Aircraft interiors INTERNATIONAL

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In this issue

BOMBARDIER

VP Patrick Baudis explains the importance of rethinking and upgrading regional aircraft cabin designs and their PRM capabilities

NEURAL NETWORKS

Artificial intelligence could enable new possibilities in cabin evaluation and design

SEATBACK IFE Industry observers give their forecasts for the future of seatback IFE

STOWAGE INNOVATION

Design experts share their ideas to increase in-seat stowage space to meet growing passenger demand

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SEATING

Our guide to every new seat launched over the past 12 months

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The aircraft seating AFTERMARKET IS EMERGING THAT CAN BRING FINANCIAL, TIME AND ENVIRONMENTAL BENEFITS TO AIRLINES

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THE NAKED TRUTH

ouldn't all airlines like to be able to truly understand customers' feelings toward their products and designs? Research into flyers' opinions undertaken today creates valuable feedback data, whether it is gathered by survey, interview or questionnaire, in person or remotely. But do the results tell the true story?

For example, British people are known for being a little understated when delivering any negative feedback, so much so that a response of "It's not quite what I had in mind" in response to being shown a new design could mean anything from mild disappointment to complete disbelief that someone could produce such an abysmal piece of work.

One might pity the teams at British Airways that have to decipher feedback from their domestic customer base to help plan future cabin projects, but then the airline itself can be guilty of understatement itself. Indeed BA's Captain Eric Moody was a master of the art (though a modest one, naturally), best illustrated by the tale of an eventful flight in 1982. Moody was piloting a B747 over Indonesia, and as he was approaching Jakarta, a volcanic ash cloud created by the eruption of Mount Galunggung caused all four engines of the aircraft to flame out and fail. If Moody was rattled, he certainly didn't let on to the passengers when he made his announcement: "Ladies and gentlemen, this is your captain speaking. We have a small problem. All four engines have stopped. We are doing our

damnedest to get them going again. I trust you are not in too much distress."

A little British reserve can be reassuring in its stoicism, but it makes for rather inaccurate analysis and potential frustration as a basis for cabin design. However, technology can, as ever, help make life a little easier. Artificial intelligence such as machine learning and neural networks could accurately deduce how passengers really feel – or indeed will feel – about designs and experiences, using models built on trusted, accurate data. No vocal or written responses are required, which might be diluted, exaggerated, bowdlerized, poorly expressed, or just plain mistaken or misperceived. Remember the blue dress that caused an internet sensation and many a silly row in 2015?

Now we have the potential for accurate design evaluation data, all available in cold, hard numbers unsullied by human inhibitions, perceptions, moods, bias or shortcomings of expression. Any poor scores could be addressed by interiors manufacturers and designers with a redesign or adjustment of comfort parameters, for example, and the result re-evaluated to ensure the design creates the desired positive feelings. Looking further ahead, algorithms could be created as a formula for a great cabin.

As a Brit, I would say that the potential of this technology is 'rather good', but artificial intelligence would reveal the idea to be highly promising. And it can say that without bias.

Adam Gavine, editor



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can't always express themselves, transforming the qualitative into the quantitative, and opening up new cabin design possibilities

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We talk regional cabin design with Patrick Baudis, VP and head of marketing at Bombardier Commercial Aircraft. He discusses the importance of international airlines improving the regional experience, and why more thought must be given to PRMs

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NO WEIGHTING

Science and design have combined to create the 'world's most comfortable chair', which creates a feeling of weightlessness and well-being. Just imagine this technology in an aircraft...

As airlines, seat manufacturers and industrial designers all seek to create the most comfortable aircraft seating experience, they may be interested to see what is claimed to be the most comfortable seat in the world. The Elysium seat, by DavidHugh in the UK, has been designed to create a feeling of weightlessness, achieved through the application of complex technological and medical research, and relatively simple engineering, unified with luxury styling.

The principle behind the seat is based on the anatomical effects of gravity on the human body. In the upright standing position, gravity exerts force downwards on the body, and the body works to maintain equilibrium and balance, with the heart having to work to return blood from the lower legs. Meanwhile in the horizontal position the situation is reversed, with less stress overall, including improved blood circulation, deep muscle relaxation and reduced load on the heart. Approximately halfway in between, at around 25°, is a point of zero gravity where pressure distribution is near isotropic and the occupant feels sensory attenuation – and, in essence, a sense of floating.

The key to the Elysium's flotation technology is an equation that defines optimal posture and gravitational force. The equation is secret, but how it is expressed as a feat of engineering isn't. At the core of the design is

a carbon-fiber skeleton that supports and engages the occupant's body, with layers of ergonomically engineered structures added on top to create comfort, giving unique support to the pelvis, aligning joints in the lower spine, reducing back muscle activity, and opening and rehydrating the intervertebral discs.

Furniture springs are fused to the skeleton structure at precise locations and with specific

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tensions, all selected to focus support on specific parts of the anatomy. The next layer is a variety of highly resilient, viscoelastic foams that add benefits of support, pressure relief and an overall pleasant feeling.

The structure rests on an innovative movement that works like a cam, translating any rotational movement of the body into a frictionless linear horizontal motion, ensuring the body is always in balance. This motion is achieved with a surprisingly simple mechanism, with only six roller bearings and one linear bearing required to create frictionless and continuous balance. The chair is intended to feel like an extension of the body, with the occupant able to manipulate the seat into the ideal position simply by subtly shifting their weight – in the same manner as a motorcycle rider taking a gentle corner. Indeed a simple gesture is enough to move the chair from upright into floatation mode.

The DavidHugh team go so far as to say the seat can help relieve pain and create an altered state of consciousness. This may sound a little ambitious, or even a little far-fetched, but then the seat has been created by a designer with an unusual blend of expertise: furniture design and science.

The idea of the technology that controls the movement of Elysium was first conceived by Dr David Wickett (founder of DavidHugh) in 2002 as part of his postgraduate studies in furniture design, after which he went on to work with a medical seating company and become a member of a bioengineering research group. He continued refining the design, and the Elysium project formed part of his thesis for a PhD in bioengineering. The idea has now really taken shape, with Wickett establishing the DavidHugh company to manufacture the chair.

DAVIDHUGH HAS DEVELOPED A NEW TECHNIQUE TO FILL THE ARMREST WITH A GRADE OF GEL THAT MIMICS THE QUALITY OF HUMAN SKIN. THIS 'SECOND SKIN' IS COVERED WITH THE SAME GRADE OF LEATHER AS THE BODY OF THE CHAIR With various aircraft seating companies such as Stelia Aerospace, as well as airlines such as Emirates (see p12) developing zerogravity cradle mechanisms for premium seats, they might be interested in investing in an Elysium to inspire their research, or simply to make their research more comfortable. However, invest is the word, with the chair priced from around £25,000 (US\$34,000).



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Michelangelo

The economy long range beyond passenger expectations.

LUCKY NUMBERS?

Many sectors of the aviation industry are still enjoying positive growth, driven by healthy aircraft order books. Not every figure is a positive though...



SUITE TALKING

Emirates pioneered the concept of private suites in first class back in 2003, and 15 years on it has unveiled its latest B777-300ER designs. This is what the luxurious 2018 experience has to offer...

> Passengers can request room service using the video call function. Crew can serve drinks and canapés through a service window without disturbing

customers.

The 13in touchscreen wireless handset controls

The suites were created in collaboration with Boeing, Rockwell Collins, Panasonic, Pierrejean Design and Teague.

Each suite has individual temperature control.

seat functions as well as the IFE system. More than 2,500 channels of on-demand entertainment can be viewed on the 32in HD LCD TV screen, or it can be used to show content from their own devices. The viewing experience is enhanced with Bowers & Wilkins active noise-canceling E1 headphones created exclusively for Emirates, which use a unique hybrid noise-cancellation technology

optimized for the first class cabins.

STATES STATES STATES

The 1-1-1 configuration of the six suites means the center suites do not have a window; however, they still have a view, as Emirates has introduced the industry's first virtual windows for the middle suites. These 'windows' project the view from outside the aircraft using real-time camera technology. In the outer suites, Steiner Safari binoculars are available for customers who want to explore the sky outside.

The inspiration kits feature an Emirates' exclusive luxury Byredo skincare collection, Hydra Active moisturizing pyjamas, and Bulgari amenity kits.

Each suite is fitted with chandelier-style lights. The system also enables 10 ambient mood lighting settings with seven color schemes that customers can control from their suite. First class has been removed from Emirates' Boeing 777-200LRs, but business class has improved, going from 2-3-2, to wider seats in a 2-2-2 configuration, and a business class social area with snacks and beverages has been added.

Measuring up to 40ft² (3.7m²) and

passengers to change in privacy,

84in (2.1m) long, there is space for

especially with 6ft 9in (2m)-high doors.

 (\mathcal{A})

There is ample stowage space, including a cleverly designed overhead compartment, and a full-length cupboard for hanging clothes.

The new cabin is 1-1-1 rather than 1-2-1.



The electrically operated leg rest, backrest, headrest, armrest, seat frame, leg rest extension and seat pan extension enable the seat to convert to a 'zero gravity' seat setting inspired by NASA technology, giving a feeling of relaxation and weightlessness.

The seat is 78in long, and up to 30in wide.







The suite has been influenced by the interior design of the Mercedes-Benz S-Class design. Sir Tim Clark, president of Emirates, said he sees the automotive brand as a natural fit as they both have an eye for fine detail and quality, and a drive to push boundaries. The collaboration inspired several design details including the soft leather seating, high-tech control panels and mood lighting.

The experience is extended on the ground as Emirates runs a fleet of S-Class cars as part of its complimentary chauffeur-drive service, which whisks first class passengers arriving or departing in the UAE between aircraft and home.

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Aeromexico is using the same seat across its new wide-body and narrow-body fleets, customized for a consistent experience and future-proof service

Aeromexico has revealed an interesting business class seat design for its fleet of 60 new B737 MAX 8s and 9s (with an option for another 30), designed to add a greater feeling of space to the short- and mid-haul passenger experience. The Mexican flag carrier worked to customize the Rockwell Collins MiQ seat, the same model that has been in service for the past year on the airline's long-haul B787-9s, to achieve consistency across the fleet.

"Our fleet of Dreamliner interiors marked a turning point for the brand," explained Antonio Fernandez, Aeromexico's SVP for onboard product. "The challenge was to embed Aeromexico's brand values throughout our new fleet of short-haul aircraft while ensuring a premium and seamless passenger experience."

As with the Dreamliner cabins, Aeromexico teamed up with London design agency New Territory for the customization work, a major part of which involved a rethinking of the seatback. The IFE monitor bezel and shroud, and the magazine pockets, were redesigned in such a way that if the airline decides to refresh its cabins in a new scheme, these elements can be easily replaced, saving time and money. The customization process also saw comfort enhanced through an increase in seat width, a redesign of the foams and seatback ergonomics, an enlargement of the cocktail table and meal tray, and the addition of an integrated tablet holder.

The in-seat lighting effects were also customized, with the illumination of the footrest, tablet holder, magazine pocket, phone charger and personal effects holder all tweaked to enhance the visibility of key elements – as well as to tie in the seated environment with the cabin lighting effects.

Hugo Jamson, creative director at New Territory, commented on the importance of the lighting work: "The ways in which we installed lighting systems were crucial because they provide a much clearer sense of personal space for the passenger. In essence, the lighting makes you feel that the back of the seat in front of you is part of your own seating area, and when added to the widening of the seat and its new features, you're left with a more comfortable experience and an increase in perceived value."



OPEN APPROACH

Aeromexico's B737 interior designs follow the ethos of passenger well-being applied to its B787-9 cabins. For the Dreamliners, particular attention was paid to the onboard social space (Espacio Premier) which was designed as a welcoming kitchen-style environment rather than a branded business-class bar experience with limited seating.

According to New Territory, which also worked on this project, onboard bars can create unwanted subdivisions within a class, with people who aren't in a particularly sociable or conversational mood feeling reluctant to try to take a seat at a bar or help themselves to refreshments, if they can gain access at all.

The full story behind the Aeromexico B787-9 cabin designs can be found on our website.

> ABOVE LEFT: MOST PARTS OF THE MODULAR SEATBACK CAN BE EASILY SWAPPED OUT, WHETHER FOR REPAIRS OR NEW CABIN SCHEMES

ABOVE: THE MIQ SEAT WILL BE FAMILIAR TO LONG-HAUL FLYERS WITH AEROMEXICO

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REGIONAL CHAMPION

Singapore Airlines is creating consistent luxury across its fleet, with a regional business class to complement its redesigned A380 cabins

Hot on the heels of the unveiling of its redesigned A380 interiors, Singapore Airlines (SIA) has made another exciting reveal. The airline has taken delivery of the world's first Boeing 787-10, the 68m-long (223ft) aircraft being the longest Dreamliner variant. This aircraft is the first of 49 B787-10s that SIA has on firm order, making it the largest customer for the aircraft type, and it intends to use the fleet for flights up to eight hours. The two-class, 337-seat aircraft features all-new regional cabin products, and just the initial 20 aircraft represent an investment of US\$350m in interiors.

The business class cabins feature 36 seats based on the Solstys III model by Stelia Aerospace, with 14 main points of customization making it a unique design for SIA, and deserving of its own name: Symphony. The forward-facing, staggered 1-2-1 cabin layout offers fully flat beds and direct aisle access – a big upgrade from the airline's current 2-2-2 angled recliners on regional routes. Symphony's styling and trim also ties in with SIA's longhaul product, with the distinctive 'wings' providing privacy.

Seat pitch is 44in and width is 20in (51cm), which expands to 26in (66cm) when the armrests retract in bed mode. The beds are 76in (193cm) long, but unlike the new Jamco seats on the A380 the center doubles do not have adjustable dividers that retract fully, meaning they do not have double-bed capability. However, on regional routes passengers will only be having a nap – with the Alcantara-clad padding within the seat shell helping them nod off as it absorbs cabin noise and makes them feel 'cocooned'.

Other custom comfort features for Symphony include increased stowage space, a larger meal table, a 'business panel' with in-seat power supply and USB ports, an THE REGIONAL TRAVEL EXPERIENCE REALLY DOESN'T GET MUCH BETTER THAN SINGAPORE AIRLINES' NEW SYMPHONY DESIGN integrated reading light unit with adjustable lighting intensity, and an 18in HD IFE monitor. All in all, Symphony offers regional business flyers everything they might need.

SIA has also strived to create a good level of comfort in economy class, with the 301 Recaro CL3710 seats arranged in a 3-3-3 configuration, each with an ergonomically designed contoured backrest and a sixway adjustable headrest with foldable wings to provide neck support. Other comfort features include storage space for small personal items, a coat hook, USB port and in-seat power supply.

This regional upgrade helps ensure a consistently luxurious passenger experience across the SIA fleet. \otimes

Regional media

Whether using the 18in HD touchscreen monitors in business class, or the 11.6in versions in economy, all passengers have access to more than 1,000 movies, TV shows, audio programs and games on the KrisWorld system.

KrisWorld IFE is powered by Panasonic's eX3 system, with a myKrisWorld feature that enables customized experience through content recommendations based on customer preferences and viewing history. Members of KrisFlyer, SIA's loyalty scheme, can bookmark and resume content, as well as customize and save preferences for subsequent flights.

The B787-10s will also be equipped with wi-fi supported by Panasonic's Global Communication Services and GSM phone services provided by Aeromobile.



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SPINE TINGLER

THE BRIEF

With ultra-long-haul aircraft entering fleets, we would like to see new thinking in the economy seating space that offers the necessary comfort and environmental credentials for flights approaching 20 hours.

THE SOLUTION

Known for its work in furniture design with clients such as Walter Knoll – experience it has translated into airline seating projects with Lufthansa and LIFT by EnCore – design studio PearsonLloyd has undertaken independent research into new solutions for long-haul economy.

The studio has developed a modular concept that increases passenger space and extends visual sightlines, primarily through a separation of the headrest from the seatback. The two elements are connected by a central 'spine' that narrows the form of the seat, giving a greater sense of personal space for the passenger behind and increasing sightlines through the cabin. That central spine runs down the length of the seat and houses all functional seatback parts such as IFE and stowage, visually separating them from the upholstered part of the seat in front, creating a slimmer form and reduced mass at head height.

This form will naturally lead passengers to place their knees either side of the spine in the more padded sections, maximizing space and enabling passengers to recline further without impeding the sense of space in the seat behind. The seat layout has also been optimized to allow for a greater recline in the upright position.

Other design features include a bifold tray table that extends laterally for space efficiency, and easily accessible upper and lower stowage areas that reduce unnecessary passenger movement during flight.

The seat materials have been selected with sustainability and comfort in mind, with the internal carbon-fiber structure covered at the rear with recycled plastic containing a high percentage of sunflower seeds. The covers are composed of a recycled wool mix and are held away from the foam with a 'spacer-knit', improving airflow next to the skin. All aluminum parts are constructed from recycled aircraft aluminum.





VERDICT

Any design that reduces the sense of claustrophobia in economy seats, especially when the passenger in front reclines during a long flight, is a positive. The slimmer, lighter form of the seat shows that padded bulk is not necessary to convey a sense of comfort and helps create an airier feel throughout the entire cabin. The modular design also enables swift and easy replacement of seatback parts, which is useful as they will suffer a great deal of wear and tear during the long flight durations. The only criticism? A padded section around the knee area might be nice, for those who prefer to sit with their knees together. 🔊

SOMETIMES IT'S THE SIMPLE THINGS DONE SUPERBLY





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THE RISE OF ARTIFICIAL INTELLIGENCE AS A MEASURE OF PERCEPTION COULD OPEN UP NEW POSSIBILITIES AND METHODS IN AIRCRAFT CABIN DESIGN

Words by Marisa Garcia. Illustration by Viktor Koen









It started as a challenge. And ended up setting an example. s machine learning and neural networks advance, could artificial intelligence (AI) measure the impact of design on personal well-being more effectively than designers, engineers or passengers themselves?

Vedran Dzebic, cognitive neuroscientist and R&D coordinator at Entro Communications, believes that AI can be a useful tool in design evaluation. Indeed he has developed a neural network that evaluates how spatial elements affect people. Using AI, he can help architects and designers identify necessary changes to ensure that a space generates desirable feelings.

"The basic principle of how these models work could be applied to any kind of environment," Dzebic explains. "What we've been thinking of doing is training specific models and specific algorithms for specific types of environments under the assumption that there is something inherently different about airports compared with art galleries, for example."

THINKING INSIDE THE BOX

The neural network is able to work through a large set of baseline design data for comparison more quickly than a person could, and it also comes up with results impassively as it has no personal stake in the success or failure of a project.

"We're not just coming up with numbers that we think are going to measure something important about an experience," Dzebic says. "We make the argument that since these models are being built on human perceptions BELOW: VEDRAN DZEBIC HAS DEVELOPED A NEURAL NETWORK FOR AIRCRAFT INTERIORS

BELOW LEFT: ASSESSMENT OF PERCEPTION IS IMPORTANT TO BOMBARDIER: SEE P30 + P32



and human emotions, we're getting a little bit closer to what the real experience is like."

Carrie McEwan, senior human factors specialist at Teague, believes that we know

enough about the impact of design elements to make judgments on their emotional impact, based on spatial parameters. But whether AI can process those factors as effectively as a human is another matter.

"We have found that you can change your emotional state and arousal level through some of these things, which can include space, lighting, different colors, etc," McEwan says.

"But your perception is influenced by so many things over time that it's not always an instantaneous thing – for example, cultural influences, personal influences and experiences, and biological influences as well. You would need a massive amount of data to come into focus on some statement that you could actually generalize as being universally true. The likelihood is that you get something relatively close, and from that you are able to make a generalized statement or hypothesis, but it's

"Aircraft cabin design is a good choice for testing a limited scope of data"



never going to apply to every single person. It would be fairly broad."

Warren Schramm, technical director at Teague, has studied AI applications in depth and has been closely tracking advances in the development of neural networks. He says they have proved useful, though they are still developing.

"I've seen training models that deal with photographic input, which could just as easily be trained to look at light and space, but there isn't the volume of data around them that I think would make the algorithms very responsive right now," he says.

SPATIAL LIMITATIONS

Dzebic acknowledges that complex factors that affect experience may exceed the scope of data used in the

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"Design elements become much more important"

initial design of the neural network, but extending that scope may not be useful. Aircraft cabin design, he says, is a good choice for testing a limited scope of data because of common structural elements.

"The models and algorithms that we have can, even in their present form, be applied to predict the experience between one cabin design and another," he says. "The form and the shape is limited, so you have this interesting constraint. Design elements become much more important. This tool could help you compare options. You could easily draw contrasts and use these metrics to evaluate form and changes, which would lead to a better experience."

One advantage of AI rating a space is the presumed objectivity of the neural network, which offers a degree of legitimacy to marketing claims.

"If you look at new cabin designs, their creators use big terms like 'increased wellness, well-being and happiness', and 'a welcoming environment'," Dzebic says. "Those are things that designers have thought very deeply and fully about. But at this point, from what I can see, there aren't any measures to support that. With something like our tool, they would be able



TEAGUE TECHNICAL DIRECTOR WARREN SCHRAMM HAS BEEN MONITORING ADVANCES IN NEURAL NETWORKS to look at current measures and determine whether it predicts that this cabin design is going to be more welcoming or pleasant."

BUILT-IN BIAS

While there are many types of neural networks engaged in creative fields, from making music to writing poetry, this application for design uses more functional parameters.

"You would get a centralized idea of what is likely to be perceived as a calming or invigorating space, based on what that machine and algorithm has learned," Schramm says. "But to judge or understand it you have to go back to the training data that was used, and who was involved, because their biases do drift in."

Think of unintended AI bias this way: if you've got seven people making minestrone soup based on a recipe in a cookbook, you might expect all seven soups to taste exactly the same. But each cook may pull ingredients from different sources, according to their personal preferences and shopping habits. They may add seasoning according to their own taste – even



THE BLUE DRESS TEST

The notion that perception is a constant was called into question by the phenomenon of the white/gold or blue/black dress, which made its rounds on the internet. People seemed split down the middle on what colors they saw in a single photograph.

Dzebic tells us that he has considered these occasional disparities. "The reason why the dress was such a huge phenomenon is that it violated our everyday perceptional experience," he says. "We agree more often than we disagree about our perceptional experience. The dress was a counter-example to that. The fact that such disagreements are rare is what made the dress so powerful. But more often than not, for many things we agree more than we disagree. If we didn't agree on those things, if our perception were completely different, then we would live in a very chaotic world and there would be no agreement on pretty much anything. Thankfully our perception is stable enough across individuals, and across people, and there is a certain amount of agreement that we can use as a baseline, that we are all on the same plane." unconsciously – but all will believe that they followed the recipe to the letter. Even if the procedure appears to be identical, the subtle choices that each of these cooks makes in selecting what they put into the pot will affect the final flavor of the soup.

"When you form these models and these types of predictions, you get an enormous sense of how well the model performs relative to other models," Dzebic says. "You have the first version that tells you that the model is reliable. The more data you collect, the more robust the models become. More often than not you improve the predictive power and the accuracy of measures. But there is also a point of diminishing returns. There are situations where you have so much data that

VALUE JUDGMENTS

Designing premium aircraft seats is expensive and airlines need to know what value they generate in order to implement features and fares that deliver optimal returns. Oliver Ranson, founder of Ranson Pricing, considers the question of perceived values:

What value do horizontal beds create over other products? Horizontal beds offer better sleep. But what is sleep's value to meetings the next day, and other reasons for travel?

What value do longer and wider seats create?

These seats offer improved sleep too, and again you need to quantify value. Consider foot space as well as shoulder width, and whether feet are enclosed. Length and width also improve the experience when working, eating or watching IFE. Length and width can be traded off – you need to find the right balance.

Do longer flights increase seat value?

Not necessarily. If your airline has a lot of five- to eight-hour overnight sectors, every minute of sleep is precious, potentially increasing flat bed value.

Do different markets value seats differently?

Airline passengers are a diverse bunch and each group almost certainly values the seat differently. Seats last a long time, so you need to understand not only the distribution of valuations today, but also how they may change over the seat's life. the training becomes ineffective and you start skewing the data in certain ways."

By comparing the results of baseline data with actual feedback from a fixed demographic group, then by

entering the human feedback as fresh data that informs the neural network, the improvement in the AI's ability to evaluate a space should be exponential.

"Saying that you will apply this problem-solving process to the space, and to the problem of understanding what a space feels like, is very exciting," Schramm says. "It's worth pursuing, but it's only as good as its checks and balances."

McEwan believes a multidisciplinary group should be involved in the training and evaluation of a developing AI model. "For example, a neuroscientist may not be good at programming, but he or she would understand the neuroscience of emotion," she says. "When those groups can collaborate, it could lead to something."

REALISTIC EXPECTATIONS

"There's such a wide range of human factors in that enclosed small space," McEwan says. "How do you build something that can read through all the cultural norms? At a general level, how do you take something very subjective, like passenger comfort, and make it more objective, try to quantify it a little? It is possible to do it. It requires a lot of data and you have to make some links that are not as tight as you may want, but I think it's getting there."

As Schramm points out, there can be unexpected sensory crossovers. During a cabin refresh satisfaction test that Teague conducted a few years back, for example, the studio duplicated the whole of the flying experience, including meal service, but was only trying to measure the effect of elements like materials and lighting – something akin to what Dzebic's AI would measure.

"In the second pass, when the passengers were sitting in the refreshed space with exactly the same seat frames and padding – just different colors, materials, finishes and better lighting – they all said the food was better. It was exactly the same food. There was no difference at all. There wasn't even different packaging," Schramm says. "You have to monitor all your variables very carefully so that you understand the result. In the research arena and a lab setting we try to carefully control those variables so The new GuideU 1000 Series

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"It gives you a way to compare things that are potentially years apart"

that we can see what is actually happening in the data to make those conclusions."

SEAS OF BEIGE

On the whole, AI-generated ratings of a space could be useful. "It's something else to talk about. It's something else to consider when you go into these spaces. In that sense, it is valuable," Schramm says. "If you use it early in the design phase, it gives you a baseline. It gives you a way to compare things that are potentially years apart, which is a great thing with the 10-year-plus program to bring a new aircraft to market. That baseline is useful as a measurement tool, to say that we believe that a space is good, and we will continue to iterate on what good means, and what the standard for good is. That baseline is right in the sweet spot, I think."

Schramm has one concern about an over-reliance on AI: "My first impulse is the hope that it doesn't become institutionalized. I would hope that some of the training data sets, as they continue to be used to test these algorithms, will involve things that are genuinely beautiful and inspiring, that it doesn't become just a lowest common denominator.

"We have to acknowledge

our own bias," he adds. "We're designers. If a computer can do it better, then..."



PATRICK BAUDIS, VICE PRESIDENT AND HEAD OF MARKETING AT BOMBARDIER COMMERCIAL AIRCRAFT, EXPLAINS THE IMPORTANCE OF THE PASSENGER PERCEPTION OF CABIN DESIGN

Read an exclusive interview with Patrick, overleaf

It's amazing how the human body subconsciously responds to design. You can feel more comfortable or more at ease in an environment just because of its design. For example, we came up with new cabin lighting schemes and new ways of styling the overhead bins for the Atmosphère cabin on the CRJ, ideas which were then taken on board by Zodiac Aerospace, which then added magic in terms of functionality and technology. This is more than just an attractive cabin: I think it makes the people feel more comfortable, and the passenger experience is all about making people feel comfortable. Air travel is still stressful for people

traveling these days, and the more they relax and feel good when they come on board, the better.

An interesting point with the CSeries is that it is really seen as offering another level of comfort by the airline industry and by owner operators. Some operators have surveyed passengers and found that they rate the CSeries highly in all metrics, especially in terms of comfort – even when seat pitch is reduced. This is due to different reasons such as the large cabin width, the brightness of the cabin, the number of windows, etc. The cabin design makes them feel they have more comfort, even if seat pitch is reduced by an inch. However, an interesting way to show how cabin design, lighting, physical comfort and audience perception influence human body is that when people are in a good mood on a CSeries – and this is what operator surveys have shown – they think the food tastes better.

It's the same food, , but they think the food is better just because they feel more comfortable on a CSeries.

It's amazing the psychological effect that can be achieved using shapes and lights. This psychological effect on the body makes passengers feel relaxed, and therefore they better appreciate everything experienced in flight.

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There's surely a better way of doing things"

IN TERMS OF CABIN DESIGN, SMALLER DOES NOT MEAN SIMPLER, AS SHOWN WITH BOMBARDIER'S REGIONAL AIRCRAFT. PATRICK BAUDIS SHARES HIS THOUGHTS ON THE REGIONAL SECTOR AND THE WIDER AEROSPACE INDUSTRY

Interview by Adam Gavine

he regional aircraft experience may be a more intimate affair than that on board wide-bodies, but that doesn't mean it has to be a weak point in the end-to-end travel ribbon. Certainly Bombardier is striving to evolve the regional flying experience, gaining understanding of evolving needs by surveying airlines and holding discussions with the flying public and travel associations. The result is exciting developments in the Bombardier aircraft range, including the CRJ, Q400 and C Series. We spoke to Patrick Baudis, vice president and head of marketing at Bombardier Commercial Aircraft, to discuss cabin developments at the company, and the main trends the aviation industry needs to pay attention to.

A MAJOR NEW DEVELOPMENT AT BOMBARDIER IS THE ATMOSPHÈRE CABIN DESIGN FOR THE CRJ RANGE. WHAT WAS THE THINKING BEHIND IT? Airlines are striving more and more for a seamless experience when passengers move from a long-haul flight to a regional aircraft for the last leg of their journey.

So we wanted to find ways to give airlines the ability to reproduce their brand colors, their touch and feel, in a regional aircraft so that passengers feel they are having



the same travel experience as they did in long haul. We worked on this with airlines, bringing in features such as enhanced mood lighting. We're harmonized with what you see on wide-bodies, but applied to the regional space.

DOES BOMBARDIER HANDLE ALL DESIGN WORK IN-HOUSE?

We have design teams, including a team in our marketing department. They work on form and design, and also look at trends such as furniture and cars, to see what kinds of forms people want, and which are now perceived as being more comfortable, and why. For Atmosphère we also worked with Zodiac. We set targets in terms of what we wanted to achieve with the cabin, including look, feel and dimensions, and they offered expertise in detail design.

WHAT IS THE MAIN ADVANCE WITH ATMOSPHÈRE OVER NEXTGEN? The NextGen CRJ entrance was a bit crowded, with passengers having to walk around the galley, through business class and then into economy in a kind of a zigzag. Airlines also wanted an improved lavatory design.

So we have opened up and cleaned up the whole entrance area. We rounded the shapes of all the monuments at the entrance so that there are no choke points. Now when you enter the CRJ there is a flow, and for PRMs [passengers with reduced mobility] it is a plus.

Atmosphère is also a very smart design in terms of galley space. We reduced the size of the galley without losing trolley capacity. The main cabin is also accessed in more of a straight path and the redesign gave us space to enlarge the lav. We increased space by 60%, making it PRM-compatible.

For PRMs, going to small lavs on aircraft can raise a question of dignity, as they often have to ask crew to help them access the space. The size of the lav in the Atmosphère cabin eliminates this issue because even wheelchair users can move themselves into the



ATMOSPHÈRE BRINGS A FEELING OF LIGHT AND SPACE INTO THE CRJ EXPERIENCE. AMERICAN AIRLINES IS CONVINCED OF ITS BENEFITS AND ON MAY 3 SIGNED A FIRM ORDER FOR 15 NEW CRJ900 JETS WITH OPTIONS ON AN ADDITIONAL 15

LESSOR CONSIDERATIONS

Leasing company customers favor a neutral cabin design that can be easily and quickly switched between customers. What are Baudis's thoughts?

"I think the industry has made a lot of progress in terms of repitching cabins and reworking the environment. Operators are still constrained by fixed equipment such as the lavs and galleys and they probably won't want to change that because it's heavy stuff and it's a lot of money if you want to start moving things around. From the leasing company perspective, I think the industry is moving a lot in terms of technology and the ability to repitch depending on customer needs. It still requires work and I know the leasing companies want a magic solution where they simply take seats out and repitch them, but there are factors such as wiring and air-conditioning.

"But now with the new cabins we are becoming cleverer. For example, with

Atmosphère for the CRJ we worked with Zodiac on much easier ways to improve the relocation of PSUs. There are solutions that facilitate rearranging the cabin when a lessor wants to flip the aircraft from one airline to another.

"Are we at the point where we can do that? Probably not, and that's across the industry, but we're getting there. So interior OEMs need to be extremely clever with plugand-play solutions."


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INTERVIEW

THE SPACIOUS AND EASY TO OPERATE BINS ARE THE RESULT OF A SUCCESSFUL PARTNERSHIP BETWEEN BOMBARDIER AND ZODIAC AEROSPACE



"PRM accessibility is still an area where the aviation industry really has to evolve"

lav, close the door and be fully autonomous there. This capability already exists for wide-body and singleaisle aircraft such as the C Series, but this is a first in a regional airplane.

THE PRM SECTOR IS A CRITICAL CONSIDERATION IN TODAY'S CABIN DESIGNS. WHAT ARE YOUR THOUGHTS?

We believe that moving forward we're going to have more and more PRMs flying. People tend to think of passengers with reduced mobility as being handicapped people, and indeed we have very neat and well-designed solutions for them. However, in my mind PRMs also include parents with kids, and elderly people. The reworked entrance with the straight line down the aisle makes the cabin easier to access for wheelchair users, and also for people with roller bags.

A lot of work has been done with PRM accessibility, but it is still an area where the aviation industry really has to evolve. If demand does not come through regulations, it will come from the customers and airlines themselves.

The average population in many parts of the world is getting older, and this is an area that has not been fully explored. It can be simple things like, if you cannot move from your seat, how can you reach the attendant button when you need help? So how can we be clever from our side, having buttons better located and similar kinds of things?

I think if there's a new focus that needs to take place in the aviation industry then its mainly on the accessibility front. A lot of things have been done in the industry in terms of improving seat shapes for comfort and knee clearance, bag capacity, connectivity – yet you still have people that have difficulty with accessibility on board. And I think the industry can do way more than has been the case so far.

CAN THE ATMOSPHÈRE CABIN ALSO MEET STOWAGE EXPECTATIONS?

Fitting baggage into bins can be a passenger stress point, but with new technology and new materials, there are always ways to improve stowage, and that's what we did with Atmosphère. So we now have new larger bins in the premium section that can accommodate 50% more bags. And they can be loaded wheels-first, which is a big plus point for passengers and important for airline satisfaction. In the back of the cabin in economy we have enlarged the bins to have 40% more volume, which is good for coats and bags. It smooths out the travel experience for passengers.

ARE THE BINS A PROPRIETARY BOMBARDIER DESIGN?

With the bins we had an idea of how to improve the design of the handle, and Zodiac actually came up with an even better idea. With the new design, the handle is fitted

SALES TOOLS

Baudis and his team were demonstrating the benefits of Atmosphère at Aircraft Interiors Expo, using a digital setup developed with a European supplier, rather than a physical mock-up. However, unlike many companies that were offering virtual tours via VR headsets, Bombardier had a space roughly the size of a CRJ cabin cross section, which was lined with video screens. Cabin designs could be loaded and shown in the space, enabling people to virtually explore aircraft. "I like this concept because not a lot of people want to have the goggles. The CEO of an airline doesn't want to look silly with goggles and feel dizzy. I'm even thinking of using these kinds of technologies to define aircraft specifications and seat colors, etc with customers in the future and show them what the cabin will look like," says Baudis.

"With this kind of technology we could very quickly show the customer what their cabin could look like. It's a cool technology."

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to the bottom of the bin as opposed to on the door, so no part of the handle encroaches into the bin itself, which makes loading really easy.

It's the same with the bin hinges. In the previous design they protruded into the bin and took up stowage space. They are now integrated into the frame of the bin, maximizing space.

Bin space can always be increased by mounting them lower in the cabin, but we didn't want that – we wanted to maintain a nice appearance. So we gave Zodiac a list of our needs, required dimensions and choke-point issues, and then they worked their magic.

ARE YOU NOTICING ANY OTHER PASSENGER TRENDS?

IFE is providing interesting angles. On single aisles like the C Series, operators like to have IFE systems such as seatback displays or at least a server on board, which passengers can use to stream or download content. When it comes to regional aircraft, because of the short nature of the flights we see airlines moving to much lighter solutions – and that's what we've implemented.

Moving forward with regional aircraft we'll have more servers on board for streaming because we see airlines moving toward this technology, with some even offering downloadable content before flights. During online check-in, customers can download magazines, movies or TV series and then watch them during the flight on their own electronic devices.

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BELOW: THE ATMOSPHÈRE LAV IS PLEASANT FOR ALL, BUT A REAL BENEFIT TO PRM USERS

This is something we have implemented in the Atmosphère



cabin. We can also offer two kinds of solutions, with streaming on board for passengers to use their own devices, or integrated connectivity such as 2Ku with in-seat solutions. We also offer in-seat power options.

WHAT CAN WE EXPECT FROM BOMBARDIER IN THE COMING YEARS?

I'd like to apply parts of the Atmosphère concept across more of the Bombardier range. We see a lot of appeal for Bombardier platforms and design, and if that success continues with this new design and philosophy, I'd love to develop it on our other platforms.

I also think that aircraft interior industry innovations are really going to be driven by the PRM sector. I really hope so. There's surely a better way of doing things.



ABOUT PATRICK

Patrick Baudis joined Bombardier Commercial Aircraft as vice president and head of marketing in January 2016, and is based at Bombardier's Montreal headquarters.

He is responsible for all marketing activities for Bombardier's commercial range (C Series, CRJ Series and Q400 turboprops), including definition of requirements for product development, analytical support for sales campaigns, positioning and promotion of Bombardier products, branding and digital strategy.

He has wide-ranging industry experience, having worked at Airbus,

E

recently held

the position of vice president of marketing for the Americas, where he was instrumental in providing marketing direction, influencing product development and maximizing sales success.

With over 25 years of strategic marketing expertise, Patrick's successful career began at Mitra Aviation, a consulting company he joined right after completing a master's degree in aeronautical engineering at l'École Nationale de l'Aviation Civile-ENAC, in Toulouse, France.



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s a new generation of space-efficient slimline seats comes onto the market, the flow-on effect for the refurbished aftermarket will be substantial. While not all airlines will refit existing fleets, it seems clear that large numbers of shipsets of lightly (or not so lightly) loved seats will start to become available.

But what's the market for these refurbished, recertified seats? Why would an airline pick off-the-shelf seating from a warehouse, perhaps rebrand it, and ship it around the world? What about items that many people think of as ultra-customized, such as IFE, in-seat power, and even business or first class flatbed products?

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GEVEN'S ESSENZA IS BEING

HUB AIRLINES

USED ACROSS THE AIRBUS A320

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The primary market for refurbished seats, according to Thomas Bulirsch, chief executive officer of aviationscouts, is either startup airlines or smaller market players, plus the engineering companies or maintenance, repair and overhaul operators that run cabin modification projects and source the interiors for those aircraft. Leasing companies, too, refurbish their existing interiors to reduce turnaround time or change configurations for passenger experience reasons.

Cost and speed are both factors, as Tim Garvin, vice president of sales at Regent Aerospace, highlights. "Refurbished seats are mostly purchased by lessors either returning or delivering an aircraft and by airlines that either have a short-term requirement, or cannot afford the cost of new seats, or wait 12+ months for them. Time and money are the primary advantages, but we are also able to incorporate customer-specific add-ons and customized features."

The market for refurbished seats is largely economy class, which highlights the overall sense of commoditization found in the industry, and with larger airline group-level purchases of seating (as exemplified in the Lufthansa Group's selection of Geven's Essenza slimline model for its three hub airlines: Austrian, Lufthansa and Swiss) this interchangeability is likely to hit the aftermarket in time.



"That sort of figure will make even the most lavish of airline managers sit up and notice"



HALF PRICE AND FAST – AN ATTRACTIVE OPTION

"Typically we see savings of 30-40% for refurbished versus new economy seats, and 50% plus for business and first class seating," Regent's Garvin says. That sort of figure is bound to make even the most lavish of airline managers sit up and notice.

"Usually you save between 40 and 60% compared with a new seat, depending on the condition required," aviationscouts' Bulirsch says, noting that the "biggest advantage is the quick availability and the sourcing prices with aviationgate.com," – the online portal to aviationscouts' stock.

"It is the same with the lead time. Seats in an 'as removed' condition are available off the shelf – we carry up to 15,000 passenger seats in our warehouse in Lichtenfels, Germany," Bulirsch says. In addition, the





aviationgate portal contains more than 100 seat models covering over 450 shipsets stored at client and partner sites worldwide.

Regent, meanwhile, offers more than 300 shipsets of inventory, and both companies are only too pleased to add value to their services with a range of refurbishment options in addition to 'as removed' stock. Newer, smaller airlines, many of which do not have the internal MRO capacity to do the servicing themselves, are clearly a key market for this work.

A 'clean and tag' level of servicing takes two to four weeks and involves deep cleaning of the seat structures and specific components, plus checks and adjustments according to the component maintenance manual.

AVIATIONSCOUTS HAS 3,500M² OF STORAGE SPACE, WITH PLANS TO EXPAND CAPACITY UP TO 9,500M² BY RENTING MORE LOCAL WAREHOUSES

"Newer, smaller airlines are clearly a key market for this work"

The weird and wonderful world of seats

Being a business that interacts – even at third hand – with passengers, aftermarket seat servicing often has its quirks and foibles, just as travelers do. Suppliers find their share of baffling items when servicing products.

Aviationscouts' warehouse team, for example, all have little collections of airsickness bags, coins, notes, and so on: the sort of airline ephemera with which many will be familiar.

The 'who on earth does that to an airline seat?' question is also occasionally asked, arms

raised to the sky. "Definitely the most unusual I saw was damage that looked like somebody had tried to bite into a tray table," Bulirsch says.

But the strangest request for an aftermarket product, Bulirsch says, came from a Swiss customer who telephoned aviationscouts on a Friday afternoon wanting to order a wedding present for a friend in the Czech Republic who was a pilot. "We finally delivered a triple economy class seat packed nicely with a huge bow on it," Bulirsch laughs. "I'm not kidding!"

A full overhaul takes four to six weeks depending on spaceport availability, and adds the option to replace cushions and covers with new parts, also enabling some substantial design changes under either the component maintenance manual or a minor modification program.

> In the middle is IRAN (inspect, replace as necessary), whereby the seat gets the same cleaning process as with a clean and tag refurb, but including replacement of broken components with new spares. Aviationscouts generally delivers seats

certified under EASA Form 1, FAA 8130-3 or a dual release certificate, depending on the location of the Part 145 station where the work takes place.

PASSENGER BELLS AND WHISTLES ARE PART OF THE GAME

With relatively few suppliers in the in-flight entertainment business, monitors – and the backbones that supply them – are a big part of the aftermarket ecosystem, both in terms of being pulled off seats and being put back on during the seating refurbishment process.

"In most cases the IFE gets removed from the seats and sold separately," says

Lufthansa Technik's new Lease Your Cabin scheme is intended as a means for fast, easy cabin modification from a single source. The initial offering of the scheme is aircraft seat leasing, a service for airlines who want to swiftly update their cabins (with more luxurious or lighter-weight seat models for example), fit out an aircraft on short-term lease, or alter seating configurations. The scheme is offered as a single-payment service for a change in cabin layout, including engineering, seat adaptation and installation, alongside a monthly leasing payment for the seats themselves. LHT will also organize the installation of the seats at any location in its network and provide all the necessary material. The services also include engineering and the necessary documentation, including all regulatory approvals (EASA Part 21J). LHT is working with seat manufacturer ZIM Flugsitz as the supplier of lightweight economy seats and is aiming to offer lead times of three months, with the actual modifications carried out within two days on each aircraft, perhaps as part of a minor maintenance check. Lufthansa Technik can also store the original cabin interior, which is useful for operators who need to restore the cabin to its contractually agreed original state at the end of a lease term.

By the end of 2018, LHT intends to offer the leasing product

for other cabin elements such as galleys and lavatories,

partitions and monuments, and to extend it to

further travel classes.

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Bulirsch. "With our partners we usually integrate existing IFE in other seat models and match the onboard system of the customer. We currently have 15 shipsets of different IFE systems in stock that we can choose from. Sometimes we feel as if we have a big shopping mall, where our customers virtually walk around and put things in their basket."

For airlines looking to differentiate themselves with a positive passenger experience, adding USB and AC 110V power sockets is definitely an option. "In-seat power is an item than can easily be installed on existing seats if it stays within the weight limitations. We can choose from used systems or new systems that can be integrated," Bulirsch says.

With some of the newer secondhand seats on the market, the perennial problem of refurbished seats needing clunky in-flight entertainment boxes is less likely to bite into passengers' legroom – and ankles.

And largely, the newer the seat, the more likely it is to be able to take the extra weight of IFE and in-seat power. While few of the current generation of aftermarket seats contain the flexible modularity of newly built

"Certification authorities have the same requirements for refurbished seats as for new"

ABOVE LEFT AND BOTTOM RIGHT: QUEBEC-BASED MRO AVIANOR IS HANDLING SEAT REFURBISHMENT WORK FROM MANY CLIENTS



products, there is still a fair amount of flexibility in certification terms.

REFURBISHMENT AND CERTIFICATION GO HAND IN HAND

"Generally speaking," Regent's Garvin says, the level of refurbishment of existing seats "depends on the arrangement with the previous operator. However, as a practice Regent does not sell seats with the previous operators' covers. Regent's specialty is providing seats in Zerotime Refurbished condition with all-new plastics, arm caps, cushions and dress covers.

"One of Regent's strengths is our in-house capability to design, manufacture and certify," Garvin explains, noting that airlines will often want minor – or even major – modifications. At that point, certification authorities have the same requirements as for

new seats: "For minor modifications, such as change of plastics and dress covers, we work within the original technical standard order certification. If a major modification is required, such as structural or leg modifications, we may need to test and recertify the seat under supplementary type certificate approval."

While Regent doesn't see significant changes to how the market works with newer, lighter seats such as the ones now beginning to arrive for secondhand distribution, aviationscouts does: "Especially on the 16g and HIC requirements," says Bulirsch. "Where seat repair shops had a lot of freedom



GOOD REASONS

Robert Pearson (pictured right), senior interiors manager at ACC, a company that supplies and refurbishes aircraft seats, gives his view: "There are a number of advantages in purchasing aftermarket seats, such as improved lead times – it takes between six and eight weeks to refurbish a shipset, as opposed to the six to 18 months it can take to fulfill a new seats order. This makes them better suited to a fast-paced aviation market, allowing airlines to reconfigure their aircraft and take last-minute aircraft deliveries to meet capacity and demand.

"You also benefit from far greater choice, with different seat OEMs, models, seat cover designs and IFE options available, and, cosmetically, refurbished seats look as good as new. "Additionally, if a certain model has been on the market for a good length of time, there will typically be several stockists offering spares, and a higher proportion of 145-approved repair stations capable of servicing that seat model. While new seats tend to be covered by an OEM warranty, there will be a limited number of companies, in a limited number of locations capable of making repairs.

"Then, of course, there is the subject of cost – depending on the model and availability, aftermarket seats can usually be purchased for less than 50% of the price you would pay for new seats. Their affordability makes them ideal for less well-established airlines, allowing them to operate with the same seat models and provide a similar passenger experience to the top-tier operators."

Doing business - and first



A quick review of any aftermarket warehouse's website reveals that the current generation of second-hand seats are remarkably interchangeable, coming as they do prior to the age of branded cabins – even in business.

Above the cradle sleeper sort of standard, of which there are many, aviationgate's list includes a lot of fairly obvious Lufthansa Recaro 6510 angled lie-flat seats, some ex-KLM World business class B/E Aerospace Minipod seats that are also angled lie-flat, and some Contour fully flat seats formerly flying with SAS.

"We see a stronger demand for economy class for wide-body aircraft than for first class or business class," aviationscouts' CEO Thomas Bulirsch says. "The reason is that economy class is a lot less customized, and easier to replace.

"While the short-haul market is creating full economy class requirements, long haul

is also more focused on the economy class part of the aircraft. Business class is a lot more customized and somehow more difficult to remarket."

The higher end of the premium market, too, is in some ways seen as a one-time-only product. "There might be IP issues," Bulirsch notes, highlighting that "we had cases in the past where we received customer limitations or were not allowed to sell seats back into the aviation market."

First class, meanwhile, is "really the personality of an airline and has a unique design in most cases. I would clearly see it as a first-user item."

From Regent Aerospace's perspective, vice president of sales Tim Garvin says the logistical problems of refurbishing premium products are "really no different from economy. It's just that more work is needed to fit the new operators' needs."

to modify seats, or replace or repair parts in a 9*g* environment, the rules for 16*g* seats are a lot stricter. This reduces the flexibility of operators a lot."

Some of that flexibility in certification parameters has been built into seats, especially newer generations, but older seats are often adorned with placards containing service bulletins showing changes that the original equipment manufacturer, operator and/or service department have made, whether to improve seat comfort, add features or for other reasons. Using the information on the placard to refer to the engineering order and required documentation, the seat can be recertified after refurbishment in what is a relatively simple process.

Overall, seat life can stretch into decades, assuming parts are available – and for popular seat models, they



REGENT SEES A STRONG MARKET FOR ALL CLASSES OF SEATING, FOR AIRLINES (BELOW), CHARTER CARRIERS AND EVEN VIP AIRCRAFT





generally are. Typically manufacturers will support seats for over 10 years, but this is dependent on the overall number of seats sold during the production cycle. As a general rule, if a seat sold relatively few examples, it will be officially supported by the original manufacturer for a shorter time.

"We exclusively use original spare parts on our projects," says Bulirsch. "We have a good relationship with many original equipment manufacturers, where we source directly. If a shorter lead time is required, we also go on the open market. There are also situations where Part 145 partners remove parts from spare seats to install them again as a spare part.

"In most cases," Bulirsch notes, "sourcing older spare parts can get really expensive and a long lead time is expected. In such cases we always try to cannibalize spare seats."

Tray tables, hydrolocks, IFE, arm caps, cushions and covers are all strong candidates for reuse. But a full recycling – in this case, upcycling – option is available too, particularly as seats and components approach their end of life.

"A local partner is currently developing an upcycling initiative that is supported by crowdfunding," Bulirsch says. "The goal of the initiative is to convert used passenger seats into office chairs, or lounge chairs for waiting areas. Or to use ex-airline cushions, covers or life vests to create lifestyle items. These products are targeting offices, waiting areas – or simply aircraft enthusiasts like us." @



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Stow items - and prevent jetlag

The inner surface of an in-arm stowage compartment presents a rare section of unused real estate in the ever-optimized business class seat. Anthony Hudson (pictured below), a designer at Acumen Design Associates, explores how this surface could be used to better the passenger experience.

"There has been extensive research into how the body's circadian rhythm can be influenced by the use of artificially colored light. When certain wavelengths of light interact with photopigment proteins, the brain sends signals to the body to stop producing melatonin, the hormone that promotes sleep. Thus, lighting companies such as Philips have invested large sums in the research and development of applications in both medical and domestic settings.

"Ambient light manipulation has also now been introduced into aircraft cabins – the Dreamliner being a case in point. However, this process is yet to be tailored to the personal preferences of each passenger.

"The time each passenger will spend at a destination, as well as their work schedule, will vary a lot. A passenger may not want to optimize their body clock to the destination time zone - something that the uniform ambient lighting of an entire cabin is intended to do. To be able to better influence which time zone their circadian rhythm is set to would be hugely beneficial in preventing the dreaded jetlag.

"So how does this relate to optimizing the use of stowage space? Well, the aforementioned real estate available in the in-arm stowage represents an excellent location to place a light with a large surface area - something that is necessary when trying to recreate the conditions of natural light.

"The position of the armrest is very well suited to providing this wash of light while in bed mode. With the passenger's personal settings applied in the IFE, the armrest could automatically open at the required time to either provide the wavelengths as a sleep aid or to begin the process of slowly waking up the body just as the light of the sun would."

WITH THE FIRST CLASS CABINS ON ETIHAD'S A380s HAVING JUST ONE AISLE, THERE WAS SPACE TO MAKE THE APARTMENTS 39ET² EACH THIS MEANS THERE IS PLENTY OF SPACE FOR IN-SUITE STOWAGE INCLUDING UNDER-BED STOWAGE ENCLOSED SHOE STOWAGE A FULL-LENGTH WARDROBE A MINIBAR A PERSONAL DRAWER HEADPHONE STOWAGE, A VANITY LINIT FOR AMENITIES TWO SPACES FOR DOCUMENTS AND A LARGE PIVOTING STOWAGE FOR BEDDING







LOSE TO HANI

Anthony Harcup, associate director at Acumen, has found that the over-55s are rediscovering their love of travel – great news for society and the airlines industry, but a consideration for cabin designers as it is harder for older people to manipulate luggage into overhead bins.

This may drive a rethink in the industry to create more personalized and localized stowage

"Other things are changing too. Whereas 20 years ago travelers needed access to little more than a book during a flight, now laptops, tablets and smartphones all need to be easily accessible, along with the energy to power them. Dedicated laptop stowage would be popular with business travelers and perhaps there should be a rethink of the tray table for short-haul flights. Passengers would most likely welcome a modular tray table that could be used to stow a smartphone or tablet at a helpful viewing angle, while still providing flat space for a tray when the meal arrives."

ENVISIONS IN-ARM STOWAGES AS WELL AS A MEANS TO ENHANCE PASSENGER WELL-BEING

Using every inch

The solution to in-seat stowage shortages could be hidden right below your feet. Team DAELead, a group of students from the University of Hong Kong, entered the AirbusFly Your Ideas 2017 global student competition with an idea for installing a small flip-up stowage compartment below the footspace in an economy seat.

The Private Stowage Compartment concept, which won the competition, takes advantage of the existing but unused space in-between the seat tracks and between the cross-beams to create a space for stowing personal items.

Compact but powerful pushrods assist when opening the compartment. The team is still exploring the different types of rods available, so that the prototype design can be fine-tuned.

> BELOW: WITH THE NEWFACE CONCEPT, THE SOLUTION TO ACHIEVING A MORE SPACIOUS CABIN FEEL WITHOUT SACRIFICING STOWAGE LIES UNDER THE SEATS



BAGGAGE BELOW, SPACE ABOVE

The newFACE narrow-body concept for 2030 uses a twin-aisle configuration and 2+2+2 seat layout, meaning that every seat is desirable, being either window or aisle. Even better, the overhead bins have been removed to create a spacious and uncluttered cabin architecture.

So where does Almadesign, the creator of the concept (together with Inegi, SET and Embraer), intend passengers to stow their belongings?

André Castro, design manager at the studio, states, "A flip-up seat concept enables the storage of a predefined maximum size of hand luggage under the seat pan, which allows for faster ingress by removing 'aisle interference' while boarding – passengers do not need to stand in the aisle to store luggage overhead." The concept uses a raised double cabin floor, which provides extra length for luggage to fit under the seat pan. The height and weight is compensated for by the removal of the overhead bins. Meanwhile the air and lighting systems are integrated into the central upper console. The system enables each passenger's space to be customized, so that items can be stowed more quickly and easily. The seat numbers indicate each passenger's storage space, and passengers can always keep their belongings close.

"It is expected that such a system would improve boarding and deboarding times as well as reducing queuing at the gates, as passengers will not feel so eager to board first in order to find available stowage space," adds Castro.



THE PRIVATE STOWAGE COMPARTMENT HELPS MAKE USE OF EVERY AVAILABLE INCH OF POTENTIAL STOWAGE SPACE. SHU WAI LEUNG (BELOW) FROM THE UNIVERSITY OF HONG KONG WAS ONE OF THE FOUR TEAM MEMBERS



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TECHNOLOGY COULD HOLD THE ANSWER

Cristian Sutter (below), British Airways' cabin development lead for the A350 and B787 programs, has a few ideas about the importance of in-seat stowage.

"Current in-seat stowage issues are closely linked with addressing passengers' needs for bringing more 'must-have' travel items, the number of which has increased over the last decade," he says.

"In the personal entertainment area alone, smartphones, tablets, personal headphones, e-readers, laptops, power banks, battery chargers and data cables represent a large number of gadgets that need storage and in-seat power – and this is on top of other common travel companion items such as neck pillows.

"In-seat stowage is competing for a slice of seat real estate," Sutter continues, "with ever-larger IFE screens, tablet holders, in-seat power sockets, etc, regardless of the travel class. The application of technology such as VR, AR and active sound control (for noise canceling or sound creation) will free-up in-seat space by allowing IFE screens and headphones to disappear, and will also reduce the need for passengers to travel with space- and power-hungry personal entertainment devices.

"The passengers' need to carry personal items will always prevail, but having said that, more integrated in-seat technology will cater for most passengers' entertainment requirements, helping them to de-clutter their travel experience and also allocate in-seat stowage to more efficient uses," says Sutter.

Flying today

"For premium class seating, stowage is a requirement of the brief as personal space is seen as paramount to the onboard experience," states Martin Darbyshire, CEO of Tangerine. "However, in economy class, it isn't – but that doesn't mean that airlines don't care about it, because they do. At Tangerine, we are increasingly being asked to look at enhancing the offer in economy, particularly BYOD [bring your own device] storage.

"For Cathay Pacific's new A350 economy class seat, we were able to transform the standard seatback to make something unique for the airline," continues Darbyshire. "Nicknamed the 'back pack', this is a totally integrated solution that combines a shelf and storage area to provide space to store a tablet or phone, as well as additional stowage for small personal belongings and a drinks holder. The back pack is made in thermoplastic with a bespoke gray-green color.

"In the near future, we envisage greater customization of the economy class seat, with features such as adaptable storage compartments, phone charging storage pockets, and pairing of personal devices across different screens. These are all simple changes that will greatly enhance the passenger experience – changes that are nearer than you think!"

Clean up

"Designers spend a lot of time injecting the wow factor into the seat environment," says Daniel Baron, owner of LIFT Strategic Design, a Tokyo-based consultancy. Customers say "wow", when they sit down and then, upon glancing into a crevice filled with cracker crumbs, the "wow" quickly becomes "yuck". With pressure on turnaround times and endless cost cutting, the notion of actually cleaning every crevice may be unrealistic for some airlines. So one of the most challenging issues with seat stowage, particularly for pockets or nook-shaped spaces, is how to reduce or eliminate the cleaning burden.

"In business class seats, internal illumination of the spaces would, in addition to being a design feature, help cleaners spot issues more easily. That implies installation in the cabin of a switch to turn on all seat lights at once – a maintenance-focused switch to aid cabin cleaners. "In economy class, I would advocate transforming perception of the airsick bag by flipping the primary function from vomit receptacle to 'experience enhancing refuse pouch', attached to the seatback or literature pocket. The message then becomes 'This nice bag, not the literature pocket, is your primary outlet for rubbish'. Airlines are already spending money on purchasing bags, so why not tweak the message to reduce the volume of litter in the pockets?"

STOW STUFF, MAKE MONEY

As air travel evolves, in-seat stowage solutions will change as well, mainly driven by new airline business models, new interior cabin configurations and changing passenger needs, and enabled by the certification of new technology and materials, says Juliane Trummer (right), VP of strategy and design at Mormedi, a Madrid-based design consultancy.

"Nowadays, many passengers, especially business travelers, prefer to bring their belongings into the cabin, even on long-haul flights, in order to save time at the destination airport. The need for cabin stowage space is increasing, but specific needs associated with stowage are also polarizing, depending on the routes, cabin class and passenger profiles.

"Given that airlines nowadays depend on ancillary revenues for making profit, they might seize the opportunity to offer different pay-per-use options for in-seat and overhead bin stowage. Or airlines might turn a part of in-seat stowage into a minibar point of sale in order to offer drinks, snacks or duty free. Exchangeable textile, clip-on solutions could be the answer for a more diverse set of in-seat stowage needs. With digitization and BYOD [bring your own device] becoming the norm, charging and display solutions for digital devices are becoming highly relevant.

"Furthermore, lightweight and thinner seat solutions are making space available that could potentially be used for extra storage. Stowage might be equipped with technology that will ensure that passengers belongings are kept safe and private and won't be left behind." JULIANA TRUMMER'S STUDIO, MORMEDI, HELPED DEVELOP IBERIA'S LONG-HAUL CABINS. SEE OUR WEBSITE FOR THE STORY



LYING ON A FORTUNE

The team at JPA Design has devised an economy class headrest concept that is highly customizable and which can be upgraded and downgraded for different airline and passenger needs. The headrest consists of three parts: a rear housing that provides useful functionality such as security storage, headphone sockets and USB charging, and an 'always on' lightweight fiber-optic reading light that illuminates only when it's revealed.

Keep it simple

Research undertaken by BMW Group subsidiary Designworks shows a changing trend regarding the items people now bring on board that will require stowage space, such as water bottles, food and devices, and the way people interact with their items during a flight has also changed. The challenge airlines are facing with stowage is that the requirements are evolving faster than ever, with the question arising as to whether stowage as we know it today still fit for purpose. The studio's take on stowage is that it does not need to be smart: it needs to be simple, obvious and user-friendly. People want simplicity, which can be created through design. "Designworks recognizes that if there is an opportunity for someone to lose something in a stowage space, then the design has failed," says Johannes Lampela, director of design at Designworks' LA studio. "Reducing the risk for loss provides support to the maintenance element of the airline operations chain, which in turn provides swifter and more efficient aircraft turnaround, therein supporting customer satisfaction by minimizing flight delays."

The solution, says the studio, is to provide easily accessible, dedicated 'landing pads' – deployable or fixed horizontal surfaces on which to place items as opposed to stowing items inside generic compartments – which could enhance the user experience. "In addition to the physical stowage

compartment," adds Lampela, "the studio says that how and when this space is accessed is also something that needs to be considered. People put a high amount of value on ensuring that access to stowage is guaranteed, which is often reflected in a willingness to pay for a service. The levels of anxiety linked to whether or not their items can be stowed is an important factor in the customer journey. This should be addressed, perhaps by being able to pre-confirm stowage access or providing a service to handle this for you."



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RECARO BL3710

Recaro's new BL3710 modular economy class seat for short- and medium-haul routes on the B737 or A320 families was launched in April 2018 and has already been delivered to a – currently undisclosed – "large low-cost carrier".

This lightweight seat model has numerous equipment options, including a tablet holder and various comfort features. The latter include a neck support that forms part of the six-way adjustable headrest and can be adjusted to meet the needs of passengers of a wide range of heights.

The high literature pocket, positioned above the traytable, creates more leg space, and can be supplemented with an additional mesh pocket to hold personal items such as a cell phones or passports. Passengers can charge their mobile devices via the integrated USB power supply and secure them in the tablet holder. A nice feature is that both the tray table and the high literature pocket can be used when the tablet holder is in use. Further optional features that can be integrated into the seat include coat hooks, cupholders, small item stowage pockets and advertisement frames.

Molon Labe Seating may be best known for its innovative Side-Slip seat, which was revealed in 2012 with an unusual design that allows the aisle seat to be slipped over the middle seat during boarding, doubling the width of the aircraft aisle to speed up proceedings. However, the past year has seen the company working on more conventional designs.

Molon Labe has replaced the telescopic frame mechanism of the Side-Slip seat with a fixed chassis that offers the width and personal space benefits of the Side-Slip seat (the middle seat is 3in wider) in a more familiar form: the Stagger Seat.

Two variants are in the final stages of engineering: the S1 Ultralight for short-haul operations, weighing less than 22 lb (10kg) per pax, and the S2 long-haul version. The latter, created in partnership with BMW Designworks and Panasonic Avionics, is predicted to be of interest to operators of the A321LR and B737Max, which can fly up to eight hours with more than 200 passengers. Unlike wide-body designs, while pitch can be varied in the economy sections of narrow-body aircraft, width is dictated by the 3-3 layout and minimum aisle width.

However, the S2 is designed to give a bit more comfort and space to these long flights, with 'ears' on the headrest that give support and enhance privacy, as well as 15.6in displays on the outer seats and 18.5in on the wider middle seat.

"Time will tell if passengers really are willing to do eighthour flights on narrow-body aircraft, but OEMs and airlines think it could be a success," says Hank Scott, CEO of Molon Labe.



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POSITIVE TIMES AT ACRO

Just one year after entering the Airbus BFE catalog, Acro Aircraft Seating has been awarded "good" supplier status by the airframer, based on data gathered from Airbus's recent customer survey results. The company is particularly pleased, as appearing in the Airbus catalog has extended its reach and its accessibility to scheduled flag carriers, enabling growth.

In other Acro news, the company has been working with digEcor to add power capabilities to its range, and of course in September 2017 it was acquired by ZTC, a Chinese transportation seating company, for £55m (US\$75m). The deal gives ZTC a foothold in the aviation industry, and Acro new opportunities to expand in the Chinese market.

The LCC segment accounts for 25% of the airline market today, but is expected to grow to 33% by 2023 ResearchAndMarkets research

SEATING REVIEW

Clever Optimares concept

+16

A seat concept created in a collaboration between Optimares and Almadesign could reduce boarding and deplaning times on a B737-800 by five minutes. The premise is simple: 'compressing' all three places in a seat triple by around 2.6in would double the aisle width from 16in to 32in, creating sufficient space for passengers to keep moving past as others stow baggage, and making more space for wheelchair access.

> The narrowed seat width is only temporary. Once boarding is complete, when crew members are checking the backrest and table positions before take-off they press a button on the aisle seat to activate a mechanical actuation system that expands the seats to their full width for the flight and latches them into place. Should any passengers not fit within the narrowed seat, their seats can be expanded earlier. After landing, when the seatbelt sign extinguishes, the aisle seat passenger can push the button to release the latch and narrow the seats for deplaning.

Optimares and its partners on the project – Almadesign (styling), DLR (simulation) and TU Delft (testing and development) believe the seat is viable and are going through the patent process. Indeed the mechanical actuation system uses standard components already found in the seating industry and increases weight by only 5%, which could be offset by the operational benefits.

The partners do not anticipate any major certification issues as the system is only deployed when the aircraft is stationary and has been designed in accordance with FAA/EASA regulations, so no deviations or waivers are required. The partners report successful tests of a prototype seat in a mock-up B737-800.



ASPIRE LOOKING UP

Rockwell Collins' Aspire seating platform is now flying with a major customer: United Airlines. The seat, described by the seating manufacturer as "the industry's lightest full-feature wide-body main cabin seat", has comfort features that include a kinematic mechanism that cradles the passenger during recline while preserving maximum living space. Aspire also incorporates generous under-seat stowage and greater passenger living space due to the proprietary seat frame and leg structure. The Aspire seat has been fitted on a United B777-200, with customization work carried out with PriestmanGoode.

Mirus Hawk

Mirus Aircraft Seating has been optimizing and enhancing its Hawk economy platform, broadening seat offerability to new airframe types and offering new options and configurations. The seat structure is made from carbon fiber, aluminum and structural foam, enabling a low weight (9kg (20 lb)) for the fully dressed fixed recline version trimmed in e-leather). Some 100,000 Hawk seats have been sold to date, to AirAsia and AirAsia X, with additional as-yet undisclosed customers to be revealed once their seats are in service. The company has also opened RWorks, an in-house industrial design team that can help clients with their customization requirements. Mirus will reveal an all-new seating platform at AIX Hamburg 2019.

Embraer has created S-Trip, a slimline seat concept designed to afford comfort on regional aircraft in several ways, most notably its 19.3in-wide seat cushion. As well as having a generous width, the seat cushion offers comfort in other ways. For example, instead of crushable foam, which can 'bottom out' and lose its supportive properties, a suspended flexible comfort system maintains comfort over several hours, even as passengers adopt new lateral positions on the seat. The system comprises a composite basin-shaped hollow structure, with a series of webbings running across that structure for even distribution of pressure throughout the seating surface.

The ergonomic shape of the fixed backrest has been designed with spine profiles in mind, as well as what passengers are likely to do during a flight and how they will move, whether eating, sleeping or working. Whatever the activity, the carbon-fiber composite backrest structure flexes to support the posture, with a little extra comfort afforded by the 3D knitted mesh textile, developed with Kobleder.

The prototype has not yet been tested according to FAA and EASA regulations, but Embraer is confident of its performance.

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ZODIAC Z200

Zodiac Aerospace's new Z200 economy seat is available in two versions: short range and mid-range. The short-haul version is a simple and efficient option, with generous living space and a lightweight, modern design.

The mid-haul version is a more comfortable and full-featured seat, with excellent living space and a new personal electronic device holder that accommodates smartphones and tablets and has unique ways to adjust the viewing angle. The Z400 seat, claimed by Zodiac Aerospace to be the lightest full-feature long-range economy class seat on the market, may only have launched last year but has already received revisions. This year sees the company present matured versions ranging from a lightweight and efficient version weighing from 10kg (22 lb) per pax, to a high-end comfort version with various amenity panels.

Zodiac ZA

The 'visual comfort' of the seat has also been enhanced by streamlining the table design, integrating a 'floating' monitor and adding a subtle moodlighting system.

This modular design also enables specifications tailored to individual airline preferences, from simple onepiece tables, to one-piece tables with a range of options, to bifold tables with an upper literature pocket.

Zodiac ECO Zlounge

Zodiac Aerospace's Eco Zlounge design is a simple concept that makes the most of having an empty seat in front by creating a lounger. The engineering is as simple as the idea, with kinematics based on proven mechanisms.

When the load factor allows, a passenger can upgrade to the Eco Zlounge, thus ensuring the seat in front is reserved. After take-off, when the passenger is ready to recline, cabin crew simply rotate the seat cushion of the seat in front and slide it backward to create a horizontal surface extending between the seats. The mechanism also creates an opening in the seatback so that the occupant's feet can extend into the seat space in front, with an automatically deployed 'privacy hood' covering the feet.

The kinematics allow the cushion to move independently from the seatback meal table and the IFE display on the upper part of the seatback, leaving the passenger free to put their feet up and enjoy a meal and a movie. This design has provoked interest, being a finalist in the 2018 Crystal Cabin Awards. Sign up to our e-newsletter to receive all the latest seating news

Aviointeriors Skyrider 2.0

It was back in 2010 that Aviointeriors presented the Skyrider ultra-high-density economy seat concept, but many will still remember the extraordinary press coverage this peculiar configuration received, with its motorcycle seat-inspired design enabling a 23in seat pitch with a semi-standing position. The attention was welcome, though, as the concept was presented to help Aviointeriors understand how the market would react to something completely different.

There were two main drivers for the study: recognizing that people in different parts of the world have different travel tastes, and investigating a way to facilitate aircraft travel for people who cannot afford a standard economy class ticket.

The concept has been quiet for a few years, but it is about to re-emerge in the form of Skyrider 2.0 – and this time it is being presented as a real-world, certifiable seat. Aviointeriors has identified Asian LCCs flying short and medium routes as key potential customers as they have many customers within the fifth-percentile size range, and the company believes they may also be more attracted to paying the lowest possible ticket price than some other markets. Furthermore, Skyrider 2.0 weighs 50% less than a standard economy class seat and the reduced number of components enables minimum maintenance costs.

The main modification of 2.0 since the initial concept is that it now locks onto not just the rails on the floor but also to the roof of the cabin. The seat is a one-piece design, with the hatboxes on top, designed to enable proper load distribution.

Aviointeriors says that the design reflects its aim to create not only different seats for different classes, but also different types of seats for different parts of the world, especially for short-range flights where load factors are very important.

AVIOINTERIORS MICHELANGELO

Michelangelo is a new long-haul economy seat that is an evolution of Aviointeriors' Columbus platform. The seat features new engineering solutions that have enabled a decrease in seat weight of more than 10% compared with Columbus, for a nominal weight of 12.5kg (27.5 lb) – and it is claimed that this has been achieved without compromising passenger comfort levels.

Other enhancements for the Michelangelo model include more storage space for passengers' belongings, accessories such as cupholders, a 13.3in iFE display and low maintenance costs.

Michelangelo is billed as the first seat of a new seating family which, as with the Columbus range, will also include mediumand short-range versions in the near future.

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Expliseat TiSeat E2

The TiSeat E2 seat is a modular seat frame suitable for all aircraft platforms, with an extremely rigid composite and titanium structure that enables legroom and knee-level clearance to be maximized. Compared with conventional seats, Expliseat claims the TiSeat E2 can offer up to 2in (5cm) additional legroom, which can be used to increase passenger comfort or reduce pitch.

The seat weight starts at 5kg (11 lb) per passenger (fully dressed), with a minimum pitch of 28in and a width of up to 18.2in.

The TiSeat E2 will be delivered line-fit and retrofit on various aircraft platforms, with first deliveries due in Q3 2018 on an unnamed airline's Boeing 737 and Bombardier Q400 aircraft.



REBEL. AERO JOY

Rebel.Aero is always an interesting company to watch, with its S:two flip seat creating many passenger benefits in an innovative form. For 2018 the company has released plans for Joy, a design that is all about being ultralightweight, and easy to manufacture and maintain. The headline figure for this seat is that it weighs circa 6kg (13 lb) per pax, in flight-ready configuration.

Other highlights are the optional 'staggered' middle seat to help eliminate armrest or shoulder contact, and a spring-loaded flip-up booster seat that offers options of a second seated position or a child seat, and an offset baggage bar for maximum standing space to speed up boarding.

Joy features only around 40 components per triple, an assembly time of under 10 minutes, a 3D-printed carbon fiber and a thermoplastic backshell, and a simple quick-swap cover system.

Rebel.Aero is showing Joy to everyone (including competitors) and inviting them to develop the seat jointly with them, which managing director Gareth Burks says has sparked a lot of interest from OEMs, airlines and seat manufacturers.

In other Rebel.Aero news, the company's S:two seat has received ETSO C39 certification and is now officially on sale.

Geven has been awarded an Airbus Supplier Support Rating for its excellent customer support performance during 2017

ATR TIES UP WITH GEVEN

Turboprop aircraft manufacturer ATR has signed a seating contract with Geven for its ATR -600 series aircraft. The seats in question – the Neo Classic and Neo Prestige – have been specifically created for ATR by famed Italian designer Giugiaro to replace the current generation in new ATR -600s. The R&D for the project took two years to complete, including ergonomic studies.

A compelling factor in ATR's choice was its desire to offer the widest intra-armrest space in the turboprop market, at 18in. The Neo Prestige is slightly better appointed, as it can be reclined, has a larger tray table, and its backrest is 2in (5cm) higher.

The seats also offer weight savings of up to 170kg (375 lb) per aircraft compared with the current model, and thanks to further space optimization, two additional seats can be accommodated in the cabin without penalty to the operational weight.

Skycouch update

There has perhaps been no more disruptive innovation in longhaul economy travel since Air New Zealand introduced the Skycouch in 2011, a row of three economy seats that convert into a flat, flexible surface. The airline has now further developed the product, introducing a dedicated infant harness and belt, enabling infants to remain lying throughout the cruise phase (previously they were required to be seated on a guardian's lap when the seatbelt sign was on). A new infant pod also provides additional comfort and protection for the airline's

youngest Skycouch customers.

The Skycouch Cuddle Belt, which was previously only certified to allow two adults or an adult and child traveling together to lie down side by side on the Skycouch, has also been updated to allow two children to use it.



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BEYOND HORIZONS



TSI MILLIGRAM

As the name suggests, TSI's Milligram seat has a focus on minimizing weight, with a target weight of less than 9.5kg (21 lb) per pax, enabled by its composite structure. The seat model – available for delivery in 2019 – will be Weight: 9.5kg (21 lb)

- per pax (fully dressed) • Width: 17.3in
- Pitch: 28-39in

available in several versions, ranging from an LCC seat with no recline, to a fully featured economy seat with IFE, recline (up to 6in) and footrest options, depending on aircraft configuration.

TSI is working to certify Milligram for linefit and retrofit to support the B737, B777, B787, A320 and A350 families.

TSI Epianka

Weight: 14kg (31 lb)

Width: 17.3in

Pitch: 30-39in

per pax (fully dressed)

The design criteria for Epianka, another new model from TSI, were to establish a seating platform that provides industry-leading comfort, usability, reliability and cost effectiveness. Comfort features of the aluminum seat include a mechanically controlled articulation mechanism with a cradle motion, a mechanically operated four-way headrest, and provision for IFE displays up to 12in. Epianka is certified for linefit on B737 and A320 aircraft and will soon be certified for linefit and retrofit to support the B787 and A350 families.

2018 is an exciting year for TSI Seats as the company is delivering the Epianka for Turkish Airlines' B737MAX and A320Neo aircraft, strengthening its relationships with the airline, as well as with Airbus and Boeing.

TSI Elesa S

The Elesa model, the first seat developed by TSI, has been improved to create the Elesa S, an aluminum seat which weighs 25 lb (11.4kg) per pax, complete with IFE provisions.

Elesa S is certified for the B737 and A320, and has interesting potential. With its multiple configuration possibilities, this convertible seat can offer flexibility in the cabin, allowing airlines to reconfigure from 3-3 to 2-2 configuration for business class use.

Weight: 11kg (25 lb) per pax (fully dressed)

- Recline: Up to 4in
- Width: 17.3in
- Pitch: 29-39in

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Business class

Jamco Spread Your Wings

For partners flying together, Jamco's Spread Your Wings design is not so much a double bed as a double space. The herringbone layout has the center seats facing inward and outboard seats facing the windows, which gives a good sense of privacy to all passengers in the cabin, which also has the benefit that no high walls are required to create the effect.

However, the really special part is that if occupants of neighboring center seats are traveling together, the central divider offers options: fully raised, should you want some peace or privacy; lowered midway, which opens up the space to enjoy a chat while keeping the beds separate; and fully lowered, which creates a shared space with a large flat surface. The shared surface creates a 'wing' shape larger than the sum of the two bed surfaces and can be used for stretching or sitting cross-legged as one might do at home on a living room couch or tatami. It is also a fantastic space for parents wishing to give toddlers a safe area in which to move around and play.

The seat is based on Jamco's existing Venture seating platform, which is due to launch with KLM's B787-10s in mid-2019. Using this platform – which is suitable for all wide-body aircraft types – helps minimize development times and increase reliability, with the design expected to launch within 18 to 24 months.

- Layout: Four-abreast (1-2-1) 'windowward herringbone'
- Materials used: Possibility to use carbon composite and lightweight metals
- Weight: "More lightweight than similar fully loaded seats"
- Bed length: 76-78in
- Maximum bed width: 33.4in
- Seat width: 24.9in
- Recommended IFE size: 24.5in
- Recommended pitch 42-44in



ADIENT ASCENT

Ascent is Adient's and Boeing's modular seating system concept, presented at Aircraft Interiors Expo in Hamburg in April. The versatile seat design enables both conventional as well as new cabin layouts, and delivers a personalized customer experience. Its clever integration of technology offers new features and competitive product dimensions. At the same time, Ascent's modular components approach reduces complexity while ensuring high levels of quality and craftsmanship.

Adient and Boeing have been collaborating in the aircraft seating field since March 2017 and are currently focusing their efforts on gaining all customary regulatory approvals for their planned joint venture: Adient Aerospace. The companies intend to contribute Ascent to the proposed joint venture, which will make seating products available for aircraft produced by Boeing and other airplane manufacturers. Adagio is also available as a premium economy variant with a Z-bed AVIOINTERIORS WORKED TO MAXIMIZE THE FEELING OF PRIVACY AND SPACE WITHIN THE SEAT. FOR EXAMPLE, THE ADJUSTABLE IFE SCREEN GIVES THE FREEDOM TO MOVE AROUND IN THE SEAT SPACE WITHOUT COMPROMISING VIEWING COMFORT

AVIOINTERIORS ADAGIO

The Adagio seat has been further developed over the past 12 months, following what Aviointeriors describes as "great airline interest", with developments including larger stowage spaces, wireless phone charging pads, and the proving of components in other models in the company's seating range.

An interesting selling point of the high-density seat is that it can be installed in an eight-abreast configuration in the B787 (staggered 2-4-2) with 100% direct aisle access and fully flat beds. If installed in a wider cabin, the additional space can be used for features such as sliding doors to turn Adagio into a mini-suite.

The seat can also be fitted in a narrow-body cabin, such as an A320, in a five-abreast (3-2) staggered layout, again with direct aisle access. This would help airlines with multiple aircraft types across their fleets achieve a consistent passenger experience in business class.

The design, created with Tangerine, can also be tweaked to achieve a consistent passenger experience within the same business class cabin, for example by extending bed lengths on the inboard center seats to give a little extra personal space to passengers who may have preferred a window seat.

The flexibility of the design suits its name, with Adagio deriving from the Italian *ad agio*, meaning 'at ease'.

The overall seat construction (aluminum and composites) weighs 80kg (176 lb) and the form has been designed to enable rapid design customization, with comfort options including a Relaxor massage system, pneumatic lumbar support and memory-foam cushions.

- Minimum pitch: 43in
- Seat width: 20in
- Bed length: 76.4in
- Bed width: 26.2in
- Armrest width: 3in
- Ottoman foot space: 16.2-18in
- IFE: up to 21in
- Layout: B777 2-4-2; A330 2-3-2; B787 – 2-4-2; A320 – 3-2
- Lead time for orders: 12 months from ITCM

IFE ideas

Aviointeriors is collaborating with digEcor to develop a range of TSO-authorized IFE systems that integrate with the company's seats across economy, premium economy, business and first class. The partners are working with digEcor's Integrated Flight Experience modular product portfolio, which consists of various sizes of HD screens, noisecanceling technology, custom-designed personal controller and passenger service controls, and USB and 110V in-seat passenger power.

The agreement also includes provisioning for retrofit of IFE and passenger power into in-service Aviointeriors seats.

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Iacobucci Cambiano

Following the reveal of lacobucci HF Aerospace's Cambiano seat design last year, airlines and airframers have invited the company to make presentations of the design. The feedback gathered has been applied, with an updated version ready for another round of presentations.

The company is being coy about sharing the exact details of the nature of the modifications to the super business class seat, but the market has reacted "very well" according to a spokesperson.

Cambiano (Italian for 'change') is suitable for narrow-body or widebody aircraft, and is the product of a collaboration with Pininfarina, with styling and finishes reminiscent of luxury cars. The finishes are also of automotive quality, with tight tolerances and no visible screws, rivets or attachments, even in the fully flat position. lacobucci is currently certifying the seat ahead of its entry into the market

Beneath the surface, there is a focus on weight reduction, with

composites used for the seat surrounds and aluminum for the rest of the structure, which means fully upholstered Cambiano seat should not exceed 350 lb (150kg) unless a client really goes to town on options or customization.

A standard Cambiano seat has a fully flat bed at a 67in pitch, a 21in-wide seat, 12-20in IFE in an elegant curved wraparound bezel, and a large 47-liter stowage area under the ottoman that is large enough to accommodate a small carry-on bag and enables airlines to consider not fitting overhead stowage. lacobucci is also looking to offer a highdensity version that can maintain a 79in bed length at a 60in pitch.

RECARO CL6710 DESIGN STUDY

Recaro's CL6710 has launched on El Al's B787s, but there is a lot more to come for this platform. A design study has been created for the staggered seat, aiming to provide insight into what a highly customized version of the CL6710 could look like on the B777X. The design study is pitched at 46in to demonstrate how it would look as a super business class seat.

The most immediately noticeable feature of the seat is the sliding door, something that is gaining increasing interest in business class, and once inside the space – now a mini suite – visual comfort has been enhanced through the use of generous surfaces, high-quality materials, spacious stowage options and an extended center console for every other seat.

Privacy is also enhanced by the translucent shell extension, which adds to the sense of tranquility for passengers without detracting from the cabin crew's view of the cabin.

- Weight (fully dressed): From 80kg (176 lb)
- Unique features: For each extra inch of pitch given to the seat, 1.8in can be added to the bed length
- Width between armrests: 21in
- Bed length: 82in
- Bed width at waist level: 29.3in
- Pitch: 42-46in

RECARO



Celeste electric

The unusual and innovative Celeste model by Stelia Aerospace has received further development work, with the mechanical regional business class seat being granted full offerability by Airbus for the A320 and securing its first customers.

Celeste can be installed from 40in pitch in a four abreast (2-2) configuration. It has a seat width of 21in and can accommodate IFE screen sizes up to 18in

An interesting update is the Celeste Electric version, which adds an electrical actuator system to enhance passenger comfort. The seat reclines in a cradle motion through a range of 40° (11.5in) within the fixed backshell, creating a relaxing position that supports the body from head to toe. The electrical actuation system can also be paired with leg rest and footrest options.

The mechanical version works superbly, but Celeste Electric is a useful addition to the lineup, and will enter service in the first quarter of 2019.

AIR-CONDITIONED SEAT

In cooperation with its partner Gentherm, Fraunhofer has developed an airconditioned business class seat that will soon be launched on the market. Named the Aviation Double Seat, the design features a combination of seat ventilation by means of fans and thermal regulation by seat heating. This setup is intended to lead to optimal temperature control of the seat surface as well as continuous moisture removal. The result is a comfortable, dry climate on the seat surface – ideal for long flights. The seat was created during the EUfunded iSPACE (Innovative Systems for Personalized Aircraft Cabin Environment) project. In addition to the Fraunhofer Institute for Building Physics in Germany, nine European partners from the aviation industry were involved. As part of the project, the participants have developed technologies that will enhance the comfort of passengers, enabling them to adjust their immediate environment, as well as to set the temperature and airflow to suit their personal needs.





TSI Royal Lux

This year sees TSI Seats make its first foray into dedicated narrow-body business class seating, with the launch of Royal Lux, an in-line design featuring innovations in comfort and styling. The seat, available for delivery next year, has a target weight of 88 lb (40kg) per pax and will be offered with electrical or mechanical drive options as part of the seat customization options.

The electrical controls include recline (up to 10in), leg rest and leg rest extension, and lumbar support. A privacy divider can also be specified, and there is full provision for handset, USB, remote jack unit (RJU), seat power unit kill switch, power supply system and IFE. Royalux will be certified on line-fit and retrofit basis to support B737 and A320 families.



Photo credit : Singapore Airlines

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LAUNCH OF NEW CLASS 2 CREW REST SEAT

In response to EASA regulation for Flight Time Limitations (FTL), Airline Services Interiors & SWS Certification Services have launched a Class 2 crew rest seat that will directly replace the existing cabin attendant seat without any physical modification to the aircraft, therefore making the process reversible.



FEATURES

- 20 inch seat width
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BENEFITS

- Increased crew comfort demonstrated by pressure mapping
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- Flexibility to install in various locations in the aircraft
- Utilising lightweight high technology composite materials

APPROVALS

- STC approvals obtained for B737/ 767 aircraft.
- Testing conducted at SWS test facility in South Wales
- ASI : EASA Part 21G & Part 21J
- SWS : EASA Part 21J.

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Crew seats



ASI crew seat

Airline Services Interiors (ASI) has developed a Class 2 crew rest seat that offers a 20in seat width, a 45° recline, leg and foot support and Supracor's Stimulite Honeycomb seat cushion comfort system.

The first customer is charter airline Neos, which ordered 25 of the seats, to be installed on its B737s and B767s. The seat entered the test phase after just six months in development, through a project between ASI, SWS Certification Services, and design consultancy Blue Sky. The 9g seat was tested by SWS Certification in Wales, while the 16g seat underwent testing at one of SWS's approved dynamic test partners in the UK. ASI manufactured the seat at its Manchester, UK headquarters and is also responsible for POA.

"The Neos crew rest development was very challenging from a certification and testing point of view, involving new seat design and materials, with a very aggressive timescale," says Claire Demarquet, SWS's head of engineering.



AVIOINTERIORS ANDROMEDA

The recently released Andromeda crew rest seat from Aviointeriors is intended for the B767 in a 2-2-2 layout. Comfort features include 20in between the armrests, memory foam in the seat cushion and seatback, a 45° recline, a leg rest with footrest, and a meal table that can fold, slide or swivel. The seat is compliant with EASA Class 2 Regulations, and its aluminum construction brings weight down to 40kg (88 lb).

Five-star treatment for crew

Zodiac is looking to offer 'five-star spaces' with its latest crew rest designs, which are the result of extensive interviews with pilots and attendants from around the world.

Space and comfort were key, and Zodiac has applied materials, colors and lighting to ensure the spaces meet crew expectations of a pleasant experience as well as a restful one. For example, central light sources have been replaced with lighting along the outer walls of the rest, eliminating dark spots and shadows and making each bunk more spacious and inviting.



Each bunk also has a PSU for access to IFE, and sliding privacy dividers that enable occupants to close off their own space.

B777X ATTENDANT SEAT

Boeing has been working with new seat manufacturers in recent years. One such is Ipeco, which has won its first cabin attendant seat contract from the airline. The company has been selected by Boeing to design and manufacture a high comfort attendant seat (HCAS) for the Boeing 777X. This deal follows on from a 2016 contract award for pilot and observer seating and the HCAS will be offered as an option to airlines, with an anticipated selection rate of up to four seats per aircraft.

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The aircraft seat actuation system market is projected to grow from an estimated US\$507.1m in 2017 to US\$730.7m by 2022 MarketsAndMarkets

Comfort components

HAECO GAINS POWER

digEcor's in-seat USB power system is now compatible with HAECO's Vector seat platform, and can be preintegrated with the seat or retrofitted using a seat modification installation kit. It comprises two spar-mounted boxes (housing either single or double USB jacks) with a USB seat power unit powering both boxes. According to digEcor CEO David Withers, the system can be installed in a cabin overnight.

In other HAECO Cabin Solutions news, the company has received **Technical Standard Orders** (TSO)-C127b authorization from the FAA for its Vector Premium seat platform for all seat configurations on Boeing 737 and Airbus A320 aircraft. Obtaining this authorization will streamline the certification process for the seat, reducing lead times.

ARE YOU TTING SAFEI A few companies have been developing

seatbelt systems with sensors that can alert crew as to whether passengers have fastened their belts, with the latest take on the technology coming from ACM (Aircraft Cabin Modification). On aircraft featuring the system, any uncooperative passengers are exposed to crew via an app, which saves crew members having to walk up and down the aisles before take-off and landing to check whether passengers have fastened their seatbelts (as well as during turbulence, when the crew should be safely belted in). Any uncooperative passengers are highlighted on an app, so crew can directly request them to comply with safety regulations.

As well as enhancing passenger and crew safety, the technology also enables airlines to prove whether the seatbelt of any passenger injured during turbulence was fastened or not, which helps in the defense of possible compensation claims. According to ACM, despite the added technology integrated into the Smart Belt, it does not weigh more than standard seatbelts used today.



Turning seat comfort into data

Aviation technology firm FliteTrak has developed a technology that measures and maps pressure points on airline seat cushions, generating key data that an AI learning platform can interpret, to create visual pressure mapping for seat design based on live passenger use. The system, ViatorComfortsystem, creates usage data for optimizing the comfort of seat designs, and can also be used by airlines to monitor seats and cushions for signs of wear and tear – whether through tell-tale passenger movement or simply the hours the seat has been used, and it can also enable crew to access data to monitor individual seats in real time.





ADJUSTABLE SEAT PAN CONCEPT

Omniseat, an adjustable seat pan concept by Aeroworks, has been designed to increase comfort levels in the hip to knee space for all sizes of passenger in economy class or premium economy class, from 5th percentile Asian females to 95th percentile western males.

On the prototype version, the seat pan pivots below the lumbar region of the passenger, which enables the front section of the seat pan to be raised or lowered. This simple system is lightweight and does not require a great deal of force to be deployed, and it can be complemented with an extendable bull nose for extending or contracting the seat.

Spring comfort

Vanema has developed Octaspring, an eco-friendly seat cushion system. The Octaspring technology was developed in partnership with Airbus and Stelia Aerospace, initially as an option on Stelia business class seats, but has now been further developed and can also be applied to the economy and first class seating sectors.

Octaspring is a foam spring that combines the support and comfort of foam with the functionality of a spring, while using 50% less material. The foam springs are placed individually and move in three dimensions, resulting in improved weight distribution, pressure relief and comfort. Springs of varying density can be used in the same layer to create targeted zones, which increases comfort and extends the structure's lifespan. Plus, the open spring structure gives a claimed eight-times-better ventilation, which is a critical factor in sleep products. The economy class seat cushion is claimed to save up to 150g (5.3 oz) per cushion and offer optimized comfort levels in high-density seating areas.

In addition, another collaboration with the seat component producer, Aeroworks, has led to the development of a new type of seat pan (see p87).

RECLINING BACKREST

The SleeperSeat design is intended to enhance the level of comfort in longhaul economy, as well as to overcome the thornv issue of seatback reclining. The idea is that the occupant slides forward on the seat and then. as the base of the sliding backrest moves forward along the seat to the desired position, they then lean back on the backrest (much like sitting forward on a seat at home, placing cushions behind you and then leaning back). With the base of the backrest in its most forward position, the passenger sits toward the front edge of the seat and leans back onto the backrest, at an angle typically between 135° and

145°, depending primarily on the available seat pitch.

As another example, with a 38in pitch and the backrest moved forward to allow 8-10in (200-250mm) of seat cushion to sit on, the occupant can stretch out and recline, at an angle of about 142°. The 'sitting bones' play a role in stopping one from slipping forward and down, assisted by the seatbelt and footrest.

SleeperTech does not intend to manufacture the design, but is instead seeking to make the IP available for incorporation within seats manufactured by others. To achieve this, the Australian company is aiming to form relationships with aircraft seating companies.

GRP GUIDES



Motion plastics specialist Igus has expanded its Drylin W modular system, with the option of linear guides with rails made of glass-fiber-reinforced plastic (GRP). This metal-free alternative helps save costs and weight in the overall construction.

As well as having lower weight than metallic alternatives, GRP also has a very high media resistance, and is non-magnetic and cost-effective. In order to expand its Drylin W modular system for linear technology, Igus has developed a GRP rail on which a plastic carriage is used.

"The Drylin W profile made of glass fiber is 20% lighter than aluminum and 70% lighter than steel," says Stefan Niermann, head of the Drylin division. "It is also 50% cheaper than carbon." ⊗

linear motion

Faulhaber is expanding its range of linear DC-servomotors for small and micro linear motion applications. These motors combine the dynamic motion performance and robust design typical of a pneumatic system with the high reliability and silence of a brushless motor.

FAULHABER

The new LM 1483, with a continuous force of 6.2N and a peak force up to 18.4N, combines highly dynamic motion (acceleration up to 220m/s²) with high precision and repeatability (down to 120µm and 40µm, respectively).

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pitch



Seat covers

BRAND VALUES

In many cases, airlines make their supplier and product selections for the economy cabin according to cost, weight, durability and availability. However, aircraft seating company Pitch has considered what value airlines place on perceived quality and branding in economy class seating and whether there is really a need to push for higher perceived quality. The result is Project Surface, an initiative by Pitch that explores enhanced surface finishes and branding, using the company's PF3000 economy seat model, with the aim of increasing the perceived quality and exploiting the 'brand-ability' of the seat. Changes are restricted to material finishes and the dress cover design - and according to Pitch, the seat cover offers airlines one of the best opportunities to express their brand.

Pitch has worked with dress cover supplier Sabeti Wain Aerospace to develop a range of pre-engineered dress covers. The Standard lightweight dress cover is currently supplied in faux leather, while the mid-range Comfort cover uses E-Leather, with additional padding and feature lines in the headrest and lumbar area to emphasize the softness. Contrasting stitching and fluid style lines reinforce the three-dimensional nature of the curved seatback to give this cover a tailored look. The Premium dress cover comes with contrast autostitch detailing and an integrated headrest.

For the PF3000, a laminated dress cover provides a consistent and durable finish, with multi-layered foam used to emphasize specific areas of the dress covers, giving them a more comfortable look and feel.

"When we look at business and first class offerings, we see significant improvements in craftsmanship and attention to detail, setting new standards and driving up customer expectations. We want to open a conversation with airlines about economy class and listen to their feedback," says Pitch director Gary Doy.

Project Surface: an example

As an example of Pitch's Project Surface concept in action, consider a short-haul LCC that needs to upgrade the cabin on its single-aisle fleet. It has sharpened its brand and product offering, and prepared a marketing campaign, but still needs the cabin to deliver the vision. The layout has changed to a high-density 28in pitch to get the best return on investment, and the old seats won't cut it as they are too bulky, too heavy, and they recline.

The marketplace is shifting toward lightweight fixed-back seats, but the marketing team is reluctant because the airline has always had reclining seats, and is unsure if passengers will accept fixed backs. However, there is a gut feeling that at a tight pitch it is an advantage for passengers to have a fixed seat as it gives them much more space.

The airline asks seat manufacturers to provide samples so that their products can be evaluated side by side. All the seats are set at a 28in pitch, as are the current reclining seats, and teams from the airline, as well as its top 25 customers, spend hours trying them out. It becomes clear that the fixed-back seats designed for a tight pitch provide more passenger space and feel more robust, and the fixed-back Pitch PF3000 seat is selected.

The airline opts for a wipe-clean dress cover and branded antimacassar. The standard seats come with some great plastic finishes, but technical grains with metallic and pearlescent finishes add another level of individuality.

Even as an LCC, the airline has quality aspirations, so to offset the reduction in seat pitch it opts for the high-end plastic finishes and a more detailed dress cover design, balancing the product offering. There is no guarantee this will win more customers, but the airline believes this investment reinforces its brand values.



REDUCE MATERIALS, IMPROVE COMFORT

Acme Mills has joined forces with Quantum Materials to launch Comfort Zone, a B-surface fabric technology designed to provide long-term enhanced comfort to passengers, and reduce or eliminate the need for the foam often used in airline seating.

The product has been engineered with Quantum ZXT, a proprietary technology that enables fabric to provide customized levels of ergonomically correct support throughout the seat. As a supporting B-Surface application, Comfort Zone reduces the amount of foam needed and can eliminate the need for springs, wires, clips and insulators - saving as much as 3.6kg (8 lb) per seat according to the company, as well as creating space savings. The fabric can be engineered or treated with the various performance requirements needed to pass standard FAA regulations.

"In a survey by Skytrax, uncomfortable seats ranked third among a long list of customer complaints. With our Comfort Zone product we see an opportunity to change this," explains Neil Gross, chief operating officer for Acme Mills.



HIGH-TEC

Lantal Textiles has developed a new polymer construction that looks like leather but has greater elasticity and a lower price.

The material, named TEC-Leather, is stain repellent and low maintenance, requiring just occasional cleaning with soapy water and a soft cloth. The elasticity of the product means that it is suitable for complex seat shapes and does not sag, even after long periods of use. According to Lantal, other advantages are its light weight and excellent flame-retardant properties, which eliminate the need for an additional fireblocker.

Visual appeal

Soisa was shortlisted for the Crystal Cabin Awards 2018 with its Glowing Experience, which integrates ambient lighting effects into the seat cover. By illuminating the seats themselves, Soisa believes this technology could redefine where lighting can be placed. LED lighting is integrated into the trim of the seat, which has a positive aesthetic effect and serves as a brand differentiation tool for airlines.

For example, the lighting can function as a visual indicator that passengers are complying with safety procedures, help crew with their duties and help prevent injuries, and assist passengers to access their seats during night flights.

Glowing Experience (pictured inset, right) is an idea from Soisa's R&D department, which creates concepts and custom ideas for the company. Soisa itself is a supplier that specializes in the design, engineering, development, manufacturing and certification of aircraft interior products including seat covers, cushions, foam inserts and diaphragms.

Rapid progress

Franklin Products, a manufacturer of airline cushions and dress covers, claims to have 'reinvented' how dress covers are attached to seat structures. The company says that its Velocity advanced dress cover attachment system makes it possible to install and remove dress covers in seconds, dramatically reducing maintenance and production times while creating a clean, crisp, consistent look.

Further benefits of Velocity include increased security due to the locking action of the system, and flexibility in color with a reversible option. Franklin Products is actively collaborating with major seat OEMs to offer this new attachment system and expects it to be on flights as early as this year.





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A RECORD 91 AIRCRAFT INTERIOR INNOVATIONS WERE ENTERED IN THIS YEAR'S CRYSTAL CABIN AWARDS. AFTER A THOROUGH EVALUATION PROCESS, THE FOLLOWING IDEAS, DESIGNS AND TECHNOLOGIES OFFICIALLY BECAME THE EIGHT BEST FROM THE PAST 12 MONTHS...

wind

THE AWARDS

The best ideas for the future onboard experience – both short term and longer term – have been decided by a 25-strong panel of aircraft interior experts. This, the 12th year of the Crystal Cabin Awards, an initiative of Hamburg Aviation, was more international and more hotly contested than ever before, with 91 submissions from 18 countries. These are the winners – and a few things you might not know about them.

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RIESTMANGOODE



The awards process

All entries to the competition are examined by the Crystal Cabin Awards Association preselection committee to ensure that entries comply with the rules of the awards, and a shortlist of the best entries is then created.

The shortlisted entries are evaluated and scored by each of the 25 judges separately, according to the grade of innovation, operator benefit and passenger benefit. The first-round voting results in a list of the top-three finalists in each category. To eliminate any possible conflicts of interest, members of the panel who have any relationship with an entry under evaluation must abstain from voting.

These top three entries are then presented in person to the judging panel at an evaluation day in Hamburg, with applicants quizzed and all manner of prototypes tried and tested. There follows intense discussion of the entries, a final voting process, and the winners are decided.

The final steps? A glamorous awards ceremony at the Hotel Atlantic Kempinski's ballroom and a display at Aircraft Interiors Expo.

Cabin Concepts winner: Qatar Airways

This category is usually of most interest to consumers, featuring airframe and airline designs that the flying public may directly experience. This year saw an exciting competition as Qatar Airways went head-to-head with Singapore Airlines and Airbus.

The winner was Qatar Airways with its Qsuite, the first business class seat to address the desires of groups of passengers traveling together. A four-seat 'quad' layout allows passengers to socialize from within their seats, while privacy doors ensure that if only three passengers are traveling together, the remaining traveler in the 'quad' layout remains undisturbed due to the integration of complete privacy doors.

Another notable feature of the Qsuite, designed in collaboration with the PriestmanGoode studio and Rockwell Collins, the manufacturer of the suites, is the ability to convert the center doubles into double beds.

Qatar Airways' chief executive, His Excellency Akbar Al Baker, said, "As an airline, one of our top priorities is to continuously strive to create a second-to-none inflight experience for our passengers. We are very proud that Qsuite has been a gamechanger in the industry, bringing a first class experience to the business class cabin. This award proves that our extensive investment in innovative design concepts and cabin comfort has truly paid off."

RUNNERS-UP: Airbus: A320 Airspace Singapore Airlines: A380 Suites

Qsuite trivia

- The certification and regulation issues of the privacy doors were addressed by designing the doors in such a way that part of the door can be removed by the passenger in an emergency
- Qatar Airways, again in cooperation with PriestmanGoode, was a finalist in the 2015 awards with its A380 first class cabin and premium lounge
- To complement the social nature of the Qsuites, Qatar Airways is launching a food and beverage concept with dine on demand, as well as the addition of snack sharing dishes to the business class menu, allowing travelers to turn dining at 35,000ft into a social experience
- Qsuite was announced as part of the airline's 20th year of operations celebrations



TRIPLE TRIVIA

- The name was created during a flight from LA to Brisbane
- The original idea came from a quick sketch to modify an older design
- The product was previously designed as a highly optimized fixed solution. However, one of the sales



Cabin Systems WINNER: ROCKWELL COLLINS

Current aircraft dividers are static and inflexible, but Rockwell Collins' cleverly curved Silhouette Move cabin divider won the judging panel's favor by being able to adapt to meet the relevant regulations applied during each phase of flight, taking advantage of the unused space between the divider and the seat in front.

When at cruising altitude the TTL regulations no longer apply, so at this stage the divider can be pivoted back to allow the seats in front to recline. In this position the divider does not impinge on the leg space of the passengers behind as the bottom of the divider does not extend to the floor, opening up the floor and under-seat area for leg or baggage space. This was achieved while still meeting HIC requirements and without needing to test alternative restraint devices or airbags. Even better, the divider allows seats to be positioned more closely to it than any other divider in the industry, adding 1ft³ of space per passenger seated in the bulkhead row. This is sufficient for an additional row of seats to be fitted, resulting in an estimated return on investment within four months for a domestic single-aisle aircraft.

RUNNERS-UP:

PASSME Consortium (cooperation partners Almadesign, Optimares, TU Delft & DLR): PASSME Innovative Aircraft Seat Zodiac Aerospace: Durinal

Visionary Concepts WINNER: RENACEN

3D SeatMapVR is a visualization engine developed by Spanish company Renacen, which displays an immersive 3D 360° view during the booking process. When a customer selects an aircraft seat during the online booking process using a conventional seat map, 3D SeatMapVR can offer a window showing this immersive view (the software is integrated into the browser). This view affords the customer a much better idea of the benefits of the seat, in terms of dimensions, materials, location in the cabin, etc – especially if they use VR glasses.

The system can help airlines to sell more special seats (like emergency exit seats) and upgrades, as customers can really get a feel for the difference between one seat and another. The system also helps customers to know the seat, plane and surroundings better and helps reduce complaints, because customers can really know every detail of their seat prior to boarding, enabling airlines to manage user expectations in an entirely new way.

Emirates Airline will be the first airline globally to use this technology across its digital channels.

RUNNERS-UP:

Airbus Interior Services: Day and Night Concept Rockwell Collins: Universal Passenger Seat Interface

Greener Cabin, Health, Safety and Environment

WINNER: VILLINGER

The LiteHeat system by Villinger is intended to create a high-quality thermal environment in the cabin. Today's cabin heating systems use hot air, vented through small openings in the cabin, but high volumetric airflow is necessary to maintain comfortable cabin temperatures, which sometimes creates unpleasant air drafts and often results in passengers having to use blankets to stay warm – perhaps not the level of thermal comfort one might expect in a business or first class cabin.

However, the LiteHeat electrical heating system features a unique, electrically heated coating technology that can be applied to a variety of surfaces in the cabin and works using infrared (IR) radiation rather than convective heating. The award-winning element of the design was the virtually indestructible nature of the heated flooring panels, especially compared with comparatively delicate foil or cable-wrapped heated floor elements.

RUNNERS-UP:

Boeing Company: The Boeing Cabin Dry Floor VT Miltope: Cyber-secured cabin wireless networks

FAST FACTS

- The idea to create 3D SeatMapVR came to its CEO after a bad experience flying in an emergency exit seat that was not what he expected, because he did not have more information about his seat when booking
- The complete model of a large aircraft like the A380 has almost 90 million polygons to give it the maximum detail in every area, object and seat
- If conventional renders were performed with normal equipment, it would take more than 120 days to generate all the views from the seats of a single A380 aircraft
- Under standard internet connection conditions, the full view of a seat takes less than 200ms to load onto the user's personal device



LiteHeat trivia

- CEO Markus Villinger came up with the idea after hearing numerous complaints about conventional aircraft floor heaters breaking after a few months in operation and stories about emergency landings being made due to smoke in the cabin caused by conventional aircraft floor heaters that became damaged and overheated
- Villinger has had inquiries from numerous airlines and MROs from all over the world since winning the Crystal Cabin Award
- The company has just started certification of customized heated floor panels, to be retrofitted in CS25 LPAs
- LiteHeat took eight years to develop
- The first proof-of-concept prototype was made on a scrap honeycomb panel





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In-flight Entertainment & Connectivity

WINNER: BLUEBOX AVIATION SYSTEMS

In recognition of the importance of IFEC to the passenger experience, and the rapid pace of innovation in this sector, the In-flight Entertainment & Connectivity category was added to the 2018 Crystal Cabin Awards. The winner also reflected the importance of giving passengers with special requirements a great flight experience.

Scotland-based IFE company Bluebox Aviation Systems has developed the first portable IFE platform developed with and for airline passengers with visual impairments.

The company took its existing Ai IFE platform, a standalone portable IFE system featuring a secure app approved by the major Hollywood studios to host pre-loaded Early Window Content on all iPad models and converted it into an accessible IFE (aIFE) system. The fully customized iPad-based user interface builds on the accessibility features of Apple's iOS platform, such as VoiceOver and Zoom, but tailors them for the unique IFE requirements of passengers with sight loss by using audio descriptions, large type, support for multiple languages, closed captions, and consistent layout and controls for navigation

For example, rather than using a traditional screen reader function to read out on-screen text, information such as film synopses are read aloud after a single tap of the film title. These features are kept in the background until required, ensuring the interface is kept uncluttered and simple to navigate.

This is no concept: the system launched with Virgin Atlantic in December 2017, making it the first global airline to offer accessible IFE for passengers with sight loss across its entire fleet. The system is a more advanced and less costly solution than updating seatback IFE systems, and can easily be introduced sight-impaired passengers will have more independence and

RUNNERS-UP:

Inmarsat: The European Aviation Network United Screens: Glasses-Free 3D IFE

DID YOU KNOW ...?

- Bluebox tried to apply VoiceOver and other accessibility features to Bluebox Ai, but it became apparent a standalone app was needed
- Sighted team members had to mimic being blind for tests, using iPad's Screen Curtain feature and good old blindfolds

WHAT VIRGIN CREW SAY;

• "I've just landed from the Caribbean and we had a blind passenger in Upper Class use the Accessibility iPad we now carry. He loved it. He was over the moon to be able to use it" "I give this out on most flights and it has been well received by customers. Feedback from my last customer was amazing. So good in fact that she says she will now choose to fly with us in the future based on the availability of the tablet and the care and compassion she receives from all teams, from booking to baggage reclaim"





But what does Pedro say?

(For those who haven't had the pleasure of meeting him, Pedro is a charming labrador and he helps Paul Smith, part of the user group invited to participate in the product development of aIFE.)

Pedro has been Paul's guide dog for five years and will be

- Pedro was one of 11 puppies (two golden, nine black), and they
- have all become service dogs, bred and trained by the charity Pedro loves the camera and is a favorite for Guide Dog photo
- shoots as he takes direction, follows the camera, poses well
- Pedro is proud of his human friend Paul, who does not let blindness hold him back, having run the London Marathon
- three times to raise funds for blindness charities. His next challenge is a tandem cycle event from London to Brighton

Passenger Comfort Hardware

WINNER: ROCKWELL COLLINS

Rockwell Collins had a strong showing in the 2018 awards, winning another prize with its Valkyrie seat concept.

Valkyrie removes any comfort compromise in business class designs by having a separate seat and bed, with comfort optimized for both. The seat gives passengers a dedicated seat for lounging, eating and working, but when it is time to sleep the seat can fold away and a full-size mattress deploys from the console to create a dedicated sleeping surface. It's a simple idea to offer the best of both worlds within the business class footprint and an interesting proposition for airlines considering dropping first class or upgrading their business class product.

RUNNERS-UP:

LIFT by EnCore (cooperation partner Boeing): 787 Dreamliner Tourist Class Seating Zodiac Aerospace: Eco Zlounge

Valkyrie: did you know...?

- The current design grew from another 'multispace use concept' based on a multifunction suite
- The design group was international
- English, French and American
- The team had backgrounds in engineering, prototyping, and industrial and furniture design
- This is the second version of the design
- The code-name Valkyrie references the North American Valkyrie bomber aircraft

University

WINNER: CRANFIELD UNIVERSITY

Two former Cranfield University students were successful with a watersaving faucet concept for aircraft galleys and lavatories. Named the E-tom Smart water tap, the system uses water nebulization to atomize water, achieving onboard water savings of up to 90% without reducing the cleaning effect. The faucet is also fully contactless and can sense any filter blockages.

The design was conceived by Raghavendra Naik, who studied an Air Transport Management MSc at Cranfield in 2016 and 2017, and Buddhi Maduranga, who has returned to the university to complete a PhD while in the role of assistant lecturer. Naik said, "Water is an essential commodity on



board but adds weight to the aircraft. The E-tom looks at how water can still be used by crew and passengers in a safe and hygienic way, but more economically, therefore benefiting airlines in terms of cost."

RUNNERS-UP:

University of Edinburgh: LiFi **University of Cincinnati:** Virtual Assistant – Boeing Onboard

Materials & Components

WINNER: AIRBUS/ALTRAN

Airbus, in cooperation with Altran, won this category with 'printed electrics', a digital technology that uses conductive inks to print circuits on a flexible foil for data and power transmission. This design is intended to replace today's harnesses, massively reducing parts count, weight and manufacturing costs, as well as simplifying the electronic architecture of the cabin. The design also enables quick client customization.

A joint Airbus and Altran project team has developed a cabin interior panel demonstrator for a first use case on an A320. This printed panel displays passenger-related safety and comfort information. In the future, according to the partners, printed electrics technology could be introduced into cabling for air-conditioning, data transmission and lighting.

RUNNERS-UP:

Rockwell Collins: Secant Luminous Panel Weigele Aerospace: Airborne Cooking Robot

Water wisdom

- The beginnings of the idea began while using the aircraft lavatory on a flight from India to the UK
- However, 'nature' added further ideas of mist and its watersaving capability during a hike
- saving capability during a nine
 E-tom's filtering capability would make future aircraft water drinkable direct from the faucet
- The idea of the smart faucet in an aircraft convinced two
 The idea of the smart faucet in an aircraft convinced two companies and a US investor to launch it for domestic use
- To gain travelers' thoughts about using a water atomization concept in an aircraft, an online survey was done, with around 90% agreeing it was an excellent idea

SMALL WORLD

- The first flight of a printed electrics circuit made in public took place on the Crystal Cabin Award Pitch – and it was powered by a helium balloon
- The first functional circuit demonstrator of the project was printed in an Airbus lab on a standard DIN A4 office printer (*)

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THE SEATBACK IFE DISPLAY: WITH THE GROWTH OF CONNECTIVITY AND BYOD, SHOULD WE EXPAND IT, SHRINK IT, KEEP IT, OR LOSE IT? HERE'S WHAT SOME OF THE EXPERTS HAVE TO SAY...

A F F

ALLET





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THE ZOMBIE SEATBACK SCREEN

John Walton garners opinion about the future of the seatback IFE display from throughout the aircraft interiors industry

he fate of the seatback IFE monitor has been the subject of much discussion, particularly as several carriers move toward offering only streaming entertainment to devices.

Says a Boeing spokesperson, "We've noticed many operators, especially in the single-aisle market, are moving away from installing seatback monitors. Carriers are focusing on providing reliable

internet and charging outlets." "Seatback is alive and well," counters Rockwell Collins' senior director of strategic marketing, Richard Nordstrom. "The large legacy and national carriers say it is a must on aircraft making international flights. It's a proven method for creating cabin class service differentiators and hyping the 1,500 movies available to your passengers."

Notably, Nordstrom suggests wryly, "Passenger boredom does not always make for the best cabin environment. The domestic, regional or LCC airline might see this service as expensive and not delivering enough value to the aircraft's revenuegenerating capabilities."

"Maybe," Rockwell's Nordstrom muses, considering the viewpoint of an LCC, "there

"It's a proven method for creating cabin class service differentiators"

is another way to create a similar service without the weight, complexity of equipment and high purchase/maintenance costs? The ubiquity of today's PEDs traveling with passengers on flights is so high, we have reached critical mass where BYOD is really taking off. One very large North American airline has recently broken with tradition and is looking closely at onboard wi-fi services as its primary onboard service in place of seatback monitors.

"Will seatback disappear soon?" Nordstrom asks. "No. But as you read this,

> there will be another airline that no longer wants to pay for the total cost of ownership associated with seatback, and is planning a transition to an all-wireless IFE fleet."

Here's what another 10 industry experts have to say...



HERE TO STAY

Michael Childers, IFE content management consultant and APEX board member, states, "Given that IFE systems have a 10- to 12-year lifespan, embedded IFE is not going to go away anytime soon. However, to the extent that wireless systems can support the bandwidth required by the services being offered, wireless offers many advantages."



What Airbus says

We asked Ingo Wuggetzer, Airbus's VP of cabin marketing, his opinion of the future of seatback IFE. "We see that on shorter trips, connectivity is key. A high percentage of passengers bring devices on board, and sometimes prefer to use their own devices. But for long-range flights, a bigger screen is better and people can second screen – something that people do at home already. That's why I believe, for the mid- to long term, we will still see screens in seats."

Axel Becker, manager of trends research for cabin programs, adds, "I agree. Particularly with long-range flights, we are moving toward what we call a 'multiscreen environment' for the passenger. The in-seat screen should be of a greater size and quality than the passengers' tablet.

LOOSELY EMBEDDED

"I strongly believe that some kind of embedded system will remain on long-haul flights – especially in the premium cabins, which will also expect superior video quality," says Jan-Peter Gänse, head of passenger experience products at Lufthansa Systems. "However, I am using the term 'embedded' somewhat loosely, as it might very well be fixed screens that are connected to the head end over a wireless connection. I also believe that there will be a need to be able to upgrade screens more regularly."





'AND' NOT 'OR'

"There has been talk in the media lately that with the growth of BYOD, seatback IFE screens will become extinct, but we do not believe that to be the case," states Jon Norris, senior



director of marketing at Panasonic Avionics. Airlines have varying requirements for what they want to provide to passengers. Relevant factors can include region, length of flight, and also whether it's a narrow-or wide-body aircraft.

"With wide-body aircraft, Panasonic is still seeing predominantly embedded systems. A lot of airlines, particularly those with narrow-bodies that are taking streaming solutions, are those that in the past would not have had an IFE system at all. As a result, we look at BYOD and streaming as a positive, as it has increased our addressable market. Still, in most cases, embedded systems are not being taken off to install streaming solutions.

"Another factor is that we live in an 'and' society. People don't want embedded *or* streaming. They want both. The trend in homes and offices is about second screens. You watch the big HD 4K TV in front of you and browse the tablet in your lap at the same time. We are seeing this trend increasingly move onto the aircraft."

The good W-IFE

Craig Foster, senior research consultant at Valour Consultancy, asserts that this rise in the W-IFE sector will not come at the expense of embedded seatback IFE: "Nearly every wide-body is delivered with embedded IFE and this is unlikely to change for

some time yet. Also, passengers have come to expect that they will be able to watch the latest Hollywood films on longer journeys, but early-window content cannot always be streamed to passenger devices."



Delta sticks with seatback

messaging and business applications."

BIG AND BEAUTIFUI

engagement with content, advertising and promotion. Seatback displays are on all the time, never need charging, can be big and

beautiful, and offer a fresh experience compared with passengers'

own devices. Connected devices are best for powering social,

Peter Lemme, owner and author at Satcom Guru, says, "Embedded IFE systems offer the greatest passenger

"Delta is 100% committed to seatback IFE," states Chris Buckner, Delta's director of onboard products. "Our customers love it – and they tell us that, which is fantastic. It's definitely a benefit we will continue to offer. It's amazing how much customers love seatback IFE, as many don't want to have to take out a laptop or tablet, or watch something on a phone. They want to have a proper screen in front of them that enables them to relax and disengage from their PEDs."

10 YEARS LEFT

"Five years ago, I said that embedded IFE had a 10-year horizon, and I still believe that is true for twin-aisle aircraft," says IFEC specialist Michael Planey from HMPlaney Consultants. "The IFE screen is still the best use of seatback real estate for creating positive passenger interactions and generating ancillary revenues. But wireless is where the most substantial growth will happen as it expands the market into smaller aircraft that previously could not sustain traditional IFE systems."

A multiscreen world

"I personally do still see life for embedded IFE," asserts Jeff Sare, vice president of air transport cabin solutions at Rockwell Collins. see more of a multiscreen environment – not fewer screens There will be more and different types of screens depending on

"Will it look the same a decade or two decades from now, will it have the same functions and purpose? No, I don't think so, but if you look at the terrestrial world today you see more of a multiscreen environment – not fewer screens. There will be more and different types of screens depending on what airlines want to do, but it won't be IFE in the way it is today – although large screens will be embedded. \otimes




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BELOW THE SURFACE

Plating expert FH Lambert has been updating its facilities and processes to improve its efficiency, quality and environmental status

ased in the UK, FH Lambert is a decorative precious metal plating company that works primarily within the aviation industry, as well as automotive and marine.

The company has been at the forefront of decorative precious plating for some time now, and is already recognized as an AS 9100 accredited company. FH Lambert is continually seeking ways of improving the company's day-to-day running as well as becoming more environmentally aware.

Changes have already been implemented at the company with the aim of providing a more energy-efficient working environment and a cleaner working system.

The company has also begun developing and assembling a new processing line, named the B Line. Each processing tank in the B Line has been designed with a systematic method in place to allow for waste minimization and for ease of access to carry out any maintenance required.

The tanks have also been insulated and sealed for heat retention, a feature that contributes toward energy consumption savings.

Further changes later this year will include the addition of new solar panels on the roof of all three of the company's units in Hertfordshire, in the south of the UK. The energy generated through these panels will feed into the main plant for use in production, and any excess will also be directed back into the main power grid. In total, all the panels will provide an estimated 50kW, reducing FH Lambert's energy consumption by roughly 21% and decreasing any charges forwarded on to customers.

Recent improvements to the company's facilities also include an improved water curtain and new flooring



for the spray department. A new alarm system has also been integrated into the booth doors, allowing the spray booth to go into a lockdown mode if the doors are left open.

Improvements have also been made to the flooring and water curtain within the booth, with the aim of preventing foreign object debris from entering the booth and reducing dust contamination, which will further improve product quality.

FH Lambert has also made updates to its polishing department, with some of the equipment such as polishing motors having been completely overhauled and renovated, improving the efficiency and FH LAMBERT IS INVESTING IN CLEAN PRODUCTION TO HELP ENSURE PERFECT PRODUCT FINISHES

creating a cleaner working environment for employees and their output.

Overall FH Lambert has a committed drive and determination to continually improve. The company's methods of operating have played a key role in the company's success, keeping it up-to-date with the latest needs of the market and of the environment – driving the company forward and beyond.

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PERCEIVED QUALITY

French transportation design studio Style&Design shares its vision for what it considers one of the most strategic moves for the aerospace industry

n 2009, two companies merged their complementary core skills of prototyping and Class-A modeling to create Style&Design, a studio located in the Paris region of France. Both partners had strong expertise in perceived quality within the automotive industry, and over the years since, Style&Design has grown to 110 staff and has developed innovative tools and capabilities to offer to the aerospace world. These tools are particularly useful for supporting the aircraft cabin industry's efforts in re-inventing the passenger experience with quality products that can help create unique and compelling brand promises.

The studio's strategic shift to aviation was first marked five years ago when it took on challenging projects for seat vendors relating to long-range business class seats, innovative concept seats for various exhibitors at Aircraft Interiors Expo, and creative design for premium economy and economy class seats.

This work translated into a stylish, high-end business class seat, which will be delivered in 2019 to a 5-star airline.

Laurent Stritter, who joined Style&Design in early 2018 as VP of aerospace, having spent 22 years in the aircraft seat business, gives his perspective: "The cabin market is becoming increasingly diverse and demanding, and, like any other mature market, it would benefit from some fresh ideas and disruptive approaches.

"Let's consider business class, which is an iconic product for airlines, representing one of the greatest vectors for their branding, as well as one of the highest contributors to their profit," continues Stritter. "These seats are installed in a cabin where the cost per square meter is much higher than anywhere else on the planet, and these seats will keep flying for 5 to 10 years, so you'd better get them perfectly right from the outset.

"The need for higher-quality products is reinforced by the shift we see in other industries such as luxury hospitality, where consumers are looking more for experiences than products...

"Going back to business class seats, since beds cannot be any flatter, what is the next big thing in this cabin? The most likely thing is probably perceived quality, and I am convinced that Style&Design is the one organization able to support the migration from use value to experiential value," Stritter adds.

The team at Style&Design has a rich and diverse set of complementary skills. The company's value proposition is unique in the cabin world and shaped its Qore product development offer, which extends from marketing services, to perceived quality design processes, supported by 3D modeling and prototyping.

For more insight into perceived quality, see our feature on p22

In addition, while this industry is just starting to recognize the importance of perceived quality, Style&Design has a great level of maturity in this area and has also launched BenchmarQ, which can digitize perceived quality.

This approach gives subscribers access to a perceived quality scoring database (scores include shape, look, feel and usage), complemented with key dimensions, panoramic interactive tours, and other details instrumental to marketers and engineers from airlines or seat vendors.

BenchmarQ started this year with what could be the most iconic business class seats in the world, with premium economy and economy class seats following by year-end.

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BETTER THAN THE REAL THING

Introducing the newest addition to Lonseal's range of aircraft flooring: Loncontrail wood effect

he Cirrus Collection by Lonseal comprises a variety of intriguingly realistic wood looks for aircraft flooring. From the intricate grain details to the unique characteristics of real woods, Lonseal develops flooring that is luxurious in style and delivers high performance and quality. The Cirrus Collection provides the timeless beauty of wood that enhances the aesthetic environment in an air cabin space.

Loncontrail is the newest addition to the Cirrus Collection. Loncontrail has the appearance of a natural striated wood, with a thick, combed design. The continuous brushstroke is a soothing effect in the cabin environment, which can be a space of anxiety and stress. Loncontrail creates order in a demanding space and brings in a sense of harmony and balance.

This new sheet vinyl flooring product not only sets the emotions and moods of passengers and visually expands the cabin space, it is also easy to keep clean and maintain. Scuff marks are easily camouflaged and the deceptively smooth surface makes it relatively easy to wipe clean in the event of spills and splashes. THE LONCONTRAIL RANGE OFFERS STYLE AND PRACTICALITY AND IS AVAILABLE IN FOUR COLORS

> The Loncontrail ooring range will officially launch in summer 2018



FEATURES (nominal data)

Roll width: 6ft (1.8m) Roll length: 60ft (18.3m) Overall thickness: 0.080in (2.0mm) Wear layer thickness: 0.020in (0.5mm) Weight: 72oz/sq yd (2,441g/m²)

Loncontrail is available in four colors, designed to add luxury to the cabin: 9401 Spiced Wine, 9402 Knight's Armor, 9403 Hickory Nut and 9404 Charcoal Blue.

The flooring material also meets key FAA requirements, including FAR 25.853a (12-second vertical flammability test) and FAR 25.793 (factor of sliding friction).

Lonseal became a leading company in the aviation industry leader because of the featherweight nature of its aircraft flooring collections, with Lonseal aircraft flooring claimed to be more than 30% lighter than standard NTF products. The lightweight materials and high strengthto-weight ratio of Lonseal's aircraft flooring ranges mean that they are specified by many aircraft designers and airplane manufacturers. @

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NEW BUSINESS

The FACC aviation group is opening up new business fields with aftermarket services including repair, refurbishment and replacement, and is launching further product innovations

he FACC aerospace group has been providing broad know-how, competence, professionalism and flexibility in the development, production and repair of innovative lightweight components and systems for 25 years. The high-tech company is now expanding its portfolio to include offering its expertise to the aftermarket services sector in response to strong market demand. As an original component manufacturer and technology partner to many well-known customers worldwide, the new unit supports existing business areas with valueadded services.

"Both the increasing numbers of aircraft flying and our specific expertise open up great potential in the repair and maintenance area, and the 200% growth in this area at our US location also shows us that this is the right move," says Robert Machtlinger, CEO of FACC.

The new FACC Aftermarket Services capabilities are offered worldwide to airlines, MRO stations, parts and service providers, and existing as well as new OEM customers.

The first locations for these services are FACC's group headquarters in Austria for EMEA as well as the FSI-Wichita subsidiary in the USA for the Americas. All required approvals, such as EASA.21J for design organizations, AT.21G for production organizations and EASA AT.145 for maintenance organizations, as well as FAA and TCCA certifications, have been obtained. An FSI-Montreal subsidiary in Canada will follow soon.

AUSTRIAN INNOVATIONS

FACC's latest production milestones will be seen in the field of aircraft interiors. For example, the company's new interior product, the Passenger Luggage Space Upgrade, enhances



PRODUCING A320 LUGGAGE RACKS

RIGHT: THE PASSENGER LUGGAGE SPACE UPGRADE ENHANCES SPACE AND STOWAGE

stowage space as well as cabin space. This upgrade package does not simply enhance the look and feel of a cabin due to the redesigned overhead stowage compartment flaps and latches. It also enhances functionality by offering significantly more space while saving weight. The cabin doors in this design offer airlines a wide range of customization and branding options and - even better - this cabin upgrade can be installed in one night.

Austrian Airlines, the cooperation partner and launch customer of FACC, was also convinced of the strong arguments for and impressive advantages of the stowage upgrade and is therefore launching its upgraded A320 Classic cabins in autumn 2018. In addition to the modern cabin appearance and increased luggage

space, the luggage upgrade makes boarding and turnaround faster.

CENTER STOWAGES

FACC also has a new cooperation agreement for its Center Ceiling Stowages (CCS+) product, with Lufthansa Technik recently signing up for development and production of CCS+. The compartments are primarily intended for the stowage of additional luggage or items such as emergency equipment in the front, middle and aft sections of the cabin. CCS+ will be a retrofit solution for single-aisle aircraft types such as the Airbus A320 from the end of 2018. 🛇

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HIDE TIMES

Cortina Leathers is launching a new leather offering and expanding its global representation

ortina Leathers has announced the introduction of Jetstream, a new line of aviation leathers, which are made in the USA to the highest performance standards and are designed to offer excellent value. Custom colors and small dye lots are also available, with short lead times.

Jetstream joins the company's range of Italian-made leathers launched last year – the Mediterranean-inspired Collezione Vento. This line of beautiful, high-performance leathers is produced in Italy, with the range named after the wind gods of Greek mythology: Boreas, Eurus, Notus and Zephyr. Each god is associated with various seasons and weather conditions, which is fitting as these leathers perform well, whether conditions are polar or subtropical.

In addition to its added global capabilities, additional leather lines, and strong growth, Cortina Leathers is also expanding its representation in Europe. The company has signed an agreement to work with BOES Aerospace as its representative across Europe. Signed at Aircraft Interiors Expo in Hamburg in April, this agreement adds a Europebased company with tremendous technical experience to enhance the company's ability to service European customers.

According to Geo Tomczyk, head of global aviation business at Cortina Leathers, "The addition of US operations in the form of an ISO-certified leather finisher that has been in operation since 1903, and Europe-based representation, are significant steps forward in our continued growth. Along with our relationship with Topcast Aviation in Asia, we are really getting the pieces in place to support our customers anywhere in the world and at any price-point and leather quality." Cortina was the first supplier to introduce chrome-free aviation leather

CORTINA LEATHERS ARE AVAILABLE IN MYRIAD COLORS AND FINISHES, ALL OF WHICH ARE HIGH QUALITY

A product of nature, leather is no mere covering. Is it any wonder it connects with us the way it does? The look. The feel. Even the smell. Leather is soft, supple and breathable, without any of the uncomfortable heat and moisture build-up of polymeric substitutes. It is durable and lasts much longer than even the most stalwart upholstery. Beautiful yet practical, it has all the nuances of a fine wine and, like wine, the art of processing it to meet customer expectations requires a high level of skill and precision.

Tanning is a multistage, lengthy and time-consuming process, beginning with a natural raw material that is treated with penetrating aniline dyes that give it a base color throughout and draw out the beauty of the grain. The blending of that color with luster, achieving the right shade and texture, is artisanal every step of the way. And, relying on over 100 years of expertise, Cortina Leathers closely supervises the final application of protective coatings and customization of the leather, which can range from matt to glossy, according to customer branding requirements.

By integrating this comprehensive expertise of customizable US and Europe-sourced leathers along with worldwide representation, Cortina can offer customers more ready access to the full complement of great products and services for which it is known. \otimes

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EXECUTIVE KEYNOTES

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SOFT FOCUS

A PUR foam has been developed for aircraft seating that enables new design possibilities, while also passing all relevant heat release tests

An experienced supplier of polyurethane (PUR) products for aircraft seating, Ebco, has decided to use its own special polyurethane foam for armcaps.

The company decided it was time to develop a brand-new foam that fulfills the requirements of heat release tests and heat release rates. After three years of intense research, looking into customers' requirements for molded foams, Ebco can now introduce the result: PUR 170-2F.

The introduction of this foam means that manufacturers of aircraft seating and cabin parts are now able to use a foam that passes heat release tests and the complete ABD 0031 (vertical test. smoke density, toxicity) for armcaps or any other parts covered with leather.

Until now, foam materials have usually shown weakness when applied to padded leather parts of aircraft interiors such as a failure to pass the ABD0031 heat release test, a lack of elasticity or



compression strength, and/or insufficient durability. Also, such foams could only be made into simple geometric shapes.

On the other hand, Ebco's Heat Release foam is highly resilient and can be customized by adjusting it to the required hardness or softness. Additionally, it provides excellent

durability over time. The specific weight is approximately 0.1-0.2kg/l depending on customer-specific designs.

The production of PUR 170-2F requires specially heated aluminum molds, which enable very complex geometric shapes. This eliminates costintensive contour milling or trimming of blocks of foam material. So far, part sizes of up to 500 x 500 x 25mm are possible. PUR 170-2F can also be foamed directly onto metal or plastic parts without gluing.

"After a long development period, we are finally looking forward to introducing this foam to the market," says Hanspeter Ebner, CEO of Ebco, "It is crucial for us that our technical innovations meet the requirements of our customers." 🔊

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Singapore A380

The flying public and cabin designers spent much of the early 2000s speculating about what the A380 double-decker dream machine might bring to the travel experience, with ideas ranging from high-density mass transport to airborne resorts with gyms, spas and even bowling alleys. The moment of truth finally arrived in October 2007 when launch customer Singapore Airlines (SIA) revealed the interior of its first A380. The airline's accountants had injected a little sobriety into the use of the mega-expensive flying real estate, but marketing and design had clearly fought their corner to ensure this was a landmark aircraft that Airbus could be proud of, a flagship aircraft that SIA could be proud of, and an aircraft the public could really be excited about.

SIA began work with Airbus on the project in 2001, and faced with the giant blank creative canvas of two decks, came up with 40 to 50 initial concepts, inspired by customer feedback. As Sim Kim Chui, SIA's then vice-president of product development told *Aircraft Interiors International* at the launch event, initial concepts included some that made use of the cargo space. One concept even proposed the installation of a mezzanine floor. "We didn't dare tell Airbus about that in case we frightened them off!" recalled Sim.

Various ideas were presented to SIA's frequent flyers at feedback sessions to find out which cabin features were most important to them, and it was found that they placed far less importance on headline features like showers and shops than they did on the more basic factors they want in any aircraft experience: space, freedom, sleep, privacy and control over their environment.

To meet these requirements, SIA specified a relatively low cabin density of 471 seats at a 32in pitch, some way ABOVE: THESE RARELY SEEN CONCEPT SKETCHES FOR THE SINGAPORE AIRLINES A380 FIRST CLASS SUITES WERE CREATED BY JEAN-JACQUES COSTE OF COSTE DESIGN

short of the maximum capacity of 853. Of course, the majority of the seats were in economy, with 399 fitted across both decks. In response to feedback that customers prefer smaller cabins, colors were applied to visually divide the huge economy spaces for a more intimate feel. The Weber cradle seats were fitted in a 3-4-3 configuration on the main deck, and 2- 4-2 on the upper deck, with a generous 19in width.

The 60 business class seats were arranged in a tessellated 1-2-1 seat configuration at a 52in pitch (the industry average at the time was 55-60in), across 60% of the upper deck, and at 34in wide the seats were the broadest in their class. The distinctive seats were designed by JPA (the start of a relationship, as Sim is now product innovation director at JPA Design's Singapore studio) and manufactured by Koito.

The real crowd pleaser, though, was first class, which the airline described as 'a class beyond first'. Customers said they wanted privacy, and with the 12 enclosed suites in first class they certainly got it – plus the option for couples in the center pairs to create a double suite.

The suites were designed by French yacht designer Jean-Jacques Coste, and manufactured by Jamco and Sicma Aero Seat. According to Coste, the idea of having eight suites, plus a 'presidential suite' located below the forward stairs, was mooted, but it was decided that the space was needed for stowage. A similar idea was revisited years later with Etihad's Residence, though it is fitted in a less useful space forward of the stairs on the upper deck.

SIA certainly created a special and significant A380 interior, and a decade later has created a worthy interior to succeed it (see our website). Just imagine what they're planning now... 🗞

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