

Black boxes here to stay

The crash of an Air France A330-200 in the Atlantic in May last year and the failure of searchers to find the aircraft's black box deep in the ocean has renewed debate about the replacement of traditional onboard recorders with direct streaming of inflight performance data to ground bases. The decision, **TOM BALLANTYNE** reports, will almost certainly be a compromise.

Despite ongoing studies into the potential for aircraft performance data during flight to be directly streamed through satellite links to the ground in real time, most experts agree that traditional black box recording equipment on aircraft will not become redundant. The reason: the high cost of new systems and the massive amounts of data that would have to be transmitted on a continuous basis.

A study jointly conducted by the largest producer of flight data recorders, L-3 Aviation Recorders, and a satellite company, found that even with a 50% reduction in future satellite transmission costs, the price tag for direct streaming would be as much as US\$300 million annually for a major airline operating on international routes.

In comparison, data and voice recorders cost about \$20,000 and are certified for 100,000 flight hours, or about 30 years.

There is another issue. The failure to recover a black box is very rare. Indeed, only one of L-3's black boxes has ever been lost after a crash. It was aboard the American Airlines flight that ploughed into the World Trade Centre on September 11, 2001.

"A black box capability will always be needed," Akhil Sharma, director of air traffic management at SITA, the major aviation communications provider, told *Orient Aviation*.



[Direct streaming] could cause a capacity issue on the networks

Dan Pendergast

Senior Director for Airline Programmes, Asia-Pacific
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"All that we can do is enhance the communications to the aircraft and deliver the infrastructure to get more real time data to supplement that, to provide enough information should the black box be lost."

Sharma said that like all technologies, black boxes will improve. They will be able to store more information and may even, at some point, be more easily retrievable, or at least "stay alive" for longer after an accident.

The debate about transmission of data from operating aircraft has intensified since Air France Flight 447 disappeared in the Atlantic ocean off Brazil last year. The A330's black box, the flight data recorder (FDR) and cockpit voice recorder (CVR) have not been found. The only clues to the cause of the accident came from limited data transmitted from the plane through its Aircraft Communications Addressing and Reporting System (ACARS) prior

to its disappearance.

ACARS is an air-to-ground link that automatically sends operational information, maintenance data and fault reports to the ground, but it does not offer the bandwidth needed for real-time transmission of all data stored in the digital FDR and CVR.

Currently, the FDR and CVR serve as onboard recording devices. The FDR collects data from aircraft systems, while the CVR records crew conversation and aural warnings heard on the flight deck. The FDR holds 25 hours of data on up to 88 flight parameters and the CVR stores cockpit audio for between 30 minutes and two hours.

The black boxes are designed to withstand a crash and they emit a locating signal for up to 30 days after an accident or incident. But if they are not found by then, as happened in the case of the Air France jet, the data is unlikely to be recovered.

Experts say direct streaming is technologically possible, but realistically impractical. "My own feeling is it is dependant on determining the amount of data that needs to be down-linked and whether the satellites we use today can support that, keeping in mind that at any one time there must be over 2,000 aircraft flying in the world," said SITA's Sharma. "There will be a huge demand on capacity and of course there is the whole issue of cost."

Dan Pendergast, senior

director for airline programmes at ARINC's Asia-Pacific division, agrees. He said a constant transmission of information would be very expensive. "It is also something the service providers would probably not favour because it could cause a capacity issue on the networks."

Nevertheless, Pendergast said new technology, such as Inmarsat's fourth generation I-4 satellites, were adding a significant amount of capacity to networks. These new satellites are used by ARINC's GLOBALink VDL (VHF Digital Link) network. More than 2,000 aircraft use the network to send over five million messages a month.

It has now been expanded beyond North America and Europe and is available in Asia, at Beijing, Hong Kong, Bangkok, and Singapore.

Sharma said since the Air France tragedy there has been a huge focus on how data links could be used to improve aviation safety. As Europe moves towards a single air traffic control system, authorities



Air France: no signs of black box after A330 plunged into Atlantic

there have asked for tenders from groups interested in showing how oceanic tracking and safety efficiency could be improved, based on the use of data link.

Also, Airbus is undertaking a study for improving flight data recovery. This will include, but not be limited to, implementation of extended data transmission from commercial aircraft, so that in the event of accidents, critical flight information could still be recovered and provided to accident investigation authorities, even if finding the black boxes proved futile.

Airbus president and chief executive, Tom Enders, recently said various technical means for reinforcing flight data recovery and data transmission to ground centres were available. "We will now study different options for viable commercial solutions,

including those where our experience with real-time data transmission from our own test aircraft could support the further development of such solutions. The study will consider technological issues as well as data protection and privacy concerns," he said.

There are already systems available that allow some direct streaming. For example, a Canadian company, Calgary-based Western Avionics, offers a system called CommuniCube, which allows automated emergency data streaming. The data transfer can be started through a pilot-initiated "panic" button, or automatically.

In an extreme case, such as the Air France accident,

where the pilots might not have the time to activate data transmission, the system can sense sudden changes in aircraft behaviour and begin sending data immediately to an operations centre.

No one now doubts that direct streaming is possible. In fact, many military aircraft already use it. But for commercial airlines, where cost is a far more critical factor in installing such equipment than in military operations, experts are convinced the answer lies in a combination of improved onboard black boxes and an increase in the amount of data that is broadcast to the ground in real time. ■

Airservices Australia VHF upgrade milestone

A ground-breaking project to modernise and upgrade the VHF radio communication network in Australia has reached a major milestone. Airservices Australia technicians have upgraded air-ground-air voice communication equipment at 100 of around 150 sites nationally. Vital to safe air navigation across the country, the 100th transmitter to be upgraded is at Table Mountain, Rockhampton.

Airservices is replacing outmoded radios, aerials and network equipment with state-of-the-art hardware as part of

an eight-year, US\$40.8 million VHF system upgrade.

General manager technical and asset services, Alastair Hodgson, said the system provided crucial communication links between air traffic controllers in centres in Brisbane and Melbourne and aircraft travelling across Australia. "It delivers services to over 180 individual operating positions using around 590 radio transceivers located at more than 150 sites across Australia, many in regional and remote areas," he said.

The system upgrade will enhance reliability and allow remote monitoring and defect rectification by Airservices technical staff. It also introduces additional system

redundancy and back-up capability, improving the long-term safety and security of Airservices operations.

"Ultimately, all VHF services will be transitioned onto digital bearers as part of a separate multi-million dollar upgrade of Airservices own national telecommunications infrastructure," said Hodgson. The system upgrade is due to be completed by mid-year. ■

MAS signs second deal with Lufthansa Systems

Malaysia Airlines will use Lufthansa Systems' comprehensive navigation data for its new fleet of Boeing B737-800 aircraft.

The carrier recently signed an agreement for the use of flight management system (FMS) data from the Lido/FMS navigation database.

The contract follows a five-year agreement signed earlier this year for the implementation of the Lido/RouteManual navigation charts.

The FMS database contains all important route information including altitude and airport data for optimizing routes and supporting autopilots on board modern aircraft. The navigation data, based on global aeronautical information, is updated every 28 days and can be customized to specific routes and for use in any type of aircraft. ■

Cathay to trial new 'comms' system

Cathay Pacific Airways is set to conduct a three-month trial of a new communications system which, it is believed, will speed up data communication at airports, increasing efficiency and reducing aircraft turnaround times.

ARINC's GateFusion allows for seamless transfer of data such as Flight Operations Quality Assurance (FOQA), electronic flight bag (EFB), and inflight entertainment (IFE), using wi-fi or wireless communications.

"With GateFusion you can move large data files seamlessly with the optimal wireless connection between aircraft and ground-based applications," said Dan Pendergast, ARINC's senior director for airline programmes

in the Asia-Pacific.

"We will be installing an electronic flight bag class 2 system on a B777 aircraft by mid-February for the operational trials. There is a bunch of very significant accomplishments associated with that and probably one of the most significant is the capability to have wi-fi capability connected to the airplane to upload and download information to the EFBs that are going to be installed.

"Along with that is the capability on the ground to manage the wi-fi communication capability along with VHF and the other medias. The ground system will have the smarts to send, depending on the size of the application, the information not only over ACARS, but over



Cathay Pacific Airways: new communication system will reduce turnaround times

wi-fi and manage the content of the applications."

The system will give aircraft crews access to a variety of new capabilities. Information previously received on paper will be easily accessible through the EFB and pilots will be able to do calculations on the aircraft they have been unable to do up to now.

"Errors will be reduced. They will save time and they will save paper. It will also quicken the turnaround time for the aircraft," said Pendergast.

Ground crew will also benefit. "Currently, the maintenance people have to use a memory stick to download

parameters from the aircraft on its structure and engines and so forth. With a wi-fi connection to the aircraft it will enable information to be downloaded more quickly. If there are any issues people will know about them sooner," he said.

"It will be a very significant accomplishment once the aircraft is retrofitted with the EFB and the communications capability is deployed in Hong Kong with Cathay. This will be a precursor to prove the technology does work and provides benefits. It should help the business case to move forward with multiple retrofits on wider fleets of aircraft." ■

Japan's AVICOM to upgrade ACARS link

Japan's service provider for airline and civil aviation communications, AVICOM, has signed a comprehensive technology replacement agreement with ARINC to enhance the country's ACARS (Aircraft Communications Addressing and Reporting System) data link infrastructure with more efficient multiple-service technology.

The technology refreshment will be a significant benefit to civil aviation in Japan by allowing increased data link

message traffic for both aeronautical operational control (AOC) and air traffic control (ATC) communications. The project will also meet AVICOM's objectives to prepare for future controller-pilot data link communications (CPDLC) and aeronautical telecommunications network (ATN) operations, after the new ARINC systems are in place.

"We anticipate the aviation outlook in Japan will grow and our project with ARINC will ensure we are able to support

the industry's requirements for aviation communications," said AVICOM JAPAN president, Hiroto Nobukiyo.

CPDLC is a data link application that allows for direct exchange of text-based messages between air traffic controllers and pilots. The ATN is designed to provide data communication services to Air Navigation Service Providers (ANSP) for AOC traffic.

ARINC's replacement project for AVICOM will include a central processing

and networking system (CPS and AMQS), together with installation of fully redundant multiple-service ground system (MSGs) capability at 60 current airport sites.

The technology includes multiple-service digital radio (MDR) components that may be used for VHF ACARS, VDL or voice communications by changing software configurations. This means AVICOM will not need to maintain different hardware for each service. ■