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The ultimate flight experience

We will soon be able to cope with those dreaded long haul flights thanks to an innovation by Panasonic Avionics called eXConnect. This system will enable passengers to access all the same communications services as they would on the ground. Helen Jameson finds out more about this exciting development.

Panasonic Avionics is a leader in the In-Flight Entertainment sector but they are about to fill a very important gap in the market – that is the provision of voice and data broadband services via satellite on board commercial aircraft. This exciting development in the industry is expected to herald a revolution in air travel giving both passengers and crew an array of services that they have never experienced in-flight before.

In these days of constant connectivity, the sky is the next frontier to be conquered. Helen Jameson speaks to David Bruner, Executive Director Corporate Sales and Marketing and Dave Bettinger, CTO and Senior Vice President of Engineering for iDirect who have worked closely with the Panasonic team on the modem design.

David Bruner, Executive Director Corporate Sales and Marketing, Panasonic Avionics.

Question: Can you please begin by giving our Readers an overview of the eXConnect system?

David Bruner: Yes. It is actually quite simple. There is an antenna that is custom designed for the aeronautical market. This is one of the areas where we have made significant improvements. The antenna is much lower profile than in previous efforts. There is up to 50 percent less drag on the aircraft and that is a major factor in terms of the airline's operational costs. The weight of the antenna is 75 percent lighter than previous antennas performing this type of function. So there have been major steps forward in the technology and all the associated

functionality that goes with it such as LNBs and amplifiers. They are all part of one module that is prepared and delivered to Panasonic's specifications.

We have not yet announced who the antenna supplier is but that news will be released shortly. We have developed an excellent relationship with iDirect for the modem. This is such a critical part of the system so we had to find a company with experience of mobile platforms of which they have with two projects with Intelsat. What they are implementing for us is the same service that Intelsat offers today on the iDirect platform. We are simply extending that to the aeroplane. We are trying to make as few changes as possible. One main adaptation is required to make the system work effectively on a very fast-moving vehicle that banks and turns. This movement is not suitable for optimal antenna reception so the modem has to be very smart. This is where iDirect is really helping us to maximise the performance of the system.

The modem can travel from what may be a sweet-spot of a transponder all the way to the edges at the point where you lose coverage. They have a function called automatic beam switching that is really essential to our service so we try to get overlapping satellite beams so that the aircraft can move from one region to another and never lose coverage. It also helps us to manage network capacity better. The iDirect team have done a very good job of modifying the technology to make it adjust faster. That development is in process right now and we will be testing it late in the fall and that will be one of the last key pieces of the system.

iDirect are actually licensing their modem technology to Panasonic so we can do the manufacturing of this component ourselves which involves all kinds of strict environmental testing. This is really our speciality. We house the modem in an electronics box that is like a server or a router. We end up with a very small, very light configuration that performs many functions so it is really more than just a modem. We complete tight integration of different components to fit them into a small space. This means that airlines need very little room onboard their aircraft to fit this technology. They do not want to carry an ounce more weight than they need to, and that is where we have made some incredible strides. We have wireless access points on board the aircraft and we also have GSM picocell so we can tailor the system to the airline's needs. All of this traffic will pass through the same router. On most aircraft, the total weight of the eXConnect system will be less than 200lbs.

Question: How big is the antenna and whereabouts does it attach to the aircraft?

David Bruner: The system is all fuselage mounted. This is an improvement on the tail-mounted antennas. Whether it is on a regional jet or a large business jet it will still fit on the fuselage and is certified to fit there. We do all the tricky work, all the aerodynamic analysis necessary to fit the antenna onto the different types of aircraft fuselage. There are no safety issues and the weight is not affected. It's about 36 inches wide and seven inches tall. The weight is probably the most important factor. I think you will see the system finding its way into a lot of private aircraft – not just the core air transport market but the high end business jet market.

Question: How will eXconnect change the flight experience for both passengers and crew?

David Bruner: The obvious way is connectivity for the passengers. People can use their laptop or phone at rates that are comparable to international Wi-Fi roaming rates. It's the same as if you land in Singapore and open up your laptop in the airport where there is a Starhub service - your rates are going to be almost identical. If you are already enrolled in a WiFi system then you can access this on board using your user ID and pin as we have roaming relationships with virtually every Wi-Fi operator worldwide. It operates in exactly the same way as it does on the ground. That is a tremendous move forward. Before it was quite an effort to get enrolled. If you have used it once, it remembers you and so you can use it over and over again. This, and being able to use your mobile phone on board are big changes but we think that this will dramatically change the way in which airlines operate.

There are so many things that airlines wish to do today that are not feasible either through lack of bandwidth or because the cost of that bandwidth is just too high. For instance, a lot of airlines encounter things beyond their control such as weather. Imagine you will miss your connection in Hong Kong due to bad weather. At the moment they will tell you not to worry, that a customer service agent will meet you in Hong

Photo courtesy of Panasonic Avionics.

Kong and sort out a connecting flight whilst you spend the entire flight worrying that your itinerary will be messed up. Using the technology, they can re-accommodate you and relay this information to you so that you can check your diary and decide whether that is good for you or not. They can communicate directly with their customer service staff from the air. Airlines find that they can relieve passenger anxiety very easily. The airlines really do want to do this but they have a missing link – they have the operation on the ground and the processing capability on board the aeroplane, but they do not have a feasible communication link between the aeroplane and the ground. Our system will provide them with the last piece of infrastructure so they can use the connectivity to serve their customers better. There is some tremendous creativity out there in airlines today and they are just waiting for this system to be implemented.

Question: What were the principal reasons behind your choice of iDirect's satellite transmission platform for eXConnect?

David Bruner: This was really twofold. The first was their existing relationship with Intelsat. Their service was already integrated into the Intelsat teleports. Everywhere we needed the service it was already in place.

Then there was the fact that they worked with us to develop the product but actually gave us the license so that we could take on the manufacturing of the product. We didn't have to worry about environmental testing and lifecycle changes that came along in the product. They are also very flexible to work with.

You know that there are only a small number of modem suppliers in the business, and they are all good companies but, over the past 3-4 years, iDirect has been the fastest growing (seems to be almost overnight). And they have moved into a strong position in that marketplace and that cannot be without some very good reason. They have some products in the field that are performing very well. All of these things combined plus heavy endorsement from Intelsat were what led us to conclude the arrangement with iDirect.

Question: What are the particular challenges that you have faced in bringing eXConnect to market? We have seen others, such as ConneXion By Boeing fail.

David Bruner: It is easy to follow someone else and see what they got right and what they got wrong and we are lucky to have what is basically a case study of ConneXion by Boeing who did an awful lot right. We are taking advantage of that.

The way that they had to define, from scratch, the regulatory requirement has made our effort much easier in terms of time, cost and getting authorisation worldwide. In terms of the technology, we are probably two generations ahead in every single area and, from an airline perspective, it gives more capability and at a fraction of the weight penalty to carry this capability. Even the cost of the components has come down dramatically.

When an airline asks what their operational costs will be, we have been able to prove that their ROI is going to be far superior. Since we supply inflight entertainment systems today, it really narrows their list of suppliers as this can all be integrated into one package and it makes it very simple for the airline to manage one supplier that provides all their needs. We already have long-term relationships with our airline customers and this will make their lives significantly easier.

We don't intend to stop with broadband communications. We are now simultaneously launching a new airline television network that will comprise several channels of live broadcast television and this can be broadcast to any airliner wherever they are in the world. It is in combination with our broadband service and this has never been done before. It's a service particularly for airlines and the licensing of the content and the testing of this with our partner Intelsat is really a novel and unique kind of service. Now you can imagine, in the future, that you will be talking and emailing and sending messages to your friends that are on the ground and they don't even realise you are in an aeroplane. This will make passengers feel more comfortable as they are able to keep in touch. A long haul flight of 17 hours- it is a long time to be out of contact. This will allow you to stay in touch as much or as little as you want.

Question: What were the main reasons behind your decision to choose the Intelsat fleet for the delivery of eXConnect?

David Bruner: The coverage was really important. There were probably two areas where they did not have their own satellite assets and they had to act as our agent to secure those regions. Intelsat has teleports everywhere in the world where we needed them so that was a big factor in our choice. I think it was also their ability to arrange a commercial relationship that allowed us to start the business small and then grow it. They are a major risk taker in this business in the way they have constructed this commercial relationship. They have been very, very flexible and very intelligent and I am very impressed by the people and their creativity too. One of the biggest difficulties for ConneXion was that they had such up front costs that they were just losing so much money in the early years when they didn't have very many aircraft. Intelsat knew our struggle and they went off on their own and came up with an arrangement that allowed us to grow the business with smaller costs at the beginning, and to grow those costs as the fleet grows. We will therefore be able to sustain the operation from a cash flow basis. Their commercial creativity and desire to understand our business and how they could match up to our needs won them our confidence.

Question: In the future, will eXConnect be suitable for use in other applications aside from commercial aircraft such as for civil or military purposes?

David Bruner: Not at this time. In the air transport market there is so much business and so much potential. Even the business jet market is a secondary market to us at the moment. We are heavily focused on the air transport market and we really do need to make that a success. We have to be successful from day one. The customer has to be happy, the passengers have to be happy and we need to know that we are meeting our commercial goals so this continues to be a viable operation. If we are sitting here three years from now and our airline customers are happy we will be happy as well. If we are able to expand further than that then that is just wonderful. It's a case of one step at a time.

Question: The introduction of broadband to commercial aircraft is a very logical extension to the offerings they already provide. Has the interest generated by eXConnect been very encouraging and when will the first systems be implemented?

David Bruner: The interest is tremendous but you have to imagine that some of the most savvy customers were customers of ConneXion By Boeing and they are very cautious. Most of them are still removing the equipment from their aircraft. However, the interest is so great – I have never seen a product like this before where everyone needs this and wants it.

It's just a matter of working out the correct details for them and then them having the confidence in us as a supplier. Hopefully, very soon, you will see the first announcements on the launch set of customers and the service will launch in the summer of 2009. It really is contingent right now on whether we have sufficient regulatory approvals in the core geographic areas that are required by those launch customers. When we have those, we will launch. You can't have patchy coverage from a regulatory approval standpoint. We need to have the main large countries covered. It is quite a task but we are finding it easier than we anticipated because the ConneXion by Boeing team built a process that many countries have now

Overcoming the challenges

Dave Bettinger, CTO and Senior Vice President of Engineering for iDirect

Question: Only a relatively short time ago, broadband on aircraft seemed to still be a long way away and an expensive concept. How has this changed?
David Bettinger: The core technologies and capabilities that comprise an in-flight broadband system have improved dramatically since Boeing's attempt, which was grounded by financial, technical and operational challenges. Panasonic, iDirect and our other partners have addressed and overcome these challenges. The result is a next-generation system that we're very confident will be a success with airlines.

Let me summarise several critical improvements. The airborne electronics system (AES) and satellite antenna are a fraction of the weight. The transmission of satellite bandwidth is much more efficient and affordable. And Panasonic eXConnect is significantly more functional. It supports applications beyond just WiFi Internet access, providing greater revenue opportunities through services such as live television programming, premium entertainment content supported by advertising, duty free shopping and voice connectivity.

Another important different is that Panasonic eXConnect presents a much more attractive ROI model for network deployment and support. Boeing purchased much of its own satellite network hardware and developed its own customized network. This would probably have meant a large capital expenses and further commitment for ongoing technology development. Boeing also deployed a global satellite transponder network, which was configured at maximum bandwidth levels for all remotes and as a result proved to be far too costly to operate.

By contrast, Panasonic has chosen to leverage Intelsat's already-deployed global satellite infrastructure, minimising the cost of acquiring satellite hardware. Panasonic can develop its network by simply adding a line card to Intelsat's network of iDirect hubs. As demand for its services grows in a region, Panasonic can add additional line cards to meet demand quickly.

Question: What challenges did you have to overcome in the development of the satellite transmission platform?
David Bettinger: There are three significant challenges in developing an in-flight satellite transmission platform. These are the ability to transmit bandwidth efficiently over an ultra-small satellite antenna that's in motion, to maintain service availability as an airplane crosses satellites footprints, and to manage multiple real-time applications on a shared network. iDirect's satellite router technology, which Panasonic is licensing, solves these challenges.

What happens in the first instance is that an ultra-small antenna requires increased transmission power to maintain a reliable link at 30,000 feet and 700 miles per hour. This uses large amounts of bandwidth and makes in-flight broadband cost-prohibitive. A prize feature of the iDirect router technology that Panasonic is licensing is something called "Direct Sequence Spread Spectrum." Our engineers developed this after a tremendous amount of testing and experience supporting military comms-on-the-move. This mobile waveform diffuses the transmission of satellite bandwidth while maintaining a high data rate. And by doing this, Panasonic can conserve satellite space segment and lower the cost of bandwidth for airlines.

Panasonic eXConnect also utilises iDirect's Automatic Beam Switching technology. As an airplane crosses from one satellite beam to another, the iDirect router automatically connects to a new satellite network, quickly and without the need for operator intervention. This benefits passengers on international flights. The faster the switchover, the less time the network is temporarily interrupted.

And finally, iDirect's innovative "Group Quality of Service" is a critical technology that enables a network operator or service provider to support a wide range of applications on a shared network. We believe this technology will make Panasonic eXConnect the most functional in-flight system available. Airlines will have the ability to provide basic Internet access as well as support live and premium in-flight entertainment, voice services and their own operational applications. All these services can be supported at the same time, with additional bandwidth being allocated to priority applications when needed.

Another benefit of iDirect's Group Quality of Service technology is that Panasonic can operate a shared network, while designating guaranteed bandwidth to each airline customer on the network according to individual service level agreements. This is a major benefit to airlines. They have the equivalent of a private network matched to their needs, while taking advantage of the bandwidth savings of a larger shared network.

adopted. This has really streamlined the task. It took them around five years to get to the coverage they had when they stopped trading but we will probably get to that stage in one year thanks to their groundwork. Governments are governments and it does take six months to a year, some countries a little longer and some countries do not even have a process. The regulatory improvements in Russia for example should make the process a lot easier. The EU has been fantastic in the way that they have co-ordinated all of the EU countries to gain approval for all of them and this just opens up a whole area to air transport traffic so that is very significant.

Question: What is next for Panasonic Avionics?
David Bruner: The implementation is absolutely critical and it is important the airlines and passengers are happy. But you can let your mind run wild in terms of looking at communication trends on the ground. It is our objective to provide all of that same capability to a passenger on board the aeroplane. It is our intention to provide the services available on mobiles today to those on board the aircraft so you are really unlimited as to the kind of service you can provide.

It could be a lot of fun! We are laying the right infrastructure in place so that you can have all the same capabilities that you have walking through the streets of London. You are no longer disconnected and disadvantaged. Whatever is next on the ground you will be able to do on the aeroplane.