."

The second announcement named Gulfstream as the launch customer for SkyLink broadband satellite service. ARINC is particularly excited about the Gulfstream order as they are recognized as the premier builder of business jets and have a customer base which will immediately recognize the benefits of the SkyLink service. The Gulfstream business arrangement with ARINC also provides for distribution of the SkyLink system through all of the Gulfstream aircraft service centers and through those service centers owned by General Dynamics, Gulfstream's parent corporation. This gives SkyLink an immediate channel to market for not only the Gulfstream aircraft, but for other manufacturers' aircraft.

As you can imagine, the NBAA was quite eventful for ARINC and the 27, 785 attendees. ●

The Global Link

is published periodically by ARINC and is distributed to its customers and others in the aviation community.

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