

Aircraft *interiors* INTERNATIONAL

JUNE 2014

THE INTERNATIONAL REVIEW OF AIRCRAFT INTERIOR DESIGN AND COMPLETION



plus

INTERVIEWS WITH KEY FIGURES INVOLVED IN THE ETIHAD PROJECT, INCLUDING THE CCO AND THE ETIHAD DESIGN CONSORTIUM

etihadunlimited

CREATING THE ULTIMATE IN LUXURY INTERIORS FOR ETIHAD'S A380 AND B787 FLEET BECAME THE ULTIMATE CHALLENGE FOR THE DESIGNERS AND THE AIRFRAMERS. READ THE FULL STORY INSIDE

batteryissues

DO THE BATTERIES IN PASSENGERS' PERSONAL ELECTRONIC DEVICES PRESENT A FIRE SAFETY RISK?

paxdemographics

PASSENGER PROFILES ARE CHANGING, AND SO ARE CABIN NEEDS. WHAT'S NEXT?

seatmaintenance

HOW OLDER SEATS CAN BE REFURBISHED TO BE EVEN BETTER THAN WHEN THEY WERE NEW

seatingreview

SEAT MAKERS ARE INNOVATING ACROSS EVERY CLASS OF TRAVEL, AS OUR ANNUAL ROUNDUP SHOWS

CHECK IN TO RECARO'S NEW BUSINESS CLASS

The innovative RECARO CL6710



Ingenious design: The new RECARO CL6710 represents a perfect synthesis. It combines premium comfort and a high-density cabin layout. The seat has a timeless design, innovative functionalities and is extremely reliable.

Premium comfort: Business class means premium comfort. For RECARO it means tangible and visual comfort at the highest level. In the CL6710 passengers travel in their own compartment-like area, which offers excellent living space and a high degree of privacy.

Perfect ratio: Efficiency can be measured in figures. The ratio 1 to 1.8 (pitch to bed length) is a key number reflecting the efficiency in what is important in the business class: the bed length. With a resulting bed length of 78" up to 82", direct aisle access for every passenger, and a variety of stowage opportunities, the seat is an extraordinary combination of outstanding features with an attractive business case for airlines.

026

“ The Etihad team started work from the bare skeleton of the A380, and by the end of the project had made more than 400 revisions to its LOPA ”



066



070

spacerace

It is rare for an airline announcement to completely stun me, but when Etihad's three-room A380 Residence was revealed, it did just that. In the space of an hour-long press conference the world of aviation changed once more, with the halo of first class being raised further heavenward. Even more impressive than the level of luxury is that, rather than being a frivolous use of valuable space, creating the Residence was actually an extremely space-efficient and commercially astute decision.

There is a depth of engineering and of product quality in Etihad's new cabins – across all classes – that simply has to be experienced to be fully appreciated. If you can't talk your way into Etihad's impressive Innovation Centre in Abu Dhabi, I hope our feature on page 26 will help you understand more about the details. And if you want to know more about Etihad's decision to create some remarkable new interiors, and what their choices might mean for future airline industry projects, Peter Baumgartner, Etihad's chief commercial officer, explains all in an interview on page 40.

With a seven-year development program already underway on the next generation of Etihad interiors, the question has to be: what on earth will they dream up? And how will the airline industry respond in the meantime? Indeed, rumors abound that certain other Middle Eastern carriers are busy making enhancements and adjustments to their next-generation premium cabins as a consequence of the Residence reveal.

Adam Gavine, editor



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regulars

009 news

Air France reveals the most luxurious part of its Best and Beyond plan; a roundup of the latest industry statistics; Monarch becomes the launch customer of a fixed-back economy seat; Asiana reveals its A380; Air Canada unveils its Dreamliner and more...

022 design briefs

A high-tech first class suite that gives you options for your journey, and a concept for a space capsule interior

etihad reimaged 026

Abu Dhabi carrier Etihad's new interiors have pushed Airbus, Boeing and its cabin supplier list to new limits – and they may push the whole industry too

ADAM GAVINE



features

masterplanner



040 interview: peter baumgartner

Etihad's chief commercial officer discusses investing in innovation and departing from airframer catalogs
ADAM GAVINE

hiddendanger



048 dangerous devices?

Passengers are checked for all manner of dangerous items at security, but could it be their personal electronic devices that pose the major risk to aviation safety?
MARISA GARCIA

peerpressure



056 passenger demographics

The key audiences for whom interiors are being designed are changing. It's time to get to know the Millennial, the Gen-TREP and the Silver Flyer a little better
MARISA GARCIA

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The latest product news from our advertisers

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120 classic cabins

There have been few flight experiences more glamorous than Boeing's 377 Stratocruiser



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066 lufthansa premium economy

A closer look at Lufthansa's premium economy product – the airline's first new travel class in 35 years
 MARYANN SIMSON



070 seat maintenance

As seat refurbishment materials and techniques advance, older aircraft seats can offer a surprisingly wide scope for adaptation and even improvement on their original designs
 BERNARD FITZSIMONS





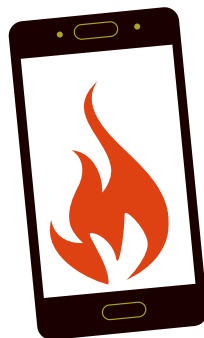
080 annual seating review

2014 is a great year for new and innovative seating products across all classes of travel. Join us as we profile the latest entries to the market, and a few concepts too



104 crystal cabin awards

Seven fantastic aircraft interior innovations have been recognized by the international jury in this year's coveted Crystal Cabin Awards. Find out more about the winners, and about how to apply for next year





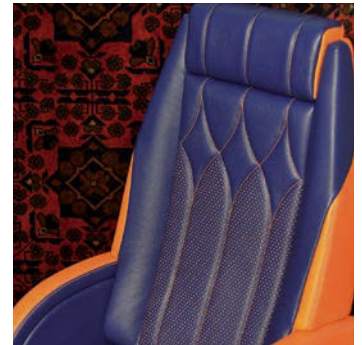
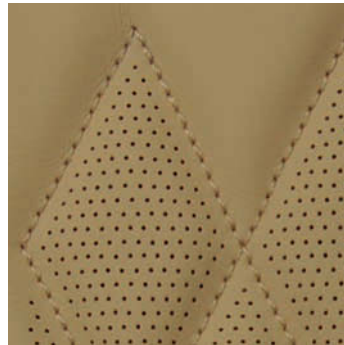
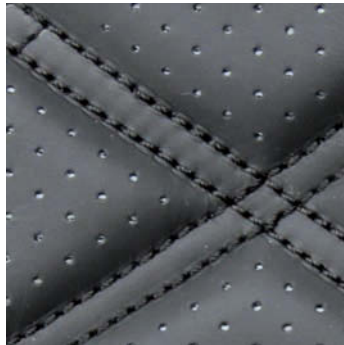
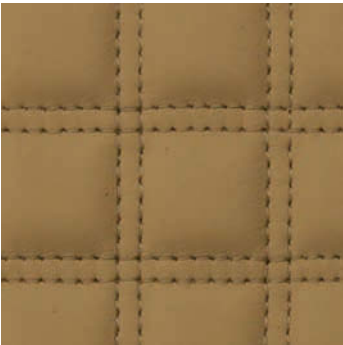
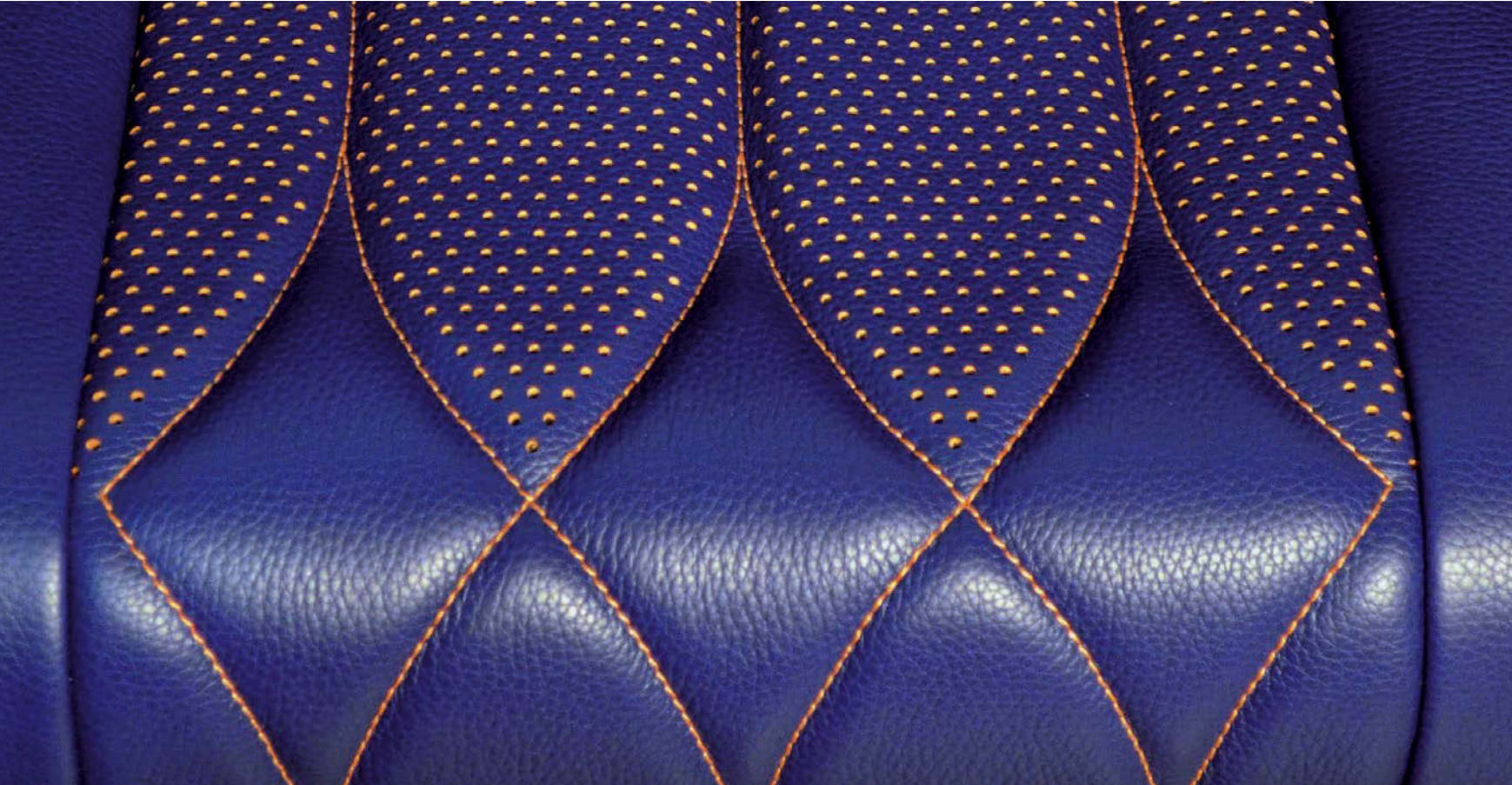
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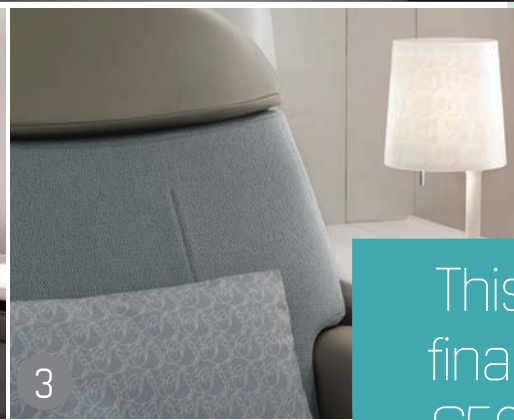
AERISTOCRAFT





BON APPÉTIT

The La Première inflight dining experience is highly luxurious, with caviar, foie gras and champagne on offer. Of course, ingredients are only as good as their chef, so Air France has a cast of renowned chefs who take it in turns to design the menu, including Joël Robuchon, Régis Marcon, Guy Martin, Michel Roth and Anne-Sophie Pic. Their creations are presented on tableware designed by Jean-Marie Massaud, which includes a full service of more than 40 unique pieces.



This is one of the final steps in the €500m Best and Beyond investment

curtaincall

Take a glimpse behind the curtain of Air France's new La Première suite, designed for a soft, hotel-like experience

As Air France's Best and Beyond program of product enhancements continues, the airline has revealed the jewel in its crown: its new first class suite, which will be retrofitted to 19 of its B777-300s (four on each), beginning in September. The key aim of the specially designed seat is to create a luxury home or hotel experience, and the airline worked with B/E Aerospace, Priestmangoode and Brandimage to ensure that the 3m² suites feel private and comfortable.

The overall feeling is soft and luxurious, with the sidewalls clad in a leather-effect material, and the seat covered in a thick, soft tweed. Soft leather covers the headrests and armrests, and the stowage compartments are lined with suede. The final touch is that when the passenger desires privacy, the suite is closed not by using doors, but by drawing the thick curtains, which adds to that feeling of softness. If the drawn curtains do not feel quite private enough, at the press of a button a partition can be raised from the aisle-side armrest. With the curtains and partition options, guests can tailor their own level of privacy at different phases during a flight.

The feeling of domestic or hotel luxury is enhanced by the suite not feeling overly high-tech, with the seat controls and the 24in HD TV being the only obvious items, while other features are subtle, such as the electric blinds for the four windows, and the bedside lamp with a base that can also be used as a place to keep earrings or cufflinks.

Instead attention has been paid to soft elements, which include a 'boudoir' cushion, an additional mattress for the bed, soft pillows, a Sofitel My Bed duvet, a cotton sleep suit and a leather Givenchy amenity kit. As Air France says, the result is "a bed worthy of the greatest hotels and comfort identical to that of a night spent at home".

- 01. The curtains offer a softer, more flexible alternative to sliding doors
- 02. The palette is mainly ice blue and pale gray, with occasional flashes of Air France's signature red
- 03. The bedside lamp is studded with seahorse motifs

PREMIÈRE LEAGUE

Bed length	79in
Bed width	30in
Seat width	22in
Overall suite length	90.5in
Total surface area	3m ²

THAT'S ENTERTAINMENT

The key to a memorable and enjoyable flight experience is the cabin crew, and when it comes to offering something a little extra, Asiana has gone the extra mile. If your flight is part of a celebratory event – a birthday or an anniversary perhaps – the crew can throw an inflight party, even including face painting and balloon animals. But that's just the start: the crew is also trained to give make-up lessons, to mix the perfect cocktail, to draw souvenir caricatures of passengers and can even give barista lessons to coffee lovers. The best thing about these services is that they are included in the fare, and are available to all.



The A380 also features a new GUI for the IFE system, named OZ:enter

goinglarge

Asiana has become the 11th member of the A380 club

- 01. Upper-deck economy passengers also benefit from personal lockers
- 02. The 32in displays in first class are impressive
- 03. Depending on the seat row, center seats can be suitable for couples or strangers
- 04. Premium economy passengers enjoy 11.1in IFE displays

South Korean carrier Asiana has become the 11th operator of the Airbus A380, configuring the first of its six aircraft with 495 seats: 417 in economy, 66 in business and 12 in first class. The airline teamed up with a London-based agency for the design, which blends comfort with cabin density, and is consistent with the cabins recently launched on its B777-200s.

The first class cabin, located at the front of the main deck, features enclosed suites with twin sliding doors. The suites offer an 83in seat pitch; a 'buddy seat' so another passenger can join you for dinner; a 32in HD IFE monitor from Panasonic (this also flies on the B777s and is the world's largest IFE display); and a mini closet. To aid comfort, a tablet-like Seat Function Control Unit enables occupants to adjust seat length and position, from relaxed, to dining, to fully flat. If you wish to sleep, crew will add a duck-down duvet to the bed, and you can snooze in comfort under the starry night-effect ceiling lights.

Also available to first class passengers is a bar and lounge area, located at the top of, and to one side of, the stairwell. The other side of the stairs features a large 'powder room' with space to double as a changing room. This space is quite generous as the airline does not offer a shower in this area.

The upper deck also features the 'Smartium' business class cabin, with its 66 seats configured 1-2-1. The seat is a customized Sogerma Solstys model with a large side table and a 15.6in HD IFE monitor. Business passengers can also make use of the bar and lounge area.

In economy (named Travel Class), some may prefer to sit in the upper deck as those 106 seats are configured 2-4-4, while the 311-seat main deck cabin is 3-4-3. For the A380, the economy seats are 1in thinner than the models on the rest of the fleet, which helps create the 34in seat pitch. Other conveniences include a fold-down footrest and an 11.1in HD IFE monitor.

Work is currently underway on the next step in Asiana's wide-body fleet modernization strategy, for which 30 A350 XWBs are on order.

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actionfigures

The latest industry statistics indicate positive growth for the aircraft and airline industries, but there is still work to be done on passenger satisfaction

US\$3.5bn

The global commercial aerospace seating market is likely to grow to US\$3.5bn from 2013-2020
Research and Markets

The commercial aircraft cabin lighting market is expected to grow from 2012's value of US\$960.8m, to **US\$1.25bn** by 2017
Markets and Markets

Between 2013 and 2032, air traffic to and from Germany is set to grow at **3.5%** per annum (global average 4.7%), driving a need for **1,821** new aircraft. The fleet of aircraft serving Germany will grow by **80%** from **1,013** to **1,821** aircraft by 2032 and is forecast to consist of **1,338** single-aisle, **386** twin-aisle and **97** very large aircraft
Airbus Global Market Forecast

- **89%** of US travelers want an end to checked baggage fees
- **42%** would pay to have dedicated overhead bin space
- **35%** would pay to have their checked luggage come out first at baggage claim
- **89%** feel that comfortable seats are important
- **45%** would pay for extra legroom
- **26%** would pay to have an empty middle seat next to them
- **34%** would pay to prevent the seat in front of them reclining
- **36%** would purchase a fast pass to speed through security

Fly.com survey



The global commercial aircraft cabin interior market has an estimated value of **US\$12,852.96m** in 2014, and is expected to grow at a CAGR of 5.99% to reach **US\$17,194.9m** by 2019
Research and Markets

Airlines score **69** on the 100-point American Customer Satisfaction Index scale, beating only subscription TV service, social media and the IRS. **Poor inflight service and lack of seat comfort** are two major reasons for the low score, receiving scores of **67** and **63**, respectively. On the other hand, passengers are pleased with the **check-in process and ease of booking**, which both scored **82**.
American Customer Satisfaction Index



In 2013, US domestic carriers made **US\$3.35bn** in baggage fees
US Bureau of Transportation Statistics

The IFEC market is expected to grow at a CAGR of **6.67%** from 2012 to 2017
Markets and Markets

The North American commercial aircraft cabin interior market is expected to grow at a CAGR of **3.41%** from 2014 to 2019
Research and Markets



US travelers between the ages of 18 and 24 want a PED or kiosk to be part of the travel experience

- **68%** would prefer an airline that offers payment options via a mobile device or self-service kiosk for seat upgrades, checked baggage fees, inflight meals, IFE options, wi-fi payment and duty free
- **77%** would like to be able to make airport-related purchases, such as parking, souvenirs, meals and reading materials using a mobile device or self-service kiosk
- **77%** would like to be able to use frequent flyer or loyalty points for airport purchases
- **51%** are willing to provide personal information in order to receive tailored offers relevant to their location and shopping habits. Only 19% of travelers aged over 65 would share such information
- **70%** would like to be able to view and purchase items from airport retailers using a self-service kiosk or mobile device and have them delivered direct to their destination

NCR Traveler Experience Survey

US\$



With the choice of the Vantage XL seat and line-fitted RAVE IFE systems, SAS has taken an avante-garde approach



CRUDE TALK
 SAS is launching an unusual travel service, beginning in August: an all-business B737-700 that will operate on the oil-rich Stavanger to Houston route. The aircraft, wet-leased from PrivatAir, will carry the SAS livery and is being fitted with 44 long-haul business seats complete with IFE, and a full cabin service will be offered.

subtle distinction

SAS's understated cabin design belies some bold decisions and strong cabin innovation

- 01. The latest technology is paired with traditional Swedish bedding
- 02. There has been a lot of interest in the Vantage XL seat, and this attractive project may add a little more
- 03. The natural feel of textiles and woods is carried into the economy cabin

Scandinavian carrier SAS (the flag carrier of Denmark, Norway and Sweden) has revealed its plans for upgraded long-haul cabin designs, which will debut on seven of its A330/A340 fleet in early 2015 following a retrofit program, with new seats, new styling, upgraded IFE and wi-fi available to all passengers.

In business class, SAS will be among the first to install Thompson Aero Seating's Vantage XL seat, which will be in a 1-2-1 configuration, offering direct access to each guest. The seats, which were engineered and customized in conjunction with Factorydesign, include a massage function, a fully flat 196cm-long bed, 15in HD IFE displays, power outlets and USB ports. To add to the luxury experience, the luxury bedding, which is in a gingham-style pattern of gray tones, is sourced from Hästens, the oldest bed manufacturer in Sweden.

In economy (SAS Go), the 2-4-2 cabin is fitted with Zodiac seats at a 31/32in pitch, with 9in HD IFE screens, shared power outlets (one per pair), plus individual USB ports.

In premium economy (SAS Plus), the 5810 model from Zodiac Seats USA was selected, configured 2-3-2 at a 37/38in pitch, with 12in HD screens, individual power outlets and USB ports.

"SAS customers will enjoy a totally new travel experience in our upgraded cabins," said Rickard Gustafson, president and CEO of SAS. "The new interior

is designed to meet the needs of frequent flyers and substantially enhances our customer offer."

The first aircraft to be retrofitted with the new cabin is expected to go into service in early 2015, and the design will be line-fitted to the new long-haul fleet as it arrives. Four new A330-300s are due to be delivered in 2015 and 2016, and eight A350-900s will be delivered from 2018 onward, with an option for an additional six.

The RAVE IFE system from Zodiac Inflight Innovations has been chosen, and when the new fleet arrives, SAS will be the first line-fit customer for the system. "RAVE was the best choice in terms of total cost of ownership for SAS," said Johan Mägi, SAS's head of onboard product and services. "RAVE meets all our requirements concerning innovation, enhanced passenger experience, cost, weight and maintenance."

ALTITUDE

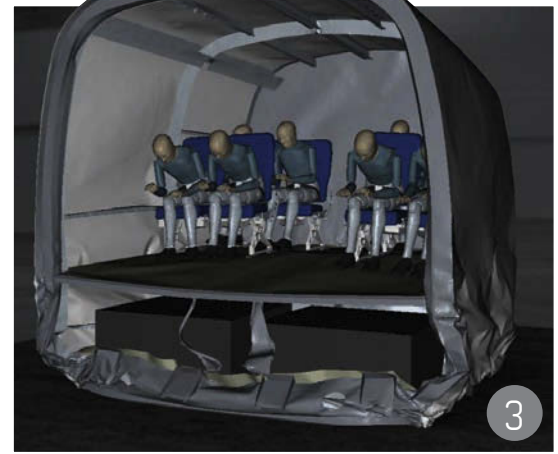
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The way clients interact with and visualize new cabin designs is changing with the latest batch of tools, which can help sales as well as design and engineering



Visitors can usually experience the Lumiscaphe system at Sogerma's booth at Aircraft Interiors Expo

1 Projection mapping
From its initial applications, such as virtual car showrooms, projection mapping has spread to other fields, including aircraft cabins. Sogerma teamed up with 3D specialist Lumiscaphe to create a virtual reality system that can help clients make product choices. Various seat models can be put in the virtual cabin – the Cave Automatic Virtual Environment (CAVE) – to check for fit, complete with the client's choices of colors and materials. Sogerma believes that enabling a client to see a seat and to virtually experience it in their own cabin is a valuable sales tool. And if a client doesn't like a color scheme, they can alter it in real time, using a touchpad configurator.

2 Configurators
The Pacelab Cabin 7 aircraft and cabin configurator from PACE benefits from the company's experience in industrial use – for the A350 XWB program, for example – and now supports all aircraft types, from bizjets to large commercial aircraft. Along with upgrades in 3D imaging and monument configuration, the latest release includes a data management feature that enables the integration of all catalog and project data into one central server-based repository. One of the advantages of the system is that it can engage customers more directly throughout the sales and customization process, in line with what PACE has recognized as strong demand for a new style of aircraft sales and marketing tools.

3 Care to share
ESI's Virtual Seat Solution supports complex seat design by enabling multidisciplinary teams to work on the same virtual prototype. Each engineering team can see the same model from a different perspective, according to its specific constraints, and seat certification can be virtually evaluated to help ensure success. Passenger comfort, living space and accessibility can be predicted on several seat variants and for different anthropometries, and manufacturing of seat composite frames, sewing of covers and durability issues can also be managed. When the data is coupled with a virtual reality platform, it is then possible to immersively test the seat design.

4 Virtual fit checks
A virtual reality suite of software has been created by Optis with the aim of accelerating the various phases of the aircraft interior completion process. The system uses a 3D digital mock-up, which enables a cabin and its furniture to be computer designed, and then the detailed physics-based renderings projected onto CAVE walls to test the fit, appearance, functionality, geometry, aspect and human machine interface prior to installation. Don the 3D glasses and enter the CAVE, and all your physical movements will then alter the 3D physics-based image projections in real time to simulate the changing views of passengers as they move through the cabin.

5 Seeing is believing
Yasava, a design company best known for its work in the business jet interiors sector, has also embraced virtual reality as part of its design and customer tools. When immersed in the ADVS³ (ASTRAL Design Visualization System 3D) system, users can walk through and explore a cabin to check layout, furnishings, and color and trim. It is a far more effective way of gauging a customer's satisfaction with a cabin design than simply showing them 2D renderings. Of special interest is the system's head-mounted 3D viewer, the Oculus Rift system – at present available only as a developer prototype kit before its official launch in 2015. Yasava is certainly ahead of the curve with this system.

Beyond design.

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THE LATEST IFE ON BOARD

The Air Canada Dreamliner fleet will have the latest Panasonic eX3 IFEC systems line-fit installed. The carrier is already a Panasonic customer, with five of its B777-300s equipped with the eX2 system.

"Panasonic's eX2 system has been very popular with our passengers," said Craig Landry, VP of marketing for Air Canada. "With the introduction of our new Dreamliner fleet, we are very excited to launch an even more advanced system that will include a deep portfolio of applications and services that will immerse our customers in a truly next-generation inflight experience."

wideawake

Air Canada is refreshing its wide-body fleet with Dreamliners, featuring all-new interiors

Air Canada is striving to increase its international profile, through a big investment in its onboard passenger offering, promoted through a bold new marketing campaign. For the long-haul experience, the airline has ordered 37 B787s (15 -8s and 22 -9s), with the first having just been delivered, and the remainder arriving regularly until late 2019.

To celebrate the new wide-body arrivals, Air Canada has created a contemporary three-class cabin design. The new International Business Class cabin includes 20 customized B/E Super Diamond seats featuring Lantal's pneumatic cushion system and a massage function, and which can be extended into an 80in-long fully flat bed. A 1-2-1 configuration means direct aisle access for all, and other features include an 18in IFE display, universal power and USB outlets. Coffee lovers in business class will also benefit from a new espresso and cappuccino coffee service being introduced later this year.

The 21-seat premium economy cabin is configured 2-3-2 at a 38in pitch. The customized Recaro PL3510 seats are 19.5in wide with 7in of recline, a 9in or 11in enhanced definition touchscreen IFE display, as well as universal power and USB outlets. The premium economy cabin service includes premium meals, a complimentary bar service, and priority check-in and baggage delivery at the airport.

Air Canada's economy cabin has 210 B/E Aerospace Pinnacle slimline seats in a 3-3-3 configuration which provide personal space "consistent with the comfort of Air Canada's current economy cabin". Each seat is equipped with a 9in touchscreen IFE display, with USB outlet and shared universal power outlets.

"The new interiors and seating on the 787 Dreamliner will become Air Canada's new international standard," said Ben Smith, Air Canada's EVP and chief commercial officer. "We also plan to begin conversion in late 2015 of 12 B777-300ER and six B777-200LR aircraft to provide our customers with a product consistent with the B787 Dreamliner. With the conversion of these B777 aircraft, we will introduce a much-desired premium economy cabin and refurbish the International Business Class cabin to the new B787 state-of-the-art standards. The reconfiguration project is planned to be completed in the second half of 2016."

As the B787s are gradually introduced into the fleet, the airline will offer a preview of the Dreamliner service on selected domestic Canada and transatlantic flights on a temporary basis. As Air Canada takes delivery of the new aircraft, its current B767s will be transferred to its leisure carrier subsidiary, Air Canada rouge, for rebranding.

- 01. The palette is slate gray and neutral tones, with accents of 'Canadian red' and celeste blue
- 02. The 18in IFE display is one of the largest in North American business class

DRIVEN DESIGN

The PF2000 seat was first revealed by Pitch at Aircraft Interiors Expo 2012, as a newcomer to the industry at the time. There is some car DNA in the seat's design as it was developed by Pitch in cooperation with Intier Automotive (a division of Magna) and automotive and premier aviation design specialist Design Q. Pitch says that the model weighs less than 25kg for a triple unit, as a result of its extensive use of lightweight composite materials.

Other carriers such as Cathay Pacific and AirAsia X have had bad responses to fixed-back seats. It will be interesting to monitor reactions to this new design



nobodymove

Monarch is the latest airline to try fixed-back seats, as launch customer of Pitch's PF2000

01. The customized seat features a seatback tablet holder
02. The PF2000 weighs less than 25kg per triple
03. The personal space you enjoy when you board will not change during the flight
04. The simple seat nets help reduce weight
05. The seat is fixed at a recline greater than a standard TTOL angle

In becoming the launch customer of the Pitch PF2000 fixed-back economy seat, UK-based leisure carrier Monarch has generated some publicity. Economy passengers often complain – and often quite vocally – about the intrusion into their space when the seat in front is reclined, and by installing this seat Monarch can look like a thoughtful carrier – while also enjoying the weight and cabin density benefits of the seat.

The seat design has been ergonomically developed in conjunction with Design Q – a UK-based aircraft interior design consultancy – to provide comfort and support during short-haul flights, while the backrest delivers a fixed recline that is greater than a standard economy seat in the TTOL position.

Pitch worked closely with Monarch and its customer focus groups to develop some unique passenger-led unique features, which could be implemented using the modular seatback system above the tray table. Research conducted by Monarch found that its passengers would like to use their PEDs for IFE, so the seatback design also includes a tablet holder. However, the seatback modules are interchangeable, so if Monarch chooses to address a different demand later on, minimal modification work is required.

Another weight-saving measure is the use of bungee cord instead of traditional seat pockets, which also reduces cleaning and maintenance needs, and enables

larger items to be held in place, such as water bottles and toys. The cost of ownership is further reduced by a lightweight dress cover system that reduces dirt traps.

The weight saving in the new design achieves significant savings on fuel and emissions, according to Monarch. For instance, when compared with a set of Monarch's existing seats, using a set of PF2000s on a flight from the UK to Egypt saves 255kg of fuel, which is equivalent to 816kg of carbon dioxide saved on a single flight.

Tim Williamson, Monarch's director of customer experience, commented, "Our new ergonomic seats have been designed with our customers' needs at the forefront of our minds. The non-reclining design gives our customers far more living space than traditional seats, without the fear of the person in front impinging on their personal space."

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functionroom

BRIEF: Blend comfort with technology to create a new first class experience; a space that is yours to use as you wish, whether having the ultimate night's sleep or a party in the clouds.

DESCRIPTION: Zodiac Aerospace's Halo concept could be a glimpse of things to come. Evoking the feel of a hotel room, the space is suitable for two people to enjoy, as it is fitted with two fold-down TTOL seats, complemented by a large TV and a sofa. However, once cruising altitude is reached, its potential comes to life.

If you feel like dining, a crew member will flip out the dining table from beneath the TV, and with the twin doors either side, restaurant-style service from behind each diner is facilitated.

If you feel like sleeping, the sofa rotates to reveal a memory foam double bed. To help you drift off, the LED-clad rear wall can display a starry night, or if you want a more low-tech experience, you can switch off the screens and view the real world outside the windows. The suite can even monitor body temperature and regulate the air-conditioning to ensure you are perfectly relaxed, and monitor eye movement to make sure you are only awoken by the sunrise-effect lighting when emerging from deep sleep.

Or if you want to party, you can shut the doors, open the chilled bar and crank up the surround sound, and there is room for five people to revel in the soundproof space. Need to work? You can hold a video conference on the TV, and project spreadsheets on the rear wall.

And if you would like to freshen up before you land, the TV slides up to reveal a mini spa.



VERDICT: Fantastic. First class already offers amazing comfort, but Halo enhances it by applying the latest audio visual technologies, and also uses technology to create an impressive level of flexibility and passenger comfort. Zodiac thinks that the complete Halo is around five years from becoming a reality. However, clever elements and ideas from the concept could find their way into the next generation of first class suites – especially as airlines respond to Etihad's new A380 interiors.



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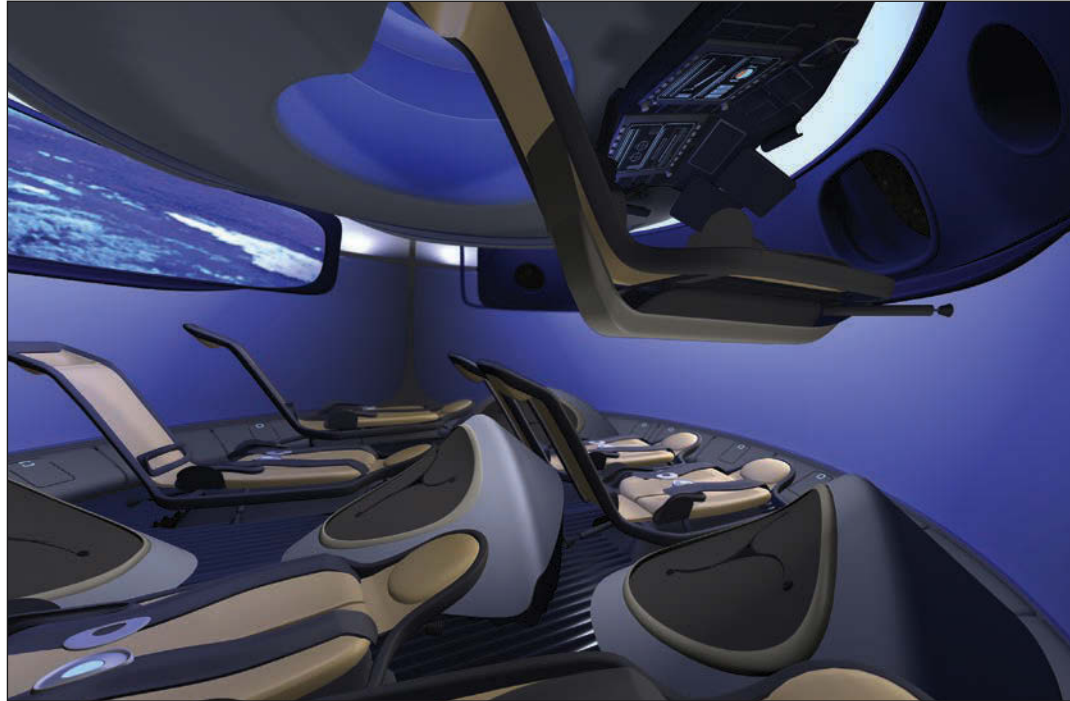
starquality

BRIEF: Space travel is soon to become an activity for commercial passengers – not just astronauts – so a space capsule with a suitably consumer-friendly interior is required.

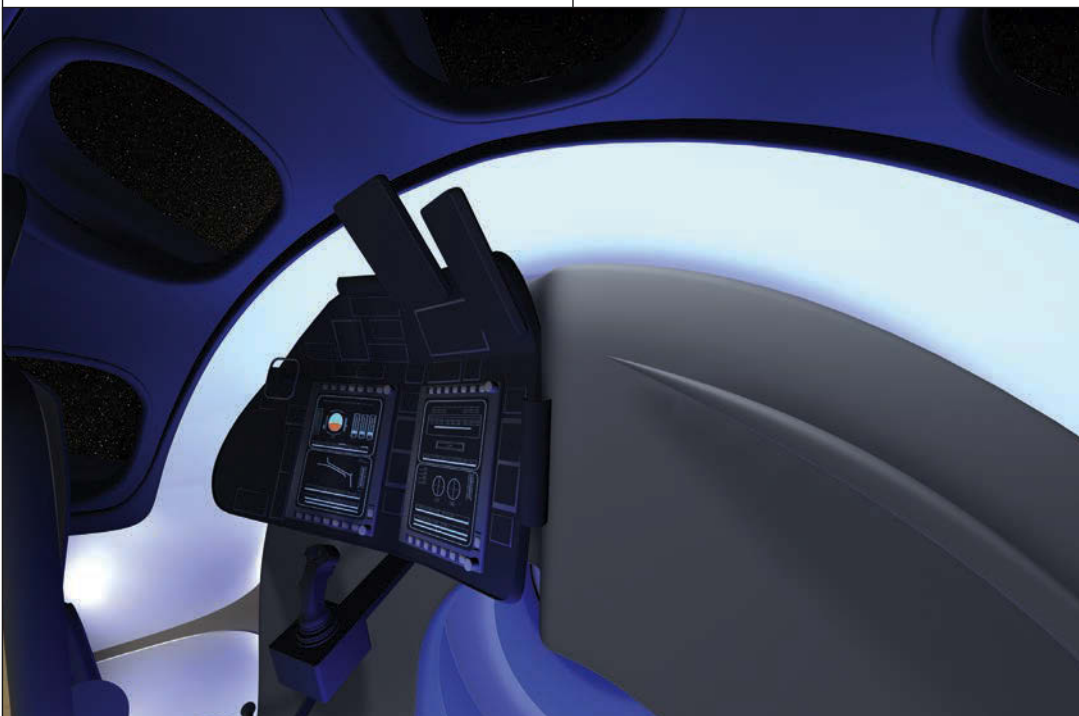
DESCRIPTION: The Crew Space Transportation (CST-100) capsule is designed to carry up to seven crew members to low-Earth-orbit destinations, such as the International Space Station. This concept, created by Boeing and Bigelow Aerospace, is designed for paying, non-professional space tourists, and as such it requires a few creature comforts, including big viewing areas; large displays for communication and entertainment; and wi-fi for email, social media and IFE – who wouldn't want to send a selfie from space?

The seats are individually mounted and collapsible to aid mobility in zero gravity, while the simplified interior linings are finished with soft-touch surfaces. Other features designed with passenger comfort in mind include secure stowage; a deployable privacy area that addresses the modesty needs of passengers and crew; and customizable spacesuits.

Boeing has also implemented its Sky Interior mood-lighting system, which was originally developed for the 787 Dreamliner. A familiar daytime blue skies programme can be selected to help passengers maintain their connection with Earth.



VERDICT: Designing a spacecraft interior sounds like a dream come true, but it is a difficult task: make it too utilitarian and it may intimidate or even scare passengers; get too carried away and you're at risk of creating a tacky Buck Rogers homage. Boeing and Bigelow have got this concept just right though, blending function with a few features that will give an out of this world experience a reassuring sense of familiarity.



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doublefirst

In its quest to create the world's finest commercial aviation experience, Etihad has pioneered many aviation firsts in its A380, including the offer of two tiers of first class

ADAM GAVINE

 Etihad's recently unveiled A380 interiors project is one of the most impressive airline schemes of all time. It is not just the luxury appointments that inspire, but the sheer depth of design and engineering – and the fact that the many NDAs in place all held fast for five years.

In 2008, Etihad invited pitches for an A380 interior project, from established aircraft interior design specialists, from boutique agencies, and from agencies that don't specialize solely in aviation, as they wanted to hear a diverse range of ideas. The panel was presented with all the highly engineered proposals and the more left-field ideas they could wish for, and found that choosing just one was a difficult task. As they considered the shortlisted bidders, they did find a solution to meet their needs though, as Peter Baumgartner, Etihad's CCO recalls: "We said, 'Guys, we made a decision, it's not you, it's not you, it's not you – it's all of you. We now want you to go back home and come back to us with an integrated proposal'."

The parties agreed and the Etihad Design Consortium (EDC) was born, comprising three agencies with bases in London: Acumen Design Associates, Factorydesign and Honour Branding. Acumen applied its aircraft seat design and innovation experience; Factorydesign worked on the passenger experience and cabin interior elements such as galleys, lavatories, stowages and passenger destination zones; while Honour coordinated the project across the EDC, and helped to define the innovation process and design strategy to inform the concept work. To simplify communication, Mike Crump, a partner at Honour Branding, was appointed as the main conduit between Etihad and the EDC.

Baumgartner hails the team's work "a complete success", but it was still a hands-on project for Etihad, whose guest experience, cabin interior and technical teams were heavily involved. As Baumgartner says, "If you have such high ambitions and aspirations, then you can't just leave it in someone's hands and say, 'See you in five years'. You have to lead very strongly from inside."

The team went through an 'immersion phase' in Abu Dhabi to understand its culture, its increasingly modern approach to design and architecture, and to appreciate why its national carrier is a key part of the Abu Dhabi 2030 Vision.



01. Not too shabby for an economy class entrance! The prayer area is behind the curtain
02. A screen between the first class Apartments can slide open to make a shared space
03. The vanity unit in the Apartments means you can get ready for landing at leisure
04. At 30in wide with 5in-wide padded armrests, the Apartment seat is like an armchair

Abu Dhabi itself was a big inspiration for the design – from the soft furnishings, materials and finishes, to the creation of spaces. Big influences were Abu Dhabi's drive into art and design, including the future opening of Guggenheim and Louvre galleries; Abu Dhabi's unique position of greening the desert; the heritage and connection to the desert; and traditional Arabian hospitality, in which social, family and work life blurs together.

However, as the research grew, the project grew and new depths of requirement were added throughout – including adding a Dreamliner interior to the project (see page 32). Indeed all parties agree that Etihad soon became the biggest project they had ever worked on, effectively becoming eight major projects to complete in five years, between all the classes and monuments. The result, however, is the most customized A380 and B787 interiors in the world, with the aim of being the best in the world.

THE BIG PICTURE Etihad really was a clean sheet project – or perhaps 'empty shell' would be more appropriate as the team started work from the bare skeleton of the A380, and by the end of the project had made over 400 revisions to its LOPA.

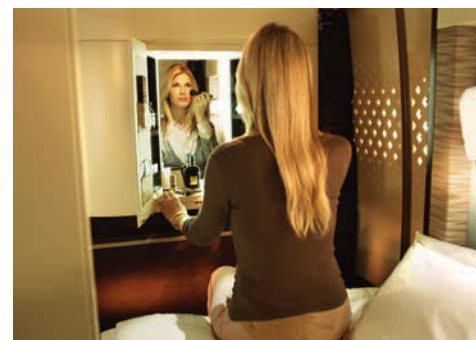
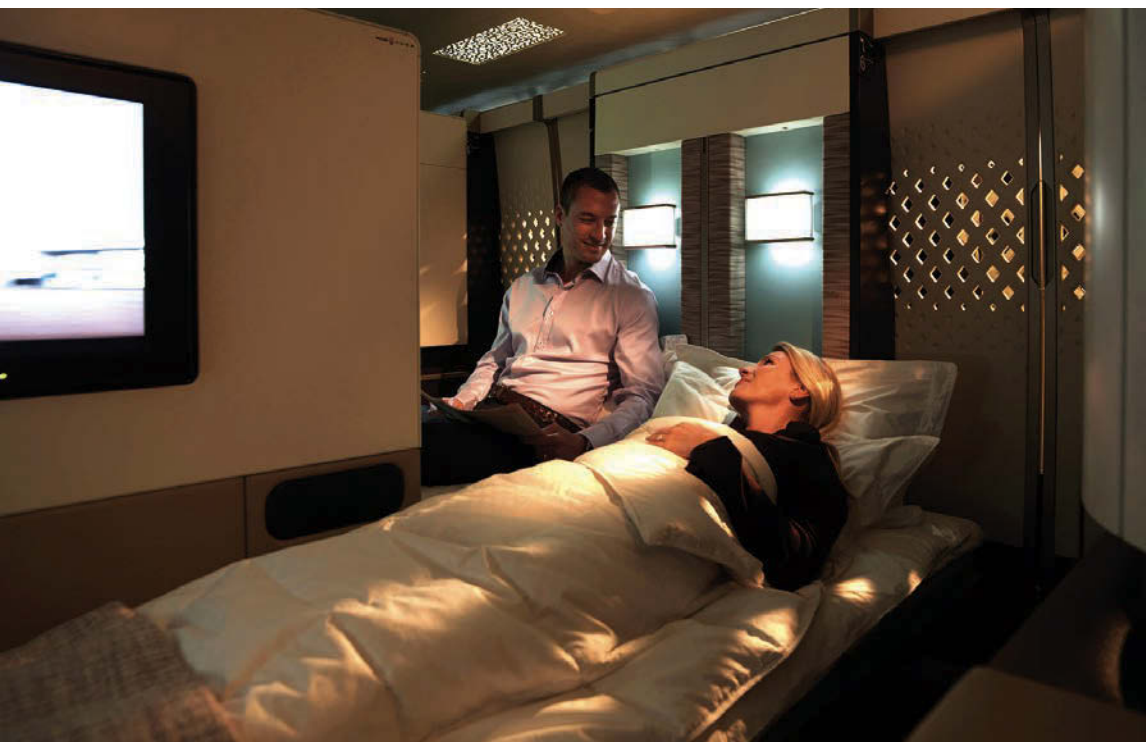
As Ian Dryburgh, CEO of Acumen says, "Acumen embraced an intensive six-month blue-sky concept phase – turning the whole company into an Etihad 'think-tank'. The net result was a mass creation of hundreds of ideas spanning

YC/PYC/HDBC/BC/SBC/FC/SFC and VIP solutions". Acumen's vast range of seating ideas were eventually whittled down to just four in each class, with the final concepts selected by Etihad.

The idea of a luxury suite – now dubbed the Residence – was considered early on for the A380, as a two-floor space with the living room downstairs and a bedroom and shower room upstairs. Some of these early cabin interior ideas considered removing the front staircase, which was not considered a great loss as it is not required for crew service and can't be used by passengers during flight or indeed boarding. However, Airbus said the staircase was structural and would require a substantial redesign to remove.

Thus the decision was made to split the aircraft lengthways, with the upper floor for the premium cabins and the main deck for economy – an idea also influenced by the ability to board the upper deck from the premium airport lounges. It was also felt that this would be culturally more acceptable and reflected how luxury hotels segregate their premium offer on higher floors.

As Adam White, director of Factorydesign, explains, "The A380 is effectively two different aircraft: a luxury private jet above and the very best commercial aircraft below." The two decks are entirely separate as far as passengers are concerned, especially as the method of boarding means they will not mix. Even the front galley lift has been removed, as it was not needed for the service, and



03



04

gave greater flexibility to the design of the galley and door welcome spaces.

A GRAND ENTRANCE Research pointed to the high level of expectation on entering the A380, and an EDC study of aircraft entrances that were flying at the time highlighted great opportunity. What they wanted were entrances that had ‘wow’ factor; that felt like entering a boutique hotel. This intention has almost become a cliché in recent years, but the EDC had in-depth talks with Etihad and Airbus to see how they could manipulate the A380’s structure and layout to bring this feeling to life.

Some brilliant ideas were discussed, including galley units on the main deck that could be moved during flight to create a flexible space, and even units that could be collapsed down to create more social space when not in use. According to Crump, the suppliers were keen to make the ideas work, but as the commercial reality of the aircraft drove more seats to be added to the main deck, more trolleys were required, which meant more traditional monuments were required to accommodate them.

The galleys are far from traditional aircraft fare in design though. The galley work was undertaken by Factorydesign, which designed some pieces worthy of the fabled hotel, featuring dark wood fretwork panels, screens and doors. To create a genuine hotel feel, it was important to remove all parts that felt more aerospace than luxury space, such as aluminum extrusions, obvious bump strips, inconsistent and ugly latches, and exposed hinges.

This was an approach followed through on all aspects of galley and stowage work, whether BFE or SFE. It was a major undertaking of coordination and effort to create an interior that was truly considered as a whole, not a series of parts, on both decks.

burden of proof

This project saw Etihad and the EDC really push their supplier network and the airframers to try new ideas. As Adrian Berry, a director at Factorydesign says, “Etihad was key as it backed the EDC in challenging the way things are done. The aviation industry is conservative and things have always been done a certain way. Getting manufacturers to talk to each other was hard, but they have collaborated more than usual because of the scope and breadth of the project.”

As each innovation was proposed – whether SFE or BFE – the EDC member responsible had to show a technical solution to support their design solution. As each solution was approved, the aircraft became more individual, and a huge amount of intellectual property was created. The 3D data of the designs were also presented to Airbus and Boeing, who used it in their CAVE systems during review sessions.

As Ian Dryburgh, CEO of Acumen Design Associates recalls, “After the initial shock, things got better. If the EDC had less experience as a group of companies, it wouldn’t have worked. When there was no precedent for a design, the conceptual engineering meant we had to create it before a supplier would consider it.”

Honour Branding’s Crump adds, “These things were all new, so Boeing, Airbus and the suppliers were challenging at first, but they became supportive. Everyone was out of their comfort zone. But once innovations were accepted, they were embraced.”

The EDC was also constantly pushed by Etihad. As any benchmark company brought out new products during the development process, Etihad CEO James Hogan asked the EDC to prove that its designs were still better, and to prove these claims with hard figures.



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05

The team worked with Sell (Zodiac Premium Galleys) to design cleaner, sleeker galleys that challenged previous norms. The team had to prove that its designs would meet all engineering, manufacturing and certification requirements before any work began – a recurring theme during this project – and happily the sleek galleys with their smooth edges and soft radii worked at every level and ultimately passed every test; indeed the first units are being delivered at the moment.

The main lower deck economy entranceway offers a boarding experience superior to that which many first class flyers experience. The wide space has a series of doors over the galley on the right, which are closed during boarding to maintain the hotel feel, and fold back during service to reveal the trolleys and galley inserts. To the left is commercial aviation's first visually separated galley, with the lower level concealing trolley space, and the upper level concealing further stowage, with two glass-fronted doors framing a pair of monitors.

The space between the levels provides a large work area and adds to the feeling of space and light, especially since it is fitted with electronic double-layer shutterglass. During boarding and deplaning the glass is clear, but at night when crew need to work in the galley or passengers wish to socialize in the space, the glass darkens so the light does not disturb the slumbering passengers beyond. This feature is used in other areas as well.

Other features of note are a unit with a flat dedicated area, which can be used as a small social space, and to demonstrate items from the duty-free catalog (the few catalog items you'll find on Etihad's new aircraft). Shopping items are also showcased in a glass-fronted cabinet above. And in a clever use of dead space, the areas by the doors have curtains, which can be drawn to create a private prayer area, complete with a prayer rug and a Qibla finder linked to the aircraft's navigation system, which shows the direction of Mecca.

ENTERING THE TOP TIER The forward upper-deck entrance gives passengers even less of a clue as to the space's core function. A dark wood cabinet with a white granite work surface is all they see before turning left into the first



06

class cabin. Turn right and they pass a unit with latticed blinds similar in detail to the doors downstairs to one side, while to the left the unit also features secure glass-fronted units which potentially will display genuine works of art and antiquity on loan from Abu Dhabi galleries such as the Louvre or Guggenheim, and monitors showing welcome and promotional videos.

So where are the first class meals prepared? The simple answer is, any galley work that might let the mundane spoil the premium experience or risk the crew getting in the way of passengers, is carried out in a second galley located parallel. The complicated answer is, this is the first time an A380 galley has been fitted in this direction, and it called for some major structural work – especially since this is a 2.5 metric ton galley area. The EDC did some extensive work with the Airbus structures team to optimize the position of the galley, and the floor had to be supported in a different way, with extra carbon fiber reinforcement. This involved years of work, as whenever the galley moved there were many implications, such as hot oven exhaust gas ducting complications, but all parties felt that creating a private galley area was a crucial part of creating the ultimate experience.

As Peter Tennent, director of Factorydesign, says, "The attention to detail of the EDC and its drive to pursue details and get them delivered was key. Every designer can create a vision, but it's the determination to implement those details and maintain the integrity of the original source that is key."

LOBBY Beyond the galley, heading aft, is the Lobby lounge area, a space made possible due to the rotated galleys. Its location between first and business class was carefully considered, as research found that first class passengers tend to prefer staying in their suites, while business passengers like to move around – but it gives another option for all upper deck guests. This is an exceptional, high-quality space, created in conjunction with Zodiac Aerospace. Until the final stages of the project, the area was known as the Majlis, after the Arabian spaces where guests are received and entertained. As the A380 approached launch, and in keeping with the boutique hotel feel, it became the Lobby.

- 05. The elegant Lobby area. Behind the curtain to the right is the second, more functional galley
- 06. The marquetry table is stowed behind the sofa for TTOL

dreamliner come true

While the EDC pushed Airbus out of its comfort zone, Boeing did not get away lightly. Etihad's B787 will be the first to feature first class suites, and to further complicate matters, the airline did not want overhead bins in the first class cabin. The cabin is inspired by some initial twin-aisle ideas developed for the A380.

A program was set up with Boeing to redesign the forward interior, with the overhead bins deleted, ceiling profiles redesigned, and lighting systems reconsidered. This was a huge project, but some costs



were mitigated as Boeing can offer the ceiling design to other airlines.

The cabin is distinctive as it has twin, curved aisles – the product of some clever working of the suites to enhance space. The 1-2-1 suites are arranged fore and aft, a bold decision in first class. However, the suites do feel spacious, aided by that curviness, which gives the occupant the impression that the suite is square, and also aids cabin density. The EDC worked with B/E Aerospace to create a suite with 58in-high walls, a 26in-wide seat and a narrow ottoman. Dreamliner guests do not get a separate bed, but the seat does convert into a 80.5in fully flat rectangular bed (pictured left).

Business is again a 1-2-1 fore and aft dovetail configuration, but for the B787 the 28 seats are supplied by Zodiac, with the same trim, dimensions and specifications as the A380 seats. The 199 economy seats are the same Weber 5751 models as in the A380, configured 3-3-3.

As Fiona Morrisson, Etihad's VP of guest experience, explains, "If the A380 is a boutique hotel, then this is where you can hang out, socialize, or just get away from your seat. It came from insights into how people want to congregate and what they want. They want a bar, but they don't want a bar that isn't quite a bar, and we wanted to create a unique environment."

To create that authentic bar feel, Etihad wanted the various bottles to be on display at all times, so the bar unit was designed with special holders so the wide range of spirits can remain in place during take-off and landing. The curved glass stowages to the sides add to the feel of a cocktail cabinet, and in themselves represented two years of work. Adrian Berry, a director at Factorydesign, is especially fond of the result, calling it "a piece of solid, machined wonderfulness".

Guests can lounge on the Poltrona Frau leather-upholstered sofas, play cards on the 27.6in-diameter marquetry table (folded and stowed in a compartment behind the sofa when not in use), order a drink from the bar and lean on the bar surface behind the sofa, watch sport on the 32in TV, hold a meeting – whatever they would like to do in this relaxed space. Current plans for the space include social events such as high tea, and themed events – strawberries during Wimbledon perhaps.

MOONLIGHTING Of note throughout all these spaces are the light features. The ceilings in first class and the PSU channel in business class have been completely redesigned to accommodate light panels that cast a dappled light on the floors and walls, similar to moonlight cast through the fronds of a palm tree.

The effect is soft and makes the spaces feel larger and less tubular... but it isn't created by those large light

fittings, as they do not generate sufficient light to cast an image on the floors. Instead they cast a gentle light that fools the eye, while a second Gobo light projects the image. In addition, a special feature ceiling in the economy entrance was developed with AIM Aviation. The lighting effects – called the Lights of Abu Dhabi – help make the Etihad experience unique and will become a key image in the airline's marketing campaigns.

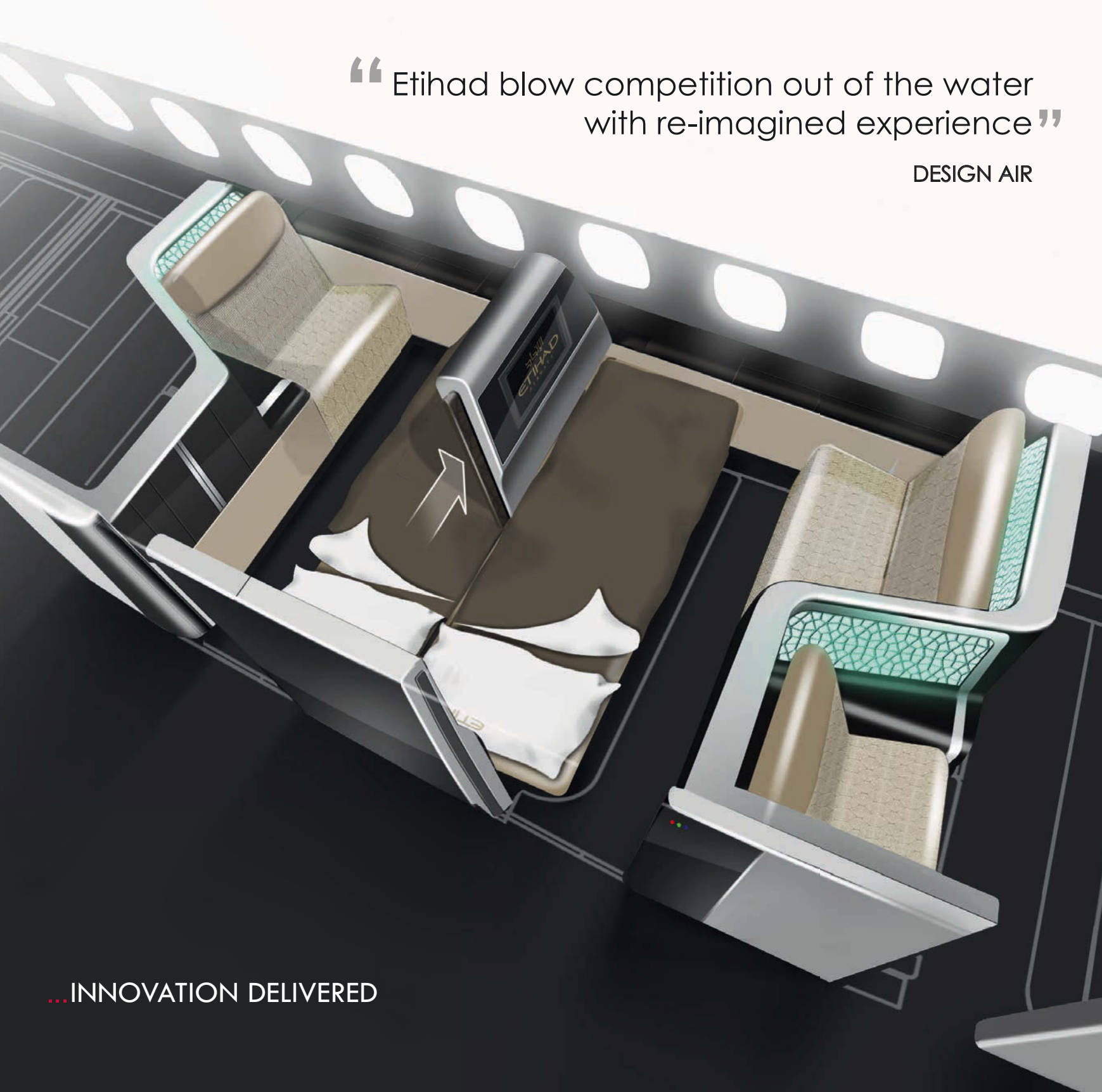
"A lot of thought went into lighting as it is an interesting opportunity to create a different feel. Lighting is an area you can own," says Morrisson. "The goal was to play with lighting and use it to our advantage and make the entryways less sterile. We will also have custom mood lighting in first class to create dawn and dusk effects, with the Lights of Abu Dhabi projected down the middle of the aisle. This is not an Airbus catalog item and it makes it our aircraft. The light was a major investment but when you walk in you'll go, 'Wow.'"

FIRST CLASS APARTMENTS Etihad and the EDC decided that in order to create the world's finest first class cabin, they would make it single aisle, giving the aisle space back to the customer. This change in proportion allowed Acumen to create an environment more akin to a hotel room. The central aisle raised a certification issue regarding the crew having a direct view down the aisle, so a crew seat had to be integrated into the galley complex. Indeed with so many new and challenging features, some certification rules have actually been updated as a direct result of the Etihad project.

For the nine first class suites, being marked as Apartments, the EDC's research found that passengers would prefer a separate seat and bed. They also preferred private suites, which require double doors for certification, which in turn generated some geometric challenges. The

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final design you see here – and indeed in every class – is a direct result of research carried out during the design phase, when interviewees were asked to select their favorite from four options.

The walls of the 39ft² suite are 64in high, so it takes a deliberate effort to peer over the side, although crew can bend down and peer through the fretwork pattern in the doors to ensure everyone is safely secured during turbulence. The 30.3in-wide seat reclines just like a classic lounge chair with an ottoman, moving to a ‘lazy Z’ position, and there is room for two companions to join you on the ottoman opposite without knocking knees.

Come bedtime, the ottoman slides and rotates to create the bed, the mechanism for which is an industry first. “The challenge was to design a structurally sound kinematic that could transform an 80.5in-long ottoman into a 26.5in-wide bed and package it into a 1.5in-thick envelope, while maintaining a clean and consistent aesthetic in either state,” recalls Anthony Harcup, Acumen’s design lead for the Apartments and Residence. “We developed a few iterations of the mechanism and built a fully powered working prototype in the final mock-up to prove the principle and test the ottoman-belt-retraction mechanism before handing it over to the manufacturer.”

Six of the nine suites can transform into double suites, so if you are traveling with your neighbor, you can retract a discreet screen to reveal the adjoining apartment. Over 75% of the suite geometry consists of doors, panels and assemblies which slide or move mechanically, and new mechanisms were designed and developed from scratch to facilitate a number these unprecedented conditions.

Other features in the Apartments, which were created with B/E Aerospace, include a chilled minibar using a non-

mechanical Icebridge cooling system, a large drawer for shoes and bedding, space under the ottoman for a cabin bag, and a pop-out bedside table for a water bottle.

To ensure the 24in Panasonic eX3 TV can be viewed in different seated and in-bed positions, a completely new monitor mechanism was developed which can rotate the monitor 90°, transport it 8in toward the passenger and cantilever it over the bed. The mechanism is packaged within a depth of just 1in, and the team had to ensure that when fully deployed, the monitor can withstand a 300 lb abuse load and still be able to stow.

Sometimes guests feel guilty about taking their time in a shared bathroom (there is a first class lavatory and shower room at the front of the cabin), so a nice feature is the vanity unit in each suite, which, when opened, reveals an illuminated space with a large mirror, stocked with inflight amenities and a shower kit. One idea considered, but later dropped, was to include a sink in the vanity unit.

THE RESIDENCE The Apartments are undoubtedly world-leading, but Etihad has gone a step further in creating its Residence halo product.

The entrance is subtle, appearing just like the other first class suites. As Morrisson explains, “The Residence is meant to be the ultimate in discretion. You can board when you like; whether first or last, it is customized to your need. You enter on the top deck and only pass the other first class seats, so if you’re a celebrity or a head of state, you probably won’t be spotted.”

Step inside and the space is similar to the Apartments, only there is a 60.4in-wide two-seat sofa instead of an individual seat and the ottoman does not convert to a bed. Having two people sharing the space during TTOL was a

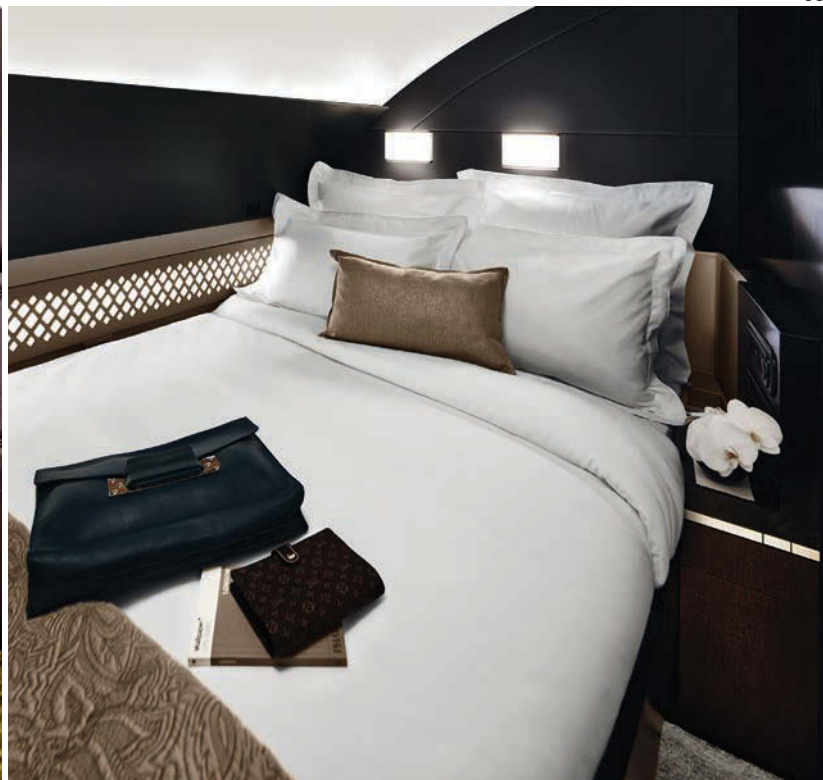
07. With a separate bedroom, the Residence living room did not have to be flexible – it just has to be the best

08. The bed every keen traveler will want to be able to say they have slept in

07



08



premium economy?

Many have asked why Etihad didn't specify a premium economy cabin when rethinking its product offer. Peter Baumgartner, the airline's CCO, explains, "We constantly look for new opportunities. However, we couldn't just introduce premium economy on a couple of aircraft types – we would have to add premium economy to a sizable share of the fleet. We feel, at the moment, that premium economy is not a priority for us."

major challenge, which took a year to get through EASA approval – work that may benefit rivals in their future plans. With approval gained, the Residence is similar to a hotel room, in that one price is charged, but two people share the space.

There are three color and finish schemes on the 10 A380s that will carry the Residence, each with different carpets, leather colors and marquetry, and each giving a slightly different experience (one is a take on traditional Arabic woven carpet, one is a modern design, and one is a design inspired by the Lights of Abu Dhabi). The initial plans were for each Residence to be individual, but with each scheme having to be certified, and the complex logistics of requiring spare parts for 10 different schemes, it was reduced to three (there are also three different trims for the Apartments).

Step through the internal door and a corridor leads to a shower room and bedroom. This space is often used by airlines as a small lounge or dressing room/lavatory, but with a shower room opposite and a great lounge at the other end of the aisle, monetizing this space made more sense – and creates an amazing 125ft² halo product.

Under the 82in-long, 47.5in-wide bed is stowage space for cabin bags, and once in the bed, there is a 27in TV to watch and a bedside table on which to rest a drink. It was a challenge to meet the decompression requirements of the bedroom while maintaining the aesthetics, privacy, and usability of the bedroom door, so a new blow-out latch mechanism had to be designed, which is engineered to fail at a specified pressure.

The shower room, created with Diehl, has a lavatory and a vanity area around the sink, complete with towels, a

hairdryer, and all the accoutrements you might need after a night's sleep. The shower head is mounted in the tallest corner of the cubicle and is high enough for a 6ft-tall passenger to enjoy the four-minute cycle. With a full-length wardrobe concealed in a recess in the corridor, Residence guests can have a great night's sleep, shower, get dressed and enjoy breakfast, ready to get on with their day as soon as they land.

When Etihad informed Airbus that it wanted showers, it was initially offered an existing unit and an option of some visual customization. However, the EDC wanted a different footprint in its shower rooms – and for its showers to be the best – and it believes this has been achieved. The position of the lavatory also created a lot of work. When one of Etihad's research projects raised the idea of installing the toilet in the corner, the idea was seized. However, making the design a reality involved proving to Airbus the design would work, and even redesigning the plumbing system.

As Morrisson says of the Residence, "This is a truly aspirational, truly unique aviation experience." This is especially true when you consider that the Residence also has a dedicated butler, together with even more options to customize your experience. As well as boarding whenever you like, you can have the minibar filled with whatever you like, and have any special catering requests attended to, provided notice is given.

BUSINESS CLASS Beyond the Lobby is business class, featuring 70 Business Suites from Sogerma, which boast 20% more space than the current Solstys seat. These spacious suites are configured 1-2-1 in a fore and aft dovetail, all with direct aisle access and an 18in IFE display. Acumen was tasked with creating a business class seat that is not just the best in its class, but even superior to some rivals' first class products.

A double curvature on the aisle-side panels creates more space at foot and shoulder height when walking down the aisle, giving a greater impression of space in the cabin environment. For the internal design of the Business Suites, Etihad's extensive research found that privacy was considered a priority. Thus the forward-facing seats down

- 09. Lighting options add to the relaxing ambience in business class, including an elegant side lamp, a reading light, and mood lighting which adapts to seat and bed mode
- 10. Generous stowage spaces allow everything to be stored out of sight, giving a clean aesthetic and freeing up surfaces to use in flight

09



10





IN-SEAT

POWER

SYSTEMS

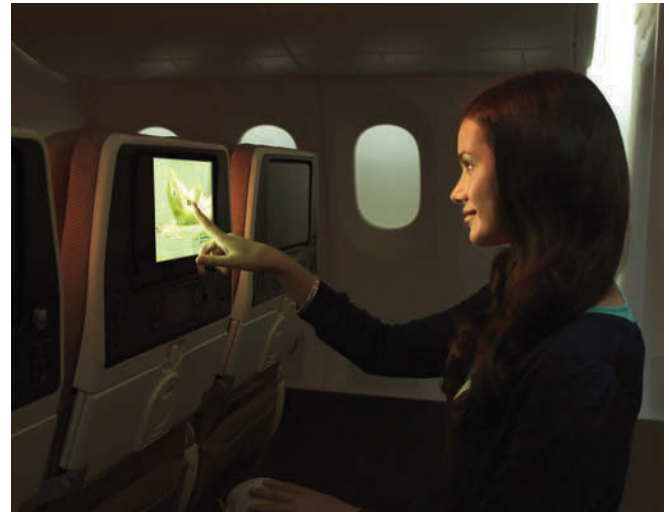
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11



12

- 11. The headrests can create the feeling of a sofa for two
- 12. Economy guests enjoy a Panasonic eX3 system with an 11.1in display

the center are divided with a full-height electric dropping screen which can be controlled by either passenger to create an open space for a more suite-like environment. The aft-facing seats have a sliding aisle screen to block them off from the aisle and for extra privacy when sleeping. The seat backrest height and suite height is 48in, which is relatively high for a business class product and enhances the feeling of privacy, personal space and luxury.

The 22in-wide seats are trimmed in Poltrona Frau hide, and there is a slight advantage in bed length for forward-facing passengers, who get 80.5in as opposed to 75.7in. To enhance the dining experience, large surface areas have been specified on which to rest items such as laptops while eating, and the 16 x 18in dining table slides in and out.

“The table was a major challenge,” states Nigel Lawson, a director at Acumen. “Our aim was to create a table design that was as simple and as intuitive for the guest to use as possible. From an engineering perspective, the packaging and design of the table was challenging. We wanted the interface with the guest to be as ‘furniture-like’ as possible; however, in order to meet all the functional requirements, the underside is very complex.”

Stowage is generous, with overhead bins, space under the ottoman for a carry-on bag, and a side stowage cabinet.

As with the showers in first class, the business class toilets were completely reconfigured to provide corner toilets, to maximize space, and to harmonize the premium sector feel of the rooms on the upper deck.

ECONOMY CLASS Once beyond the striking entranceways, the all-economy deck may seem a little ordinary, with 417 seats in a 3-4-3 configuration. Etihad’s original intention was to create an innovative seat and have it manufactured, with ideas including having seats in quads so guests could enjoy a Majlis, some staggered seating ideas, and even the notion of having beds in the ceiling void. However, this was an area where Etihad had to concede defeat, as such innovation was not possible in the given timeframe.

However, Etihad still wants this to be the best economy class in the sky. The Weber 5751 seat was decided upon as

the best seat on the market for this application, with an inflatable lumbar, and customized seatback, end-bay and headrest. The EDC found that economy passengers wanted some privacy, and within this compact environment, the idea of headrest ‘ears’ arose. The headrest – trimmed in camel leather – has one fixed wing to rest your head on, effectively giving everyone one of the main benefits of a window seat, while the other side can also be bent round to fully hold the head. The headrests also break the eyeline with neighboring passengers to increase the feeling of privacy, and help break up the ‘tunnel effect’ of large economy cabins into more human-scale zones. The three accent colorways of ruby, jade and amber also help make the cabins feel more intimate.

Where feasible in economy, all monitors have been flush-mounted into galley and stowage walls, a major undertaking and technical challenge, and this attention to detail has also extended to creating dedicated monitor housings for surface mounted units. Again – considering the design language as a whole.

At 18.95in-wide with a 31-32in pitch and 6in of recline, it is a comfortable economy seat, complemented by the 11.1in IFE system with noise-canceling headsets and magnetic jacks, and a bi-fold tray table. The economy experience is enhanced by the luxury bathrooms, which feature a custom-designed sink, pleasant lighting, a full-length mirror and champagne gold detailing.

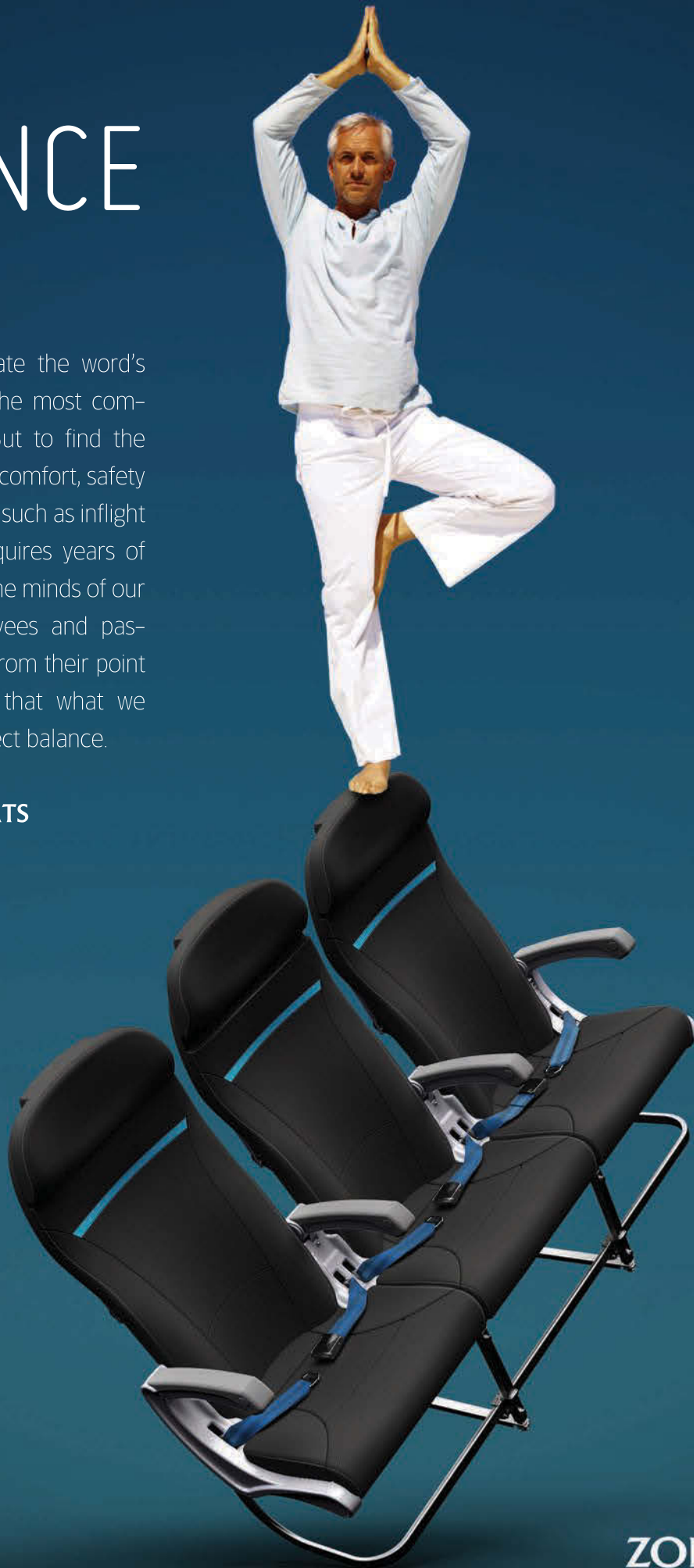
Adam White of Factorydesign says of the decisions in economy: “There is a lot more to define the experience than seat pitch. Etihad recognized its commercial imperatives on one hand, and what manufacturers would do on the other. They invested an enormous amount of time on the whole main deck, rather than just investing in an innovative seat. Those things lift the spirit and make the journey better. With the main deck entranceways, the first and last thing they see is something innovative.”

For anyone planning to fly Etihad on a route not served by an A380 or B787, the good news is that in the second half of 2015, the airline is retrofitting the fleet with the latest products, beginning with the oldest aircraft. ☒

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
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masterplanner

Peter Baumgartner, CCO of Etihad and a key figure at the center of the airline's new interiors program, explains the massive investment in innovation, why it was appropriate and why it may create a new way of working with airframers

ADAM GAVINE

 A key personality at the heart of Etihad's new interiors investment is Peter Baumgartner, the airline's chief commercial officer, who was so deeply involved in the interiors project he could tell you what is in any given square inch of either aircraft type, why it is there, what passengers will think of it, and how much it cost.

The story begins just five years ago, when Etihad decided to reimagine its offer to become the world's best airline, complete with expensive new aircraft. That was at a time when the world was in the midst of a global economic crisis – which also affected the United Arab Emirates – so it was a particularly bold decision. However, Baumgartner never doubted the strategy, “We know the world does get out of economic recessions; it's not the state of play for the next 100 years. We also know that Etihad's growth development plans are derived from the Abu Dhabi 2030 Vision, and as Abu Dhabi's airline, Etihad plays a very clearly defined role in bringing the masterplan to life.” The plan is multifaceted and links to strategies for tourism, economic diversification, air links, capital flow and people flow. Etihad is a key pillar of the economic diversification strategy for Abu Dhabi.

“There was a global financial crisis when we ordered the aircraft, but there was a clear plan of where we had to be in 5, 10 and 15 years. We knew that the crisis would not be there in that period. Maybe there will be another – who knows? – but it is essential to follow the masterplan. Anything else would be crazy.”

Baumgartner won't reveal the scale of the investments in the new aircraft interiors, but as you would expect, the expenditure on cabin product and development is “significant”. This was not an open checkbook program though, as he explains, “It was a clearly planned and defined investment from the top, up front, before we had even embarked on thinking about how the cabins should look, and the program has been delivered within these parameters.”

Indeed, beyond the design and innovation, it is the success of the overall project that makes Baumgartner proudest. “It's not the fact that we have all these unique cabins, it's that what came first was a very, very clear direction and brief on what the aircraft have to do, in terms of seat count, capital expenditure budget available, and the economics that have to stack up to fly these aircraft profitably.”



“That was the initial brief, and not one dollar more was spent than was set out. There is not one seat less than was in the target seat count, and not one commercial or economic parameter was compromised. And within those parameters we came up with these aircraft, and that makes me proud,” states the Swiss-born CCO. “It’s probably not that difficult to create the greatest ever cabin interior prototype if you ignore all other factors, but if you start with parameters, KPIs and consumer research, and then bring all that together and create what we have, that’s an achievement.”

ON THE RIGHT TRACK With a plan and a budget in place, Baumgartner sees conducting systematic concept and qualitative research as the next step toward creating excellence. As he states, “I can’t think of any innovation in our cabins that would have been possible, or come to our mind, or become a priority, without the first phase of the whole project, which was research.”

Etihad, the Etihad Design Consortium (comprising Honour Branding, Factorydesign and Acumen Design Associates – more on that in the feature on page 26), and brand and insight planning specialist Promise

Communispace embarked on a ‘customer co-creation’ program that saw two-day workshops held in New York, London, Sydney and Abu Dhabi. In these workshops – known as Etihad Big Talks – 50 people comprising Etihad frequent flyers, Etihad non-frequent flyers, frequent flyers from other airlines, economy, business and first class flyers, and high net-worth individuals were all put together in a room to discuss what they wanted from tomorrow’s flying experience. They were even encouraged to use cardboard and fabrics to create their own vision of each class of travel – some even appropriated items from neighboring rooms – and this was all monitored by Etihad representatives, with in some cases psychologists and marketing experts observing through one-way glass.

Key insights from the Big Talks have been implemented, such as the separation of the bed and seat in first class, making seats across all classes into more of a personal space, and the idea of destination areas on board, such as galleys that are welcoming enough to be social spaces, and the upper deck lounge, which is more than just a bar area.

“It was so eye-opening, refreshing and delightful to go through that experience,” says Baumgartner. “It has given

01. Baumgartner learned the airline industry at Swiss International Air Lines, where he held several senior positions

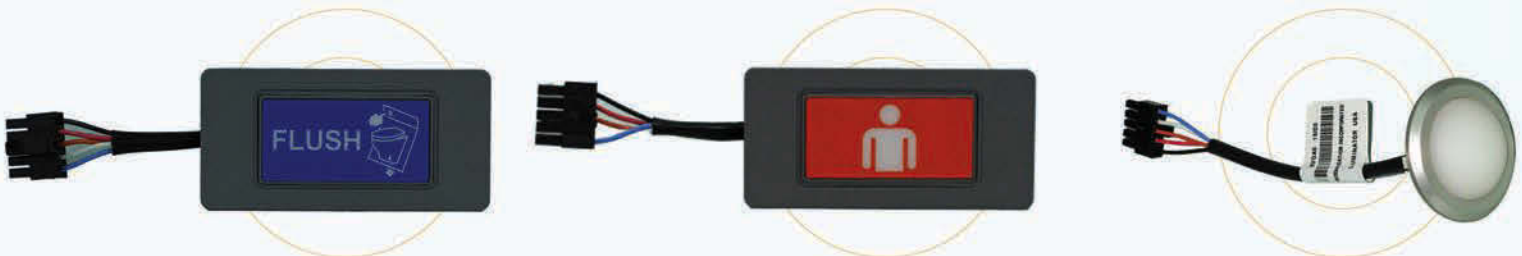
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us not just guidance on where to put our focus when it comes to design, but it also has given us a full innovation guideline for years to come.”

WIDEN YOUR BENCHMARKS It would make sense when planning product to simply benchmark other airlines, but Etihad’s vision was to push the brand and experience beyond the boundaries of the airline industry. “If you want to push boundaries, you need to find your benchmarks. They must be outside your industry, otherwise you won’t challenge it,” says Baumgartner.

Thus Etihad was looking for the best in class, not the best in category. For example, Baumgartner’s benchmark for food and beverage is his favorite restaurant in Zurich, not the best airline caterer. That level of expertise and service has consequences, as an onboard chef and a food and beverage manager are required, each with the right skill, talent, background and mindset.

“Even just the look of the chef is important because a meal just tastes so much better if you think the cook knows what he’s doing. If the environment where you sit and enjoy a steak and a glass of wine is enjoyable, then it tastes better. That’s just a fact,” he says. “You need to recreate that five-star restaurant ambience, otherwise you don’t get the experience. This is not a marketing gimmick; it’s us being serious about it.”

The same approach was taken with the cabin designs. In terms of delivering luxury in an innovative and space-efficient way, Baumgartner considers yacht design to be the pinnacle. This stems from some enjoyable times as a teenager, sailing a 12m yacht from Italy to the Greek Islands. “It was a big yacht in Lake Zurich, but on the Mediterranean it was a very small yacht – especially when you have 12 people plus a dog onboard,” he recalls. “That’s when you start to appreciate genius design. When a dining table turns into a bed and the kitchen becomes a bathroom, you start to understand that space is, to a certain extent, about perception. So for this project I said, ‘Let’s manage that sense of perception, and let’s be cool about it.’

a bright vision

The new Etihad is part of the Abu Dhabi 2030 plan to enhance, among many other elements, the economy, society and infrastructure of the emirate. Another important element is the Abu Dhabi International Airport Midfield Complex, which will be the new gateway to the city and one of its most striking silhouettes, especially since its illuminated interior will make it visible from the highway over 4,900ft away.

The X-shaped, 7,600,000ft² (700,000m²) complex features a “monumental civic space” inside the terminal, according to architect Kohn Pederson Fox, and a wide open, 164ft-high departure hall with long-span leaning arches, and supporting arches visually separated from the roof to enhance the lightweight feel.

The complex is being built with long-term growth in mind, with a plan to increase from the initial 39 gates, up to 49 gates, capable of processing around 50 million travelers a year.

“For example, there is a prayer space in front of each aircraft door, which didn’t cost us a thing apart from the price of a curtain, but with that we created a space that is very respectful for people from the Middle East, and better than having to find some space on the cabin floor with no privacy. It would otherwise just have been an unused space, so how great is that? It doesn’t cost anything, it’s just a good idea, and it came out of the Big Talk workshops in Abu Dhabi.”

AN EFFICIENT HALO The prayer areas are certainly a great use of typically unused space, but the three-room Residence takes that efficiency a step further. Many A380 operators have used the spaces either side of the stairs on the upper floor to create spacious lavatories or slim lounges, but by installing a shower room and lav/changing room on one side for the use of all first class guests, and using the other side to add a bedroom and shower room to a first class suite suitable for two, Etihad really added something special.

“This is really nothing more than a clever use of that space, because the bedroom is not a space where you could have fitted a seat,” says Baumgartner. “It’s commercially interesting, and at the same time gives us access to a complete new clientele: the elite top tier who normally travel only by private charter.

“The Residence gives us access to an extended market segment, it uses that space efficiently, and creates a big halo effect,” he continues. “The Residence by Etihad is the most luxurious commercial aircraft interior ever built and it goes around the world. Everybody loves the story, so everybody talks about it. And that halo effect means that people say, ‘Well, if they have the Residence, I don’t have to worry about their economy class also being good.’ It’s like if the Mac Pro is great, Apple will obviously also get the iPod Shuffle right. That’s how it works, and it did work, as the social media has shown.”

As a young brand – only 11 years old and Baumgartner has been there since its early days, having learned the industry at Swiss International Air Lines – Etihad is

02. When it opens in 2017, the Midfield Complex will have capacity to handle 30 million passengers per year, and up to 8,500 passengers per hour

03. The designs for the Louvre Abu Dhabi inspired some features in the new Etihad interiors

breaking into markets with established premium carriers, so products like the A380 and its innovative cabins are key to establishing itself as a major player. “I, as a marketeer, do believe in the halo effect and I do believe it gives the brand prestige, which makes it more desirable,” he says.

“Our brand strategy is based on being a remarkable brand, with ‘remarkable’ meaning that we want to be a brand that people remark on. We have seen it work in social media, where people have said, ‘Wow! I’ve never flown with Etihad, but this is just amazing. I wonder what economy class is like. This seems to be a special airline, so I want to try it.’”

IS FIRST CLASS STILL RELEVANT? With many airlines looking into downsizing or removing their first class offer from their fleets, Etihad could have been forgiven for considering reconfiguring its new fleet to something more modest during the program. However, for Baumgartner and the team it was never a consideration. “Our position is to stay committed to first class. We are seeing a good demand for first class,” he says, adding that as part of its flexible and efficient fleet planning, not every long-haul aircraft in the Etihad fleet will have a three-class cabin – only those that link key markets and traffic flows. “It’s a very targeted strategy, with different aircraft types with different configurations for different markets. There is no mandate that we have to have a first class, and there is no expectation other than to do what is right for the business. We have no intention other than to do exactly that.

“Therefore, where we have first class, we clearly see a first class market. Every airline wants to grow first class and grab market share from the competition. We stay firm and committed to premium travel, and this part of the world has the potential to source those high-end travelers from the markets in which we are flying. I’ve no doubt that with the London market we will have a very healthy first class loading from the UK.”

First-class passengers are one thing, but the Residence is a step beyond, not only in terms of the experience, but

also in the fare. It’s unlikely to be occupied on every flight, so will it become a potential upgrade perk for frequent first class flyers?

“We won’t compromise the integrity of that product, so you will not see any upgrades into it; you won’t see any staff in it; you won’t even see me traveling in there. It will be very strictly managed. If you want a seat in the Residence, if you want to see behind the door, then you have to pay for it. I think that’s the right thing to do with flagship products. You don’t want to dilute the value. If you want to be attractive to the upper end of your segment, then you have to give them that exclusivity that they are expecting.”

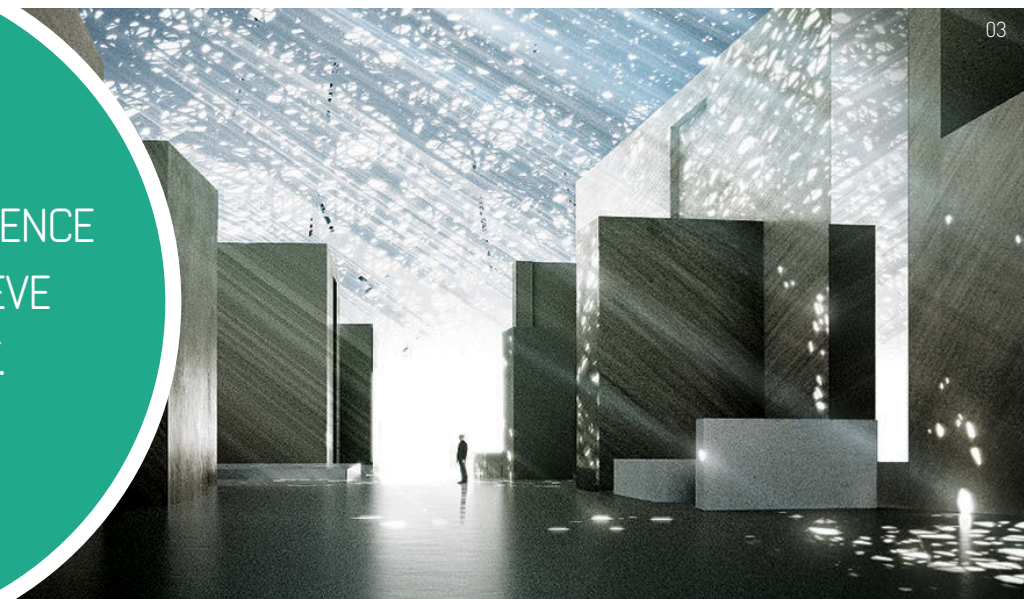
This means that Etihad won’t be satisfied with its halo product simply breaking even; it needs to earn its place in the A380. “We wouldn’t have created the Residence if we did not believe in it commercially. And I do believe in it. Commercially, even if there is lower occupancy than in the first class apartments, they will both be equally profitable. We are very bullish and I think the Residence will be a very successful product.”

RESIDENCE RESIDENTS So who will be a typical Residence occupant? “I think it’s probably fair to say that it is a product that is only accessible to wealthy individuals, possibly private jet customers,” states Baumgartner. That would be true of any market, but the UAE market introduces potential beyond single bookings. “In this part of the world, where you have big families traveling in premium or first class, it can be a very attractive proposition if you can sell the whole first class cabin. You could have the head of a family in the Residence and then the family in the Apartments, and then the entourage in business class. We can deliver that to perfection and offer the privacy that such customers desire and expect.”

Etihad already has experience with such individuals through its current long-haul first class, and also through private charters of some of its fleet, chosen because many families prefer Etihad’s food, service, IFE and seat quality



WE WOULDN'T HAVE CREATED THE RESIDENCE IF WE DID NOT BELIEVE IN IT COMMERCIALY. AND I DO BELIEVE IN IT



"The cabin is the living space in the air. Everything has to work for you. You need to be able to work, to meet, to converse, to dine, to relax and to sleep. To achieve this, the cabin environment must be completely controllable – and this is impossible without the power to control light – especially natural light."

Mauricio Cabal, President, Mauricio Cabal Design



04. Etihad's onboard chefs wear whites to enhance the restaurant feel

to that of many conventional charter aircraft. "There is a demand for that service and it is probably a little unique to our part of the world," adds Baumgartner.

However, he also foresees people who have saved for a special trip – a honeymoon perhaps – who will want the most exclusive special hotel at the most exclusive destination, and who can now take that a step further by, as Baumgartner says, "travelling in the most special cabin ever created". He adds, "There are many individuals who want the ultimate in lifestyle, convenience and privacy. That means more to them than the price of the ticket."

With the Residence due to commence operations in December, it is too early to gauge its success, but Baumgartner indicates that there have been "two handfuls" of bookings so far. That's quite something, given it is still six months from launch and the price starts at US\$20,000.

WHAT ABOUT ECONOMY PASSENGERS? Looking at the other end of the scale (or downstairs on the A380), will economy passengers really benefit from the investments?

"Probably the hardest area in which to deliver innovation is in economy," says Baumgartner. "Being innovative in premium classes is easier, as you have a little more space and a little more budget to work with, so if you spend a couple of dirhams more on a premium product, that's okay. If you spend half a dirham more per passenger place in economy, when multiplied by 417 seats on an A380 it becomes very expensive.

"Believe me, what we are introducing in economy, even if it just seems like little things, like the fixed headrest, the IFE panel, and the ergonomics, was hard work."

CATALOGS CAST OFF It's one thing specifying and developing innovative product such as a curved aisle and a new ceiling in the B787 first class cabin, galleys that run in a new direction, and a dual-occupancy suite, but certifying them is just as big a challenge.

"Because no one has done these things before, someone has to think about whether they have an impact on safety.

You know how strict certification standards are in aviation. You have to go through the whole process of coming up with something new, finding time for the authorities to look at it, consider what they think about it, and then go through the whole certification process. It's a huge effort."

The airline industry as a whole benefits from such work, though. For example, in the case of adding custom product to the Dreamliner, Baumgartner thinks that the Etihad project will benefit all future customers. "Initially, the 787 was meant to be just a catalog aircraft. However, we looked at the catalog and said, "Goodness me, this is not what we want." We went to Boeing, at the time they were having battery issues, and said, "We have another little project for you. We don't accept your catalog; you have to move away from the idea of us just picking items from it. As you can imagine, that was not easy.

"So, now we're kind of making Boeing more flexible. The way we acknowledge that is to say, 'We'll give you a little preview of what we're doing in the A380. Do you want the new Etihad Boeing cabin interior coming out second best compared with the Airbus interior, or do you want us to have two great aircraft?'

"They looked at what we have done in the A380 and said, 'Yes, if that is where the world is going, we have to compete.' We very much appreciate that increased flexibility, and we applaud them for the support. It all benefits the industry."

NEVER STOP INNOVATING So what is Baumgartner's advice for airlines looking to create an interior that will wow the world? "You can't buy innovation off the shelf. It has to be your own creation," he says. "If innovation is your ambition, as it is at Etihad, then you need to allow five to six years, knowing that one product cycle is between six and eight years. You need to have a constant innovation pipeline, because there is constant development. In fact, the day after we launched the new product we began working on what will come out seven years from now – otherwise we won't be ready in time." ☒



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hidden danger

The burning hot lithium-ion battery dilemma: how can the aviation industry solve a problem it neither caused nor controls?

MARISA GARCIA



The consumer environment loves the hottest new technology, but consumers don't associate their latest gadgets with fires burning as hot as 500°C (932°F), in a dangerous battery dynamic known as thermal runaway. In a thermal runaway scenario, when one battery cell fails at a high heat level, that can in turn cause neighboring cells to fail, creating a thermal chain reaction.

Aviation courts and embraces new technology. It has to, in order to keep up with the lifestyle demands of today's connected passenger. However, inherent dangers associated with the composition of the lithium-ion battery (Li-ion) cells used to power portable electronic devices (PEDs) produced by the major manufacturers, as well as less well-regulated copycat products, threaten to put PEDs in direct opposition with cabin safety objectives.

As the Royal Aeronautical Society stated in its 2013 report on fire safety, entitled *Smoke, Fire and Fumes in Transport Aircraft*: "One of the largest trends in the growth of inflight fire is due to the transportation of lithium batteries. From March 1991 to October 2012, the FAA office of Security and Hazardous Materials Safety

recorded 132 cases of aviation incidents involving smoke, fire, extreme heat or explosion involving batteries and battery-powered devices (Federal Aviation Administration, 2012). Lithium batteries were the majority of battery types in the incidents."

KNOW YOUR ENEMY There are two types of lithium batteries: the rechargeable Li-ion kind as usually found in PEDs such as cell phones, tablets and digital cameras; and non-rechargeable lithium batteries (Li-metal), which are similar to Li-ion, but are disposable and use a different electrode material – metallic lithium.

However, as the Royal Aeronautical Society report continues, "All lithium batteries present a potential fire hazard. These batteries are carried on airplanes as cargo, in passenger baggage and by passengers directly. Like some other batteries, lithium batteries are capable of delivering sufficient energy to start an inflight fire. But lithium batteries present a greater risk of inflight fire than some other battery types because they are unable to contain their own energy in the event of a catastrophic failure."





WHEN LI-ION BATTERIES OVERHEAT DUE TO DAMAGE, MISHANDLING OR DEFECT, THE HEAT CAN QUICKLY ESCALATE TO THE RUNAWAY LEVEL



The International Federation of Air Line Pilots' Associations (IFALPA) has also investigated this issue, and in a safety bulletin on the matter it states: "Since 1991, batteries or battery-powered devices have been involved in more than 100 recorded incidents of smoke, fire or explosion in air transportation. In order to be safely transported, batteries are required to undergo testing prescribed by the United Nations (UN) Subcommittee of Experts on the Transport of Dangerous Goods. Additionally, batteries must be designed to prevent short circuit and overcharging, and must be free from damage. Due to the expensive nature of these requirements, there is a substantial and growing supply of counterfeit batteries, particularly in Asia. These batteries have often not undergone the rigorous design and testing requirements prescribed by regulation and have a higher likelihood of overheating, catching fire or exploding."

HOW TO HANDLE A PROBLEM We asked Geoff Leach, founder of the Dangerous Goods Office, a consultancy specializing in aviation dangerous goods training, for his opinion. He explained, "From a passenger perspective, there are requirements that spare batteries must be in the cabin so if anything does go wrong it will happen in close proximity to trained staff. There is also a risk in the hold [when passengers place spare batteries in their luggage]."

Prior to founding his consultancy, Leach worked at the UK CAA for 32 years, 23 of which were directly in the Dangerous Goods Office. He was also a panel member and chairman of the ICAO Dangerous Goods Panel, focused on addressing these risks, and also contributed to IATA's Cabin Operations Safety Conference specifically to address the risks and required actions when Li-ion batteries fail on board an aircraft.

"The UK," he says, "is working with the FAA to produce media material for flight and cabin crew that reflects the ICAO emergency response guidance for cabin crew, something that is desperately needed by airlines as there is no comprehensive training material for dealing with an incident in the cabin involving a portable electronic device. The video will go a long way to addressing that."

Mark Rogers, chairman of the Dangerous Goods Committee at IFALPA, director of Dangerous Goods Programs at the Air Line Pilots Association (ALPA), and an active member of numerous industry working groups addressing these concerns, explains that when Li-ion batteries overheat due to damage, mishandling or defect, the heat can quickly escalate to the runaway level. This can also occur when batteries are charging, which is a special concern as many aircraft cabins now have many seats equipped with power outlets.

Rogers explains that most incidents of fire can be extinguished simply by cooling the batteries down again, for example by pouring water on them. In incidents where this has occurred, cabin personnel have reacted intuitively by dousing the fire with water and indeed it has worked.

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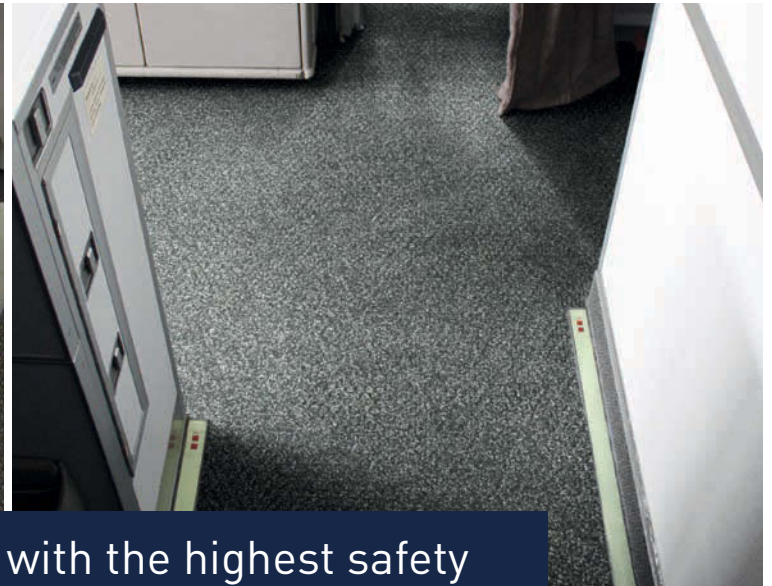
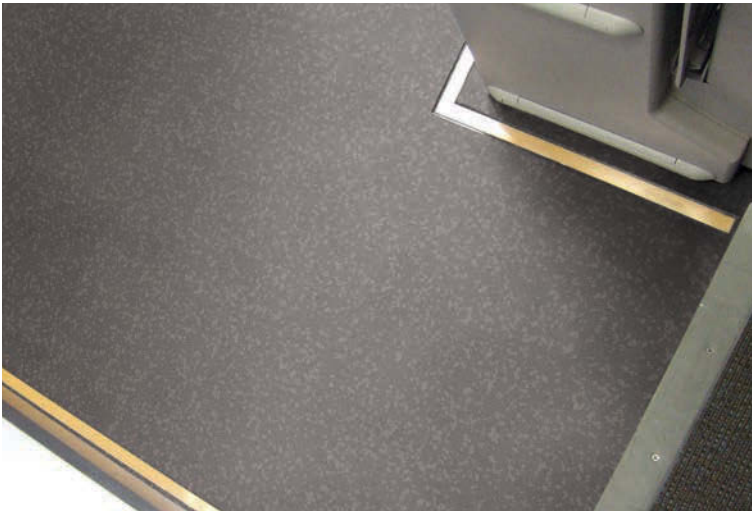
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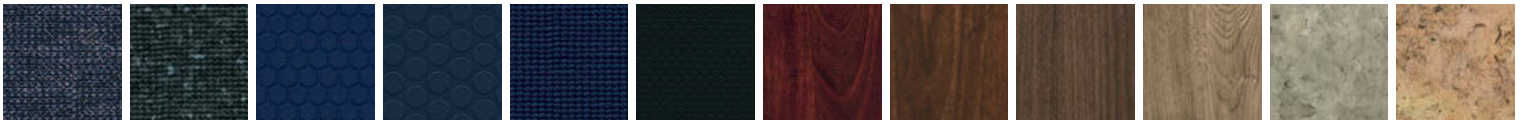
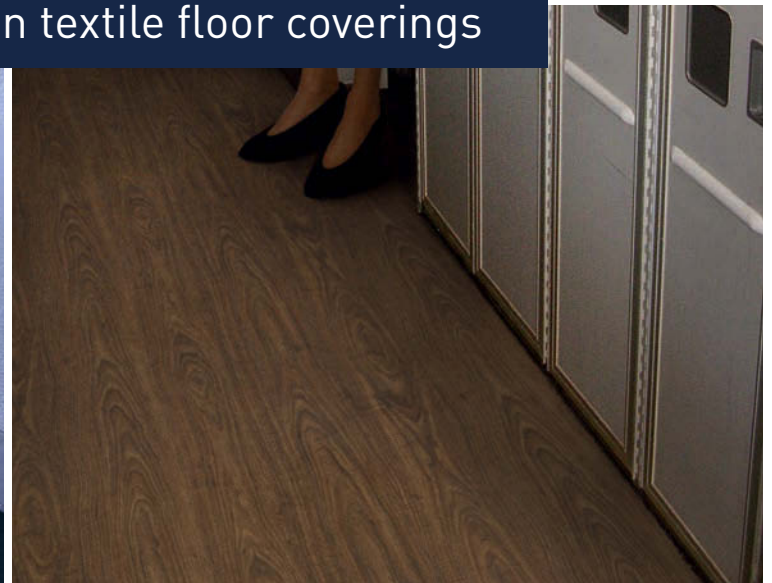
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However, even France's air safety investigation body, the Bureau d'Enquêtes et d'Analyses (BEA), in its report on an incident on board an Air France flight in 2010, where a battery ignited after being crushed by the seat adjustment mechanism after a passenger's cellular phone fell through cracks in the seat, emphasizes the possibility that Li-ion batteries may reignite.

As BEA said in its report: "Throwing water on a lithium battery fire can, however, revive the flames and make it more difficult to extinguish because of the reduction of lithium in water, which leads to the release of hydrogen, which is highly inflammable."

This confusion as to the handling of incidents is why both Rogers and Leach feel that education initiatives are required, and why IATA included this topic in its Cabin Operations Safety Conference. Aggravating the problems that approved batteries may encounter when they fail is the gray market for 'copy cat' batteries, which both aviation controls personnel and technology companies have failed to clearly define. "What nobody can answer is how many non-compliant counterfeit batteries are produced," Leach tells us. "Nobody really knows."

THE WAY FORWARD How can aviation plan a corrective action to a problem the scope of which is undefined, the risks of which are unclear and the solutions to which are in the hands of others?



NOBODY KNOWS HOW MANY COUNTERFEIT BATTERIES ARE PRODUCED



If the device manufacturers and their aftermarket suppliers do not make the scope of the gray market battery problem clear, then there is no way to know the level of exposure consumers face with these dangerous batteries, much less how many of them may end up aboard aircraft.

There are alternative battery compositions in the development phase that would reduce the flammability risks of lithium batteries, but if the tech companies themselves don't select such batteries to power their devices, then the risks remain the same.

As Rogers and Leach both emphasize, the principal action the aviation industry can take is one of education, not only for passengers but also for crew. There is still insufficient industry awareness of the problem. Cargo risks, however, are a separate matter; one for which more effective regulations could be developed and, according to Rogers, are underway.

But the cabin environment is at odds with itself, with airlines balancing the desire to provide power for passengers' PEDs and the risks of liberalizing the use of those same devices. EASA acknowledges the risk, and





WE CAN ONLY HOPE THAT TECHNOLOGY COMPANIES DO NOT WAIT UNTIL A DEADLY FIRE TAKES PLACE TO RECONSIDER



a spokesperson told us, “Through the spread of personal electronic devices such as cell phones, tablets, batteries, chargers, etc, hazards can be introduced inadvertently in the cabin. Although this does not significantly affect the safety of aviation system, it is nonetheless something that cabin crew should always be aware of.”

EASA asserts that having more PEDs onboard does not significantly affect aviation safety because, for the most part, when these fires have occurred, crew have detected them in time and been able to put them out.

Rogers confirms this, and tells us that the FAA’s Fire Protection Working Group is also active in reviewing the risks associated with PED batteries onboard aircraft. However, as Rogers also tells us, there is attention paid to these matters by the industry at large when an incident occurs, but with the passing of time the focus remains only with those specifically dedicated to these task groups.

Everyone we spoke to agrees that an extensive educational campaign, both within the industry and with passengers, can overcome that challenge.

Leach indicates that the industry is also examining practical ways to lessen the exposure to loose batteries in luggage. “We’ve been exploring the feasibility of detecting lithium-ion batteries in cargo using existing x-ray technology,” he says. “It’s in its infancy. We’ve worked with manufacturers to put batteries through the x-ray machine to see whether the algorithms can be adjusted to detect lithium-ion batteries. If we can find the non-compliant undeclared batteries via x-ray, it would be a major step forward.”

Leach leaves us with some sensible advice on what we can do as passengers to lessen the risks on board: “There are three steps that, if they were adhered to, would go a long way to preventing the kind of incidents we have seen in baggage: only buy lithium batteries from legitimate sources; carry spare batteries in the cabin; and protect batteries against short circuit by either leaving the batteries in their original packaging or by using insulation tape across the terminals.”

We have been fortunate – so far – that battery fires in the cabin have been containable. We cannot say the same of battery fires that have started in the cargo hold. We can only hope that technology companies do not wait until a deadly fire takes place in the cabin to reconsider the use of materials in everyday electronics that are this dangerous. Until technology companies take action, however, aviation can only prepare for the worst and hope for the best. ☒

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
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For a passenger experience to be successful, it is critical to know who you're creating it for. Join us as we seek out newly evolving categories of passenger, hunt the mythical Millennial, and find out what these groups will expect from the next generation of interiors

MARISA GARCIA

 Many travel aggregator websites have made a business of conducting and publishing travel surveys, accompanied by eye-catching infographics and provocative articles on how the travel sector as a whole, and airlines in particular, should woo the Millennial (sometimes also referred to as Generation Y). But, should they be wooed, or just dated casually without making any long-term commitments?

In order to better understand Millennials (broadly, people born between the early 1980s and early 2000s), we approached Massimo Scialò, chairman and CEO of Emergenza, an entertainment company that specializes in putting on concerts for unsigned bands, for which it is crucial to understand this specific age group. He is no stranger to sharing his knowledge with the aerospace community, as he recently spoke at the Hamburg Aviation Conference to share his thoughts about who Millennials are, what they stand for, and what they need.

The Millennial generation believes that corporations are inherently evil, Scialò says – and that includes airlines. Millennials expect corporations to trick them, so pricing schemes for airline tickets must be straightforward. Airlines that attract Millennial passengers with low fares must be mindful that they can perceive any add-on costs as deceptive tactics.

Scialò adds that Millennials are not swayed by traditional media, and are generally skeptical of formal corporate communications. Emergenza uses social media exclusively, as its metrics show that – for his company – everything else is a wasted investment. Airlines must actively engage Millennials on social media in a conversation, Scialò says, and address problems directly, before the negative word spreads online and the situation spins out of control. He says that airlines must have dedicated social media departments, staffed and led by specialists who exclusively manage the airline's online presence. "It's a full-time job," he emphasizes, adding that airlines are losing out by not capitalizing on the Millennials' need to share every aspect of their lives.

MILLENNIALS FIND FLYING EXCITING They will want their friends to know where they're going, who they are flying with, and where they have been. Scialò suggests that the industry should encourage this drive by sharing links on reservation sites and booking confirmations, as well as by making sharing easier throughout the journey.

On wi-fi equipped aircraft, allowing Millennials to send updates in flight, in creative ways, will increase the appeal of an airline. For example, many of these social updates can be automated via a cleverly designed airline app.



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Millennials could agree up-front to allow an airline access to their social media profiles. By linking a Millennial passenger's PED and the IFE equipment on the aircraft, the app could update the passenger's profile with what movie they are viewing in flight, which menu they've selected for their meal, what points of interest they have just flown over, and other details these passengers might like to share, without having to do it themselves.

Scialò refers to airlines charging for wi-fi as "ridiculous". Millennials view connectivity as a right – that the equipment that makes wi-fi connectivity possible on board the aircraft came at great cost is irrelevant to them. To the Millennial, connectivity is vital. It drives their choice of airline and they expect it to be free of charge, both in the terminal and on the aircraft. Scialò suggests that airlines can easily provide added value to these passengers, by setting up small mobile network hubs at the gate, keeping the passengers connected as they wait to board their flight.

Although Millennials expect free connectivity, Scialò says they are far more forgiving about speed. They understand that high demand can slow down the service.

Millennials' only other need on board is power for their various devices. They would highly value in-seat power outlets. Additional cabin design features will be less important to them. In many cases, they are unimportant.

This demographic is price sensitive. Although their interest in travel is great, their ability to travel is limited by resources. They are an ideal target customer for a lean economy cabin. They won't mind reduced pitch, narrow seats or a crowded cabin.

SILVER FLYERS At the other end of the spectrum in terms of age, financial resources and design requirements, are the generation of 60-plus passengers that Peter Knapp, global creative officer at Landor, dubs Silver Flyers. Ingo Wuggetzer, VP of cabin innovation and design at Airbus, also uses this term when he refers to this demographic, which shows strong potential for growth and revenue in the coming decades. Raymond Kollau, founder of airlinetrends.com, agrees that the 'boomer' passenger should be considered more carefully by airlines.

Silver Flyers have an abundance of disposable income, and they're eager to spend it on travel. Under current economic conditions, Knapp indicates, Silver Flyers are poised to spend. Unlike the generations that follow them, their future is financially secure.

Knapp says that, by and large, this older generation is empowered, healthy, rich, and has plenty of spare time on its hands. After years of hard work, Silver Flyers look forward to escaping their everyday routine and getting out to explore the world.

This demographic should feel that the airline brand shares values in common. Those values are the quality of the time spent on a journey, a focus on health and mobility, and a general sense that travel is thrilling and an adventure.

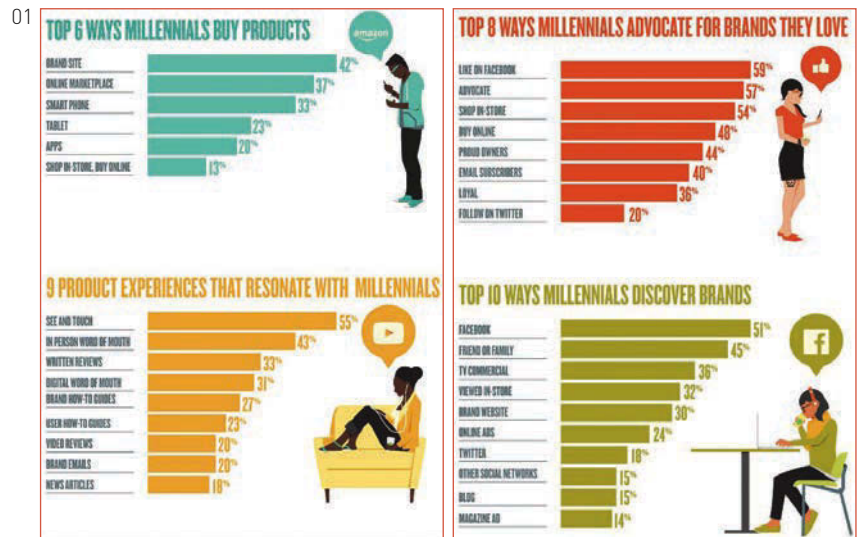
While the over-60s today are tech savvy, they may be less so than other demographics. They focus on empowerment, so they will prefer to make their



ILLUSTRATION BY JONATHAN ALLARDYCE

“ TO THE MILLENNIAL, CONNECTIVITY IS VITAL. IT DRIVES THEIR CHOICE OF AIRLINE AND THEY EXPECT IT TO BE FREE ”

01. Millennial statistics found by Moosylvania





invest in social media

A survey conducted by Moosylvania, an independent digital advertising agency, has sought to refute common myths associated with Millennials and create data on what really motivates them in how they think, shop, buy and continue purchasing their favorite brands. Millennials account for nearly US\$1.3tn in consumer spending and spend the second most amount of time of any generation online – 87% as much as Gen X'ers.

Overall, the study found that Millennials identify with themselves as being self-confident and independent, yet seek constant reassurance from friends and family when it comes to making purchases, via text, phone call or social media. The survey finds that successful brands do their homework to connect with the Millennial consumer across multiple touch points – to 'Friend' them, so to speak.

Airlines should invest in their social media platforms to engage with Millennials. Millennials expect marketers to be up-front when it comes to answering questions, and build trusting relationships with them by using context-driven content spread across a variety of platforms. Moosylvania found that Facebook is a natural stopping-off point for Millennials to learn more about brands they love. In fact, the ubiquitous social media platform outranks brand websites almost two to one as the go-to for product discovery.



AIRLINES SHOULD CONSIDER THE LITTLE DETAILS OF THE TRAVEL EXPERIENCE

own online bookings. The web (and IFE) interface should be simplified and intuitive so it is easy for anyone to navigate.

At a time when passenger processing is becoming increasingly automated, Knapp cautions we should not go too far. Airlines should ensure face-to-face contact with Silver Flyers. They will appreciate the convenience of automated check-in, if the interface for that automated check-in is easy to understand. But an airline representative should be present at the airport to meet and greet Silver Flyers traveling in groups. Airlines should also position representatives strategically throughout the airport, to help Silver Flyers navigate expanding terminals. This would enhance their travel experience and they would perceive that service as added value.

Some of the distances required to walk through many of the world's terminals are much too long for this passenger profile, Knapp points out. That can often discourage Silver Flyers from traveling by aircraft, when they might otherwise prefer to do so. Airlines could have agreements in place at the terminal to collect and transport passengers to and from their gates by buggy.

Knapp recommends that airlines, and the aviation industry at large, sympathize with these passengers, and consider the "little details" of their travel experience. For instance, little consideration is given to what seniors must

go through to cross the security line. Providing seats or benches, where they can sit as they put their shoes back on after screening, would be a great improvement. Airlines could also make the security screening process easier on seniors by issuing them with fast-track passes, just as they do for business travelers.

CABIN DESIGN SHOULD FOCUS ON ERGONOMICS

Airlines should design their toilet facilities to ensure they are accessible to passengers with limited mobility, Knapp adds. Stowage bins should be designed with a thought for accessibility to passengers with physical limitations. Variable seating would solve a number of concerns, not just for Silver Flyers, both Knapp and Wuggetzer emphasize.

Special sections in the economy cabin, with alternative widths and pitches, would sell well, because there are a number of passenger types willing to pay a bit more for comfort.

Knapp says that Silver Flyers will have limited need for business or first class cabins, although they may splurge on occasion. They are primarily economy customers, but they would purchase premium economy services if properly packaged. In fact, most of the experts we spoke to highlighted the importance of a more versatile design for the cabin. "One size fits all does not fit anyone," Knapp says.

Beyond structural considerations, Knapp suggests changes to the soft product offering. Providing table service at the lounge, for example, instead of a buffet, might make lounge access more attractive to the Silver

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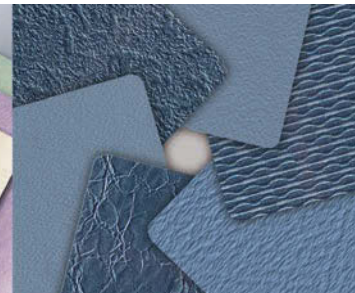
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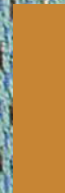
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The increase in female business travelers will necessitate a change in product design over the coming years



01. Our panel of demographics experts. From top: Devin Liddell, Teague; Chris Nurko, FutureBrand; Peter Knapp, Landor; Raymond Kollau, airlinetrends.com; and Ingo Wuggetzer, Airbus

Flyer (as well as others). This could encourage them to spend extra to access the lounge.

Simple adjustments to boarding processes can make travel more appealing to an older passenger. Knapp suggests that airlines should decide to let senior passengers board first, or last, as either would make it easier for these passengers to find their seats, without having to push through a crowd. Flight attendants could be more attentive to the needs of these passengers, helping them stow bags.

It all comes down to a “thoughtful business approach”, Knapp says, consisting of dignity, courtesy and respect. The industry should encourage the Silver Flyers’ ambition to put their hard-earned retirement funds to good use by exploring the world.

FEMALES AND GEN-TREPS ON THE UP Other demographics scheduled for growth, and with potential for high revenue, need special mention. Airbus’s Wuggetzer states that female business travelers are on the rise, and their numbers will continue to increase over the coming years. Special considerations to tailor their inflight experience for comfort, entertainment needs and meal preferences will attract this growing demographic. Kollau from airlinetrends.com also believes the increase in female business travelers will necessitate a change in product design over the coming years.

Chris Nurko, global chairman of FutureBrand, includes female business travelers in his Gen-TREP group (GENERation of the EnTREpreneur). Gen-TREPs, now in their late 30s or early 40s, is a passenger demographic marked for growth, Nurko says. Their greatest needs, he tells us, are speed, convenience and separation.



SILVER FLYERS PAY SERIOUS ATTENTION TO CABIN DESIGN



To them, flying is often a chore. It is part of their overall mission to get things done, and move their small businesses or consultancies forward. Nurko indicates that because this demographic is often self-funded, they have some degree of price sensitivity.

Like Millennials, Gen-TREPs will expect connectivity and power outlets in flight – but because they want to work, not to enhance their social networking. They will prefer to purchase space in the cabin that gives them some degree of privacy, providing a quieter place to work. While these passengers will book premium economy rather than business, they will also pay for unbundled services, such as lounge access and priority boarding.

DESIGNING FOR DEMOGRAPHICS Devin Liddell, principal brand strategist at Teague, agrees with Nurko, and they both strongly caution the aircraft interiors industry against focusing too much on demographics for design. They agree with the connectivity preferences for Millennials and the needs of the other passenger profiles as discussed here.

But, as Liddell explains, airlines should design for extremes. He suggests that while Millennials may be nearly immune to cabin design, Silver Flyers pay serious attention to it. Resolving what he calls the “impossible tensions” of completely different design considerations, is, he says, where solid design comes from.



money-making devices

Transaction technology specialist NCR Corporation has found that Millennial travelers are willing to spend money while traveling if convenient digital retailing is available. The data comes from a recent travel survey aimed at capturing the tendencies of airline passengers to embrace 'omni-commerce' when they travel.

"Younger travelers who have embraced mobile shopping and self-service in other facets of their lives are looking for that digital shopping gratification when they are en route to their destination," says Tyler Craig, VP of NCR Travel. "Airports and airlines have a unique opportunity to cater to this growing demographic by allowing them to make purchases for ancillary items via mobile devices and other opportunities through self-service kiosks."

NCR asked US travelers between the ages of 18-24 what they would like to buy using their smartphone or tablet as a shopping conduit: 68% would like to purchase items such as seat upgrades, inflight meals, wi-fi and duty free goods; 77% would like to be able to make an airport-related purchase like parking or meals; 51% are willing to provide personal information in order to receive offers tailored to their location and preferences; 77% would like to be able to use loyalty points for airport purchases; 70% would like to be able to view and purchase items from airport retailers on their device and have them delivered directly to their destination.



THE TRADITIONAL THREE- OR FOUR-CLASS CABIN IS A THING OF THE PAST

Liddell notes that design objectives depend on a particular airline's core traveler market. Airlines, he suggests, should avoid trying to be all things to all people. Making bold decisions on what exact market segments to target, and designing around those market segments, may be a risk, but it is the type of risk that firmly defines and strengthens the airline brand.

All those we spoke to agree that brand definition, and accommodating the various demographic sectors that will drive industry growth in the near-term future, will go beyond cabin design. Changes are required at the terminal as well, and airlines have some great opportunities to differentiate their brand through service enhancements.

Specific to cabin design, our experts agree that the traditional three- or four-class structure is a thing of the past. The future passenger mix will require a new cabin layout. Fare classes will change, with the products and services often sold separately. We will have to package fares creatively, to suit the needs of the numerous passenger profiles.

These predominant growth demographics will gravitate to fare basis classes yet to be invented. Let's call them hybrid-W(X). The needs of the majority of entrepreneur business passengers will be met by a hybrid (WJ), segregated to allow those passengers a space to be productive and undisturbed. An alternate hybrid (WS) may emerge, with greater space accommodations and

dedicated facilities for seniors. A hybrid (WY) for families traveling together was suggested by many of the experts, which would also suit leisure travelers who travel in groups. Nurko pointed out that group travel means far more than just package holidays. Often groups of friends will opt to travel together, independent of a travel agency.

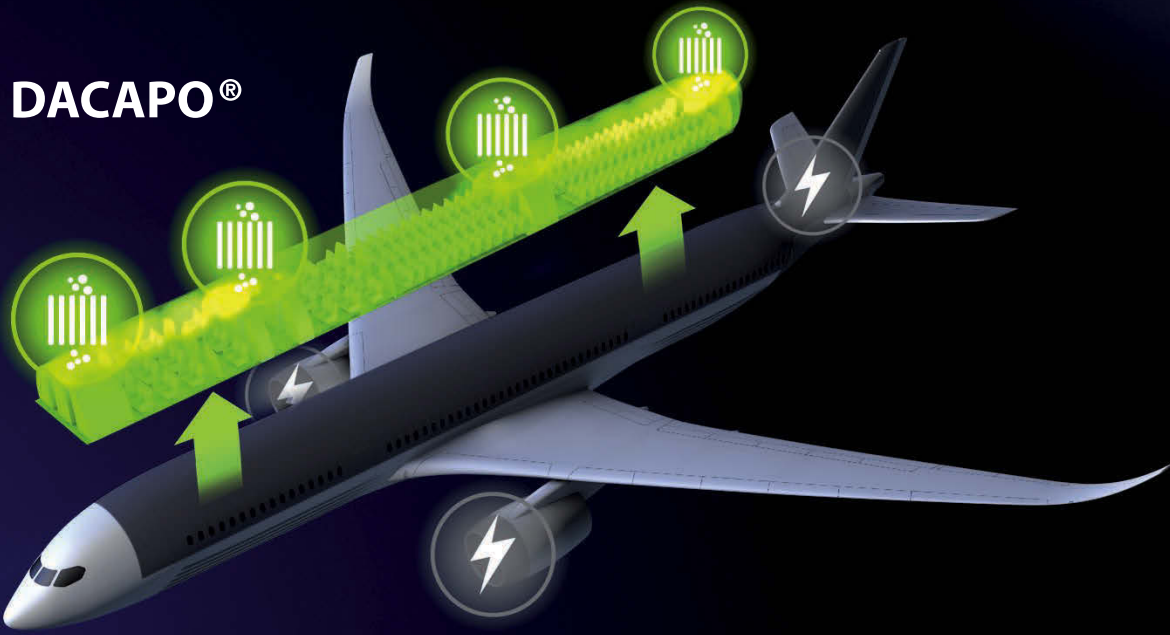
'Y' fare could easily stand for young. Because Millennials have minimal demands on cabin comfort, they could be accommodated in a tight configuration, high-capacity economy class.

So who will buy business and first-class seats? Today's 'J' will likely become tomorrow's 'F'. We already see that trend in the design of many modern aircraft entering the market. Does this mark the end of the first class cabin? There are still affluent passengers who will pay for luxury. For long-haul flights, there will likely still be a limited demand. The greatest demand for this class, as Nurko and Kollau point out, will be in Middle Eastern and Asian markets. Much of what attracts those passengers is service quality, and airlines targeting these markets should focus on this.

The challenge will be to ensure revenue from first class. From what we hear, there are some clever innovations in the works that may save the first class cabin of tomorrow.

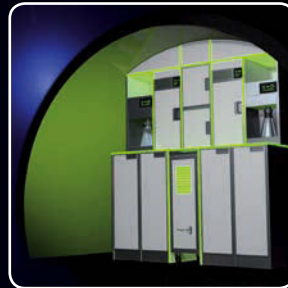
The main contribution of Millennials to aviation is less that they will fill seats and raise revenues, and more that they have captured the airline industry's attention and made it think of the needs of diverse growth demographics. The myth of the Millennial could become the legend of how aviation succeeded, by accommodating tomorrow's passenger, regardless of their age, gender or social class. ☒

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cutabove

The design firm behind Lufthansa's sporty and sophisticated new premium economy seat opens up about the concepts, colors and challenges that shaped the project

MARYANN SIMSON



Premium Economy

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LUFTHANSA PREMIUM ECONOMY



It can be said that a product emblazoned with the mark 'Made in Germany' is held in high regard as an object of quality and craftsmanship. The label carries a connotation of refined evolution and superior engineering, evoking thoughts of scientists, fast cars and respected brands such as Porsche, Siemens and Adidas.

Lufthansa, Germany's flagship carrier, provides a perfect example of the calculated precision that trademarks a 'Made in Germany' enterprise. The airline is expertly organized and the most important decisions filter down from the top for systematic implementation. No business maneuver is undertaken without serious evaluation and total confidence that it will benefit the airline's brand, its operations and, of course, its passengers.

Lufthansa's late announcement of a premium economy offering, several years after implementation by some rivals, could be an indication of just how careful and calculating the company is. Rather than rush out with a mediocre product or risk cannibalizing its business class, marketing teams at Lufthansa took their time planning and positioning this, their first new class development in 35 years.

Aircraft Interiors International recently sat down with Jens Romca and Jochen Müller, the men behind the wheel at Müller|Romca, the German design firm (with offices in Hamburg and Kiel) which designed Lufthansa's Premium Economy Class seat. The interview unearthed some unique insights into the many aesthetic and technical decisions that went into, and continue to shape, the premium economy seat unveiled at Aircraft Interiors Expo in April.

"We had to make three designs," says Müller about the bidding process. "Lufthansa asked for a shell-seat concept, a seat with an open armrest that was more oriented toward economy class, and a seat with a closed armrest. That was our brief and our task was to put the product right between economy and business class, but leaning slightly more toward economy."

The winning design concept reflects the very German ideal of streamlined precision in design. German people, in general, tend to take a 'no frills' approach toward luxury. Serious, professional, accurate and modest – all are words



LUFTHANSA WANTED THE SEAT TO APPEAR FRIENDLY AND INVITING

01. As you would expect, Lufthansa is not rushing the development of its new travel class
02. The water bottle stowage space is a particularly well designed and useful feature

that one could easily associate with the Lufthansa brand itself. They are also words that the design duo Müller and Romca use to describe their concept, one of many tasks they have completed in the past decade for Lufthansa.

This time around, they say, the airline asked for one additional attribute to be considered. “It wanted to make the seat appear friendly and inviting,” Müller reveals as he arranges leather, plastic and fabric swatches on a table. “We achieved this with dimensions and color. We made the seats cozier by increasing the width and depth of the backrest cushion. The color concept brings in more warmth, and all the materials that the passenger comes into contact with are natural. We have a woolen fabric for the main seat covers, and leather for the armrest and antimacassar. The leather has stitching lines that you can see and feel.”

According to Müller|Romca, Lufthansa’s premium economy was originally set to continue the color story of the carrier’s economy seat, which is dominated by shades of gray and blue and accented with golden yellow. This idea was abandoned, however, as it resulted in a seat that too closely resembled economy.

Working closely with German textile provider Rohi, Müller|Romca and Lufthansa’s marketing team eventually agreed on a scheme that better positioned the product directly in the sweet-spot between the classes fore and aft. “The seat fabric contains many shades: a dark bluish gray, a mid-tone gray, a light gray as a highlight, and a little brown. A double stitch-line on the backrest in light gray (matching one of the two gray tones used by plastic supplier Sabic to create the molded seatbacks) gives it a playful feel. The color scheme is a link to business class, while the shape of the backrest and open armrest is very similar to economy class.”

Many smaller elements including coat hooks, bumpers and parts of the center console are made from aluminum that has been anodized to improve durability and to create a natural and high-quality appearance (this material is also used in business class). Brown leather trim imprinted with the words ‘Premium Economy’ was sourced from German leather house Traveller Jean Weipert and used along the top of the netted seatback pocket. It also functions as a restraining mechanism for PEDs. These leather details, combined with a bottle holder at knee level, clean and technical lines and simple radius curves, lend a distinctly automotive flavor to the cabin.

Every passenger has their own headset jack, USB port and 110V AC power outlet. IFE hardware will come from Panasonic Avionics or IMS/KID, depending on aircraft type. The center console is an area of precise integration, packed tightly with one, or more often two, IFE boxes near the bottom, AC power, headset jacks, tray tables, life vests, handsets for the in-seat entertainment, and a dedicated PED stowage area. “If you submerged it in water, no bubbles would come out – it’s that tight,” Romca jokes.

Despite having some influence on material sourcing, Müller and Romca admit that they had no say in Lufthansa’s selection of ZIM Flugsitz as the seat manufacturer. Although the new seat is based on the BC-01 model, major design and functional changes had to be made – a challenging task for ZIM. Still, the designers report that the entire seat development took well under two years, a relatively short time for a program of this complexity.

There is still a lot of fine-tuning required before the product is ready for its fall roll-out across Lufthansa’s B747-8 fleet. The ink is still drying on at least one key supplier contract and new challenges pop up daily, but Müller and Romca are confident that when the big day finally comes, their ‘Made in Germany’ design will be well-liked by a wide world of passengers who could be ‘made’ just about anywhere. ☒



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freshstart

As seat refurbishment materials and techniques advance, older aircraft seats can offer a surprisingly wide scope for adaptation and even improvement on their original designs

BERNARD FITZSIMONS



Refurbished seats have one obvious attraction over their brand-new equivalent: they cost a fraction of the price. A less obvious advantage, but one that may be just as important, is that even with heavy customization they can be available in a fraction of the time of a new order.

Tim Garvin, vice president of sales at Regent Aerospace, based in Valencia, California, says a typical lead time would be about 12 weeks for the first shipset. “The determining factor is the original design, tooling and engineering, and the wait for materials,” he says. Once that is accomplished, subsequent shipsets can be delivered at the rate of one a week.

The extent of the refurbishment depends on the customer, Garvin says: “It can be simply changing the foams and the dress cover, or it can be much more involved.” He points to an old Britax business class seat removed 15 or so years ago from a commercial Boeing 767. Now, reconfigured and redesigned, it looks entirely at home in its new berth aboard a private VIP jet.

“We redesigned it to recline fully to make it a lie-flat,” says Garvin. “We redesigned the center console so that it could accept a 10in video screen and then of course put on very high-quality leather dress covers and restyled it.”

New business class and first class lie-flat seats are very expensive, so refurbishing them represents a tremendous cost-saving opportunity, Garvin says. “The move to lie-flat really took seats to a different level, both comfort-wise and cost-wise. With all the actuators involved, it really improved the product and increased the cost and the complexity of repair.”

The same seat that Regent adapted for the VIP application has also found a new lease of life in commercial business class cabins, he adds: “The seat configuration used to be 2-1-2 and the seats used to be wider. We’ve changed it from 54in wide to 50in by modifying the center console and the back structure. That way we can install the seats 2-2-2 and gain an extra seat per row.”

If premium seats are the high-value end of the market, the volume is obviously in economy. One of Regent’s most recent projects involves replacing the seatback screens in an Asian airline’s economy seats with a bigger model. “We were able to redesign the seatback and manufacture the brackets,” Garvin says. “Then we installed the larger screen. The design and manufacturing were fairly straightforward, but because it’s a 16g seat the recertification process was quite complicated. The seats are

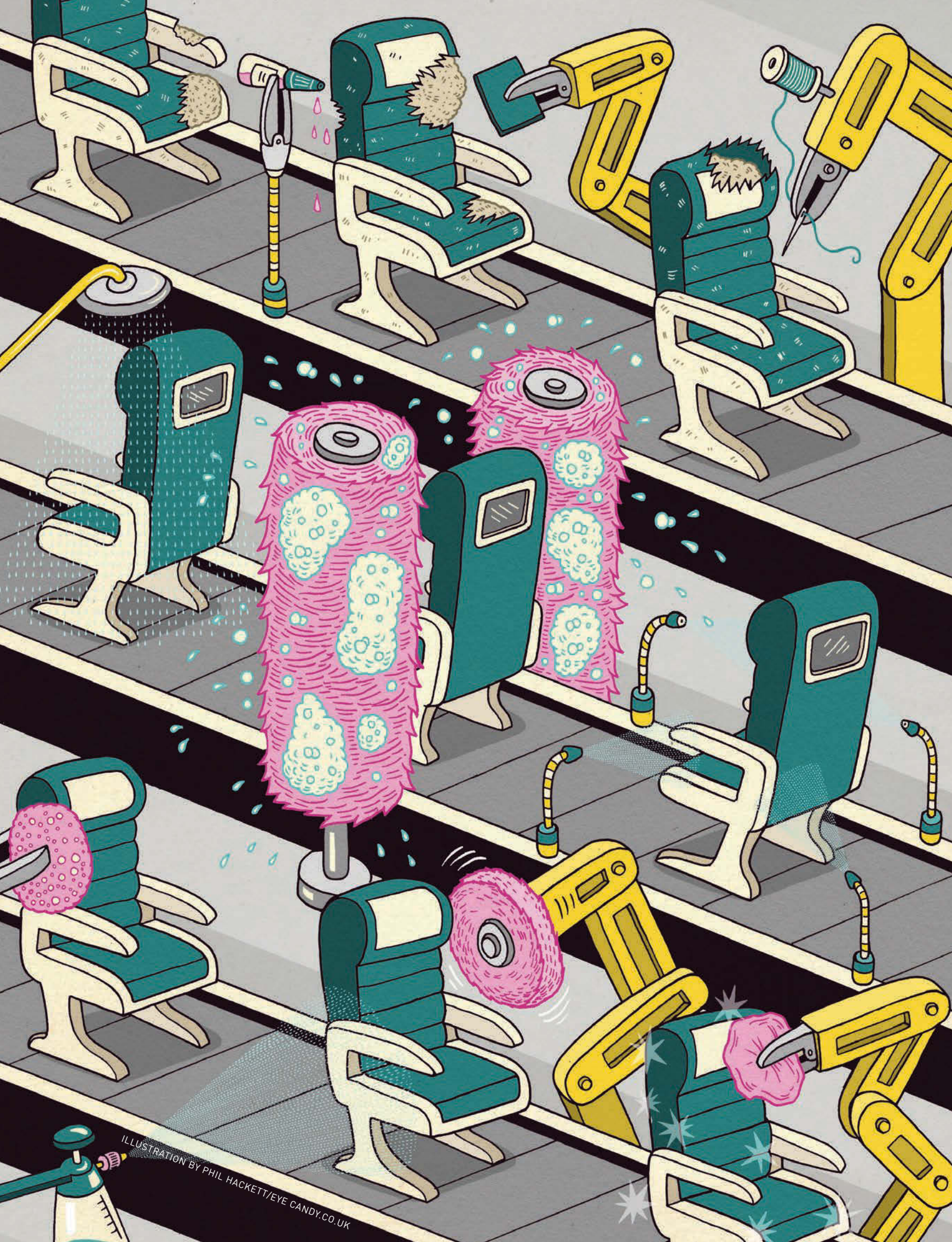
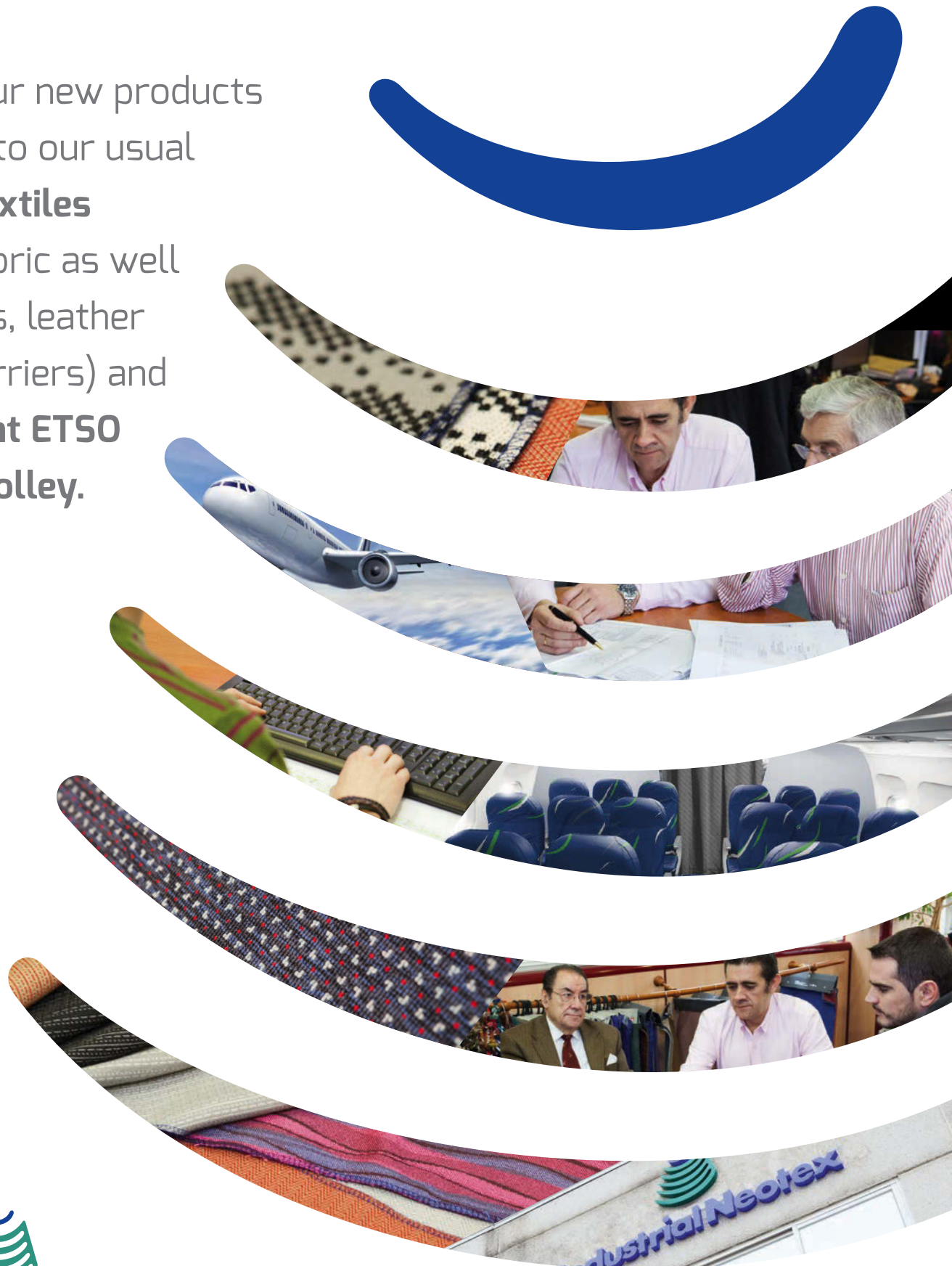




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01



02

completely refurbished at the same time, with all new plastics, cushions and dress covers.”

Dynamic testing is an expensive procedure, so certification of 16g seats is a major consideration. “With the 16g requirements, that is the biggest challenge and the biggest portion of the refurb,” he says. “Everything else is fairly straightforward. We work on a lot of 16g seats, and when we make changes, we try to stay within the OEM’s certification limits.”

TESTING REQUIREMENTS Pete Blich, director of engineering and FAA designated engineering representative (DER) at Regent Aerospace, says the company works mainly with airlines operating aircraft built in accordance with FAA regulations governing transport category aircraft, namely 14CFR Part 25. Its seats are required to meet technical standard order (TSO) C39 or, in the case of 16g seats, TSO 127A. Aircraft types certified after 1998 or manufactured after October 2009 must have 16g seats.

“As we perform maintenance, we have to make sure that the seats continue to meet the TSO requirements,” Blich says. “As we do maintenance that is above and beyond what the manufacturer is identifying in their maintenance manuals, then we do testing as needed. When cushions and covers are replaced, we have to prove that they met the flammability requirements and fireblock requirements.”

Flammability testing under Part 25.853A is done in house – Regent has an FAA-approved lab – and 25.853C fireblock testing by an outside source.

The other element of certification is the strength characteristics of the seat, which encompasses both static and dynamic requirements. “The C39 seats only have to



Aircraft manufactured after 8/20/1990 must comply with OSU 65/65/200 fire safety standards



WE HAVE TO MAKE SURE THAT THE SEATS CONTINUE TO MEET TSO REQUIREMENTS



meet the static requirement,” Blich explains, “whereas the TSO 127A seats have to meet the static and dynamic requirements. These fall under FAA regulation 25.561 for static and 562 for dynamic.

“When testing is required, we have to prepare test plans, and have them approved by the FAA through DERs authorized to assist with major alterations and repairs. We create test plans, carry out tests, write reports and ensure that the seat continues to meet the TSO requirements.”

All that is identified on the return to service paperwork, so when the seats go back into service, the installer has all the proper documentation. If an arm box has a tear in the sheet metal, for example, and Regent applies a doubler to repair it, “we still have to coordinate with the DERs”.

The maintenance manual is likely to say that if a part is broken, it should be replaced. But OEMs generally do not stock parts, which have to be ordered weeks or months in advance. “In some cases it’s not something that is visible to the passenger and it’s possible to make a local repair that will save the airline the cost of replacing the component,” Blich says. “If no replacement part is available but we’re able to make a local repair that’s FAA-approved and return it to service, we can help facilitate the turnaround time the airline needs.”

01. For one airline, Avianor refurbished the seats, removing the IFE and converting them from 2-4-2 to 3-3-3 configuration, installed them and modified the PSUs to the new configuration
02. Avianor extended the height of the seatback to add IFE screens to these Recaro seats

03. Regent has modified Britax business seats for multiple operators. Work has included modifying seats from 54in to 50in wide, adding a fully lie-flat function, and installing IFE video monitors in a center console

When Regent makes a part from scratch, it is classed as a brand-new part. “There are two ways for us to handle that,” says Blich. “FAA regulations allow us to install a replacement part on a seat that we have in house for maintenance, but we’re not allowed to sell that part. Before selling a part we have to obtain parts manufacturing approval (PMA) and/or owner/operator approval.”

The PMA process allows improvements to be made to the OEM part. He adds, “Whenever we do maintenance and encounter the parts that have common deficiencies in the OEM design, we can come up with a better product and have it approved through the PMA process.” The key is maintaining form, fit and function, which includes ensuring that any new part installed does not require any change to the next higher assembly: “It has to be completely interchangeable. But it could be improved.”

Montreal-based Avianor combines an extensive interiors refurbishment capability with its own maintenance hangar, enabling it to carry out installations as well as reworking of seats and other cabin elements.



THE PMA PROCESS ALLOWS IMPROVEMENTS TO BE MADE TO THE OEM PART



net gain

Regent Aerospace buys large inventories of seats. In May, the company had more than 75 shipsets of Boeing 737-800 seats on hand and was about to conclude a deal for 100 shipsets of Airbus narrow-body seats to add to the 40-plus already in stock. “We also buy, refurbish and upgrade complete interiors, sidewalls, galleys and lavatories,” says vice president of sales Tim Garvin.

Those numbers are a consequence of the trend for full-service airlines to ditch their existing economy seats in favor of new, slimmer models that enable them to add whole extra rows. Frontier Airlines, for example, replaced the Weber seats on its Airbus narrow-bodies in order to gain a row. “We took the seats, modified them, and could have given them that extra row for a quarter of the cost,” says Garvin. “We sold them to a high-density airline at 28in pitch.”

Although the seats were “quite decrepit,” Garvin says, Regent was able to refurbish them so they took less room, modified the seatback cushion to meet head impact criteria (HIC) requirements and gave the new operator the high density it wanted: “Marketing people don’t always understand that they could upgrade what they have for much less cost and put their ideas into practice much more quickly as well.”



“We buy seats that are being removed from aircraft and hang onto them until they can be reused and repurposed,” says CEO Earl Diamond. “The average traveler doesn’t realize they are sitting on a 10- or 15-year-old seat. They think it’s brand new.”

The company has its own engineering staff, enabling it to “take a seat from a B767, move the legs, recertify it and put it on an A320”, explains Diamond. There can be certification issues if an airline wants to add or remove seatback IFE screens, “but once we’ve established the plan, we’re able to do the work and deliver a product that’s not just acceptable but remarkable”.

One project for Air Canada a few years ago involved remodeling some old Weber 7070 full-electric seats, originally installed on the airline’s A330s, for an all-business class A320 to be used for charters, particularly for hockey and other sports teams. “It was quite a challenging project,” Diamond recalls. “We added brand-new plastics and used perforated leather so that the hockey players and basketball teams could get some aeration. We used all new foams and tricked it out with some trims that were aqua-printed so that they looked like wood. And we took out all the IFE, because they only really needed a headset, and added in-seat power.”

Crucially, the seat was available much sooner as well as at a lower price than a new equivalent. “We turned this thing around in four or five months,” he says. “To design a new seat from scratch, customized like that – they were getting more into bizjet seating – it could have been a year or longer. And it was half the price at least of what it would have been from an OEM.”

Refurbishment of economy seats would normally involve new plastics, cushions and dress covers, Diamond says. But the work may be more extensive when lessors move aircraft from one airline to another. Installing IFE screens – or, increasingly in these days of cabin wi-fi, removing them – is a common requirement.



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self-healing seats?

Imagine if cabin plastics could repair themselves. Some progress to date has seen materials that can bond microscopic cracks, but researchers at the University of Illinois have developed materials that not only heal, but regenerate, filling in large cracks and holes by regrowing material – and work more than once.

“We have demonstrated repair of a non-living, synthetic materials system in a way that is reminiscent of repair-by-regrowth as seen in some living systems,” explains Jeffrey S Moore, a professor of chemistry and part of the research team.

The regenerating capabilities build on the team’s previous work in developing vascular materials. Using specially formulated fibers that disintegrate, the researchers can create materials with networks of capillaries inspired by biological circulatory systems.

For regenerating materials, two adjoining, parallel capillaries are filled with regenerative chemicals that flow out when damage occurs. The two liquids mix to form a gel, which spans the gap caused by damage, filling in cracks and holes. Then the gel hardens into a strong polymer, restoring the plastic’s strength.

“We have to battle a lot of extrinsic factors for regeneration, including gravity,” says study leader Scott White, a professor of aerospace engineering. “The reactive liquids form a gel fairly quickly, so that as it’s released it starts to harden immediately. If



it didn’t, the liquids would just pour out of the damaged area and you’d essentially bleed out. Because it forms a gel, it supports and retains the fluids. Since it’s not a structural material yet, we can continue the regrowth process by pumping more fluid into the hole.”

The team have demonstrated their regenerating system on the two biggest classes of commercial plastics: thermoplastics and thermosets. The researchers can tune the chemical reactions to control the speed of the gel formation or the speed of the hardening, depending on the kind of damage.

The researchers envision commercial plastics and polymers with vascular networks filled with regenerative agents ready to be deployed whenever damage occurs, much like biological healing. Their previous work established ease of manufacturing, so now they are working to optimize the regenerative chemical systems for different types of materials.

“For the first time, we’ve shown that you can regenerate lost material in a structural polymer. That’s the kicker here,” White says, “Prior to this work, if you cut off a piece of material, it’s gone. Now we’ve shown that the material can actually regrow.”

04. The University of Illinois system in the process of repairing open damage. The two restorative fluid streams wet the surface of the damage where they gel and act as a scaffold for further deposition and eventual recovery of lost mass

For one Ukrainian airline, Avianor not only removed the seatback video from the seats on an A330 transferred from another airline, replacing the installation with a pillow that had been installed in the last row seatbacks and was already certified, but also modified the layout of both seats and PSUs from 2-4-2 to 3-3-3. “We used the original OEM part but we covered it in leather to make it match the new leather covers that were on the seats,” Diamond says of the pillow. Avianor also installed the seats in its own hangar.

Other airlines still want to add IFE hardware to seats without it. That can be complicated, and in one case the video screen did not fit the existing seatback, Diamond says: “We had to build up the back of the seat using foam and have our box extend up. We basically made the seatback bigger.”

Whatever the desired result, engineering capability is crucial to the process. “Without engineering to make sure you’re respecting all the certification requirements, you can’t hope to do it properly.”

MID-LIFE REFRESH UK-based soft-furnishing specialist MGR Foamtex sees a refurbishment requirement as an opportunity for a mid-life refresh. The company produces premium cabin MPS (multi-postural seating) comfort systems, which include multidensity Ecomfort foam, which the company says has been scientifically shown to increase comfort by reducing pressure on nerves and blood flow when used with advanced bedding technology. The economy variant, Ecomfort Lite, can be introduced as

part of a refresh project to improve comfort and reduce weight. Aesthetics are addressed by the MGRStyle Cover, for which a purpose-designed lamination process produces covers capable of retaining flammability characteristics through a minimum of 20 dry-cleaning cycles.

Though the company holds independent EASA design, manufacturing and maintenance approvals, managing director Jon Rose says the need to retain TSO continuity is paramount, particularly where 16g seating is concerned. “In this respect MGR works closely with major seat manufacturers such as B/E Aerospace and Zodiac,” he says.

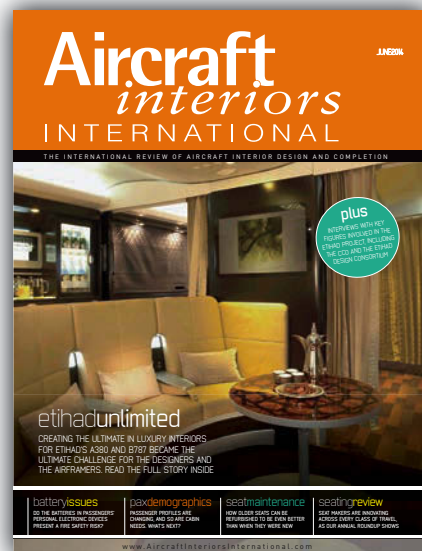
“However those manufacturers are busy with unprecedented demand for new and increasingly complex seating products,” Rose observes, “so allocating valuable engineering resources to smaller refresh or refurbishment projects is not always viable. MGR can support OEMs with development, testing and engineering, often working within challenging lead times.”

As an example, Rose points to Cathay Pacific’s introduction of an award-winning long-haul business product on its B777s and A330s, which left the airline in a quandary about what to do with the older B747s and A340s that were to remain an important part of its fleet. The answer was a mid-life refresh program for the old business class product, to provide customers with a consistent experience across its long-haul and regional business products.

Cathay approached MGR Foamtex to provide seat refresh kits to the same standard as those already installed on the B777s and A330s. B/E Aerospace provided the lead



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In the 1930s, seats could withstand 6g. In the 1950s a 9g static requirement was introduced, and today seats must be able to withstand a 16g dynamic force



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and the three companies worked in unison to a very aggressive schedule to deliver what appeared to be a brand-new cabin in less than a year.

CEO Les Simpson says mid-life refresh programs differ fundamentally from new-build projects in that airlines often want to introduce them as quickly as possible. As well as putting a strain on manufacturing capacity, that urgency imposes a burden on airlines' engineering and maintenance capabilities by making it impossible to synchronize the installation with planned maintenance programs, with a major impact on installation costs.

MGR Foamtex's initiatives to drive down associated costs include the provision of replacement parts in kit form specific to each aircraft. This reduces what can often be a complex series of replacement component part numbers to a simple part numbering system. Parts are supplied in boxes that are identified right down to specific row numbers, with the packaging being used for removal and disposal of the parts being replaced. By simplifying the supply of parts, MGR says it is able to reduce installation costs and lead time to help speed up the entire process.

ALTERNATIVE CUSHIONS Supracor, based in San Jose, California, has created an alternative to foam in the form of Stimulite honeycomb. Fusion bonded from Elastollan, a high-performance thermoplastic urethane (TPU) developed by BASF, Stimulite can be much thinner than foams, saving space and weight. It is also more comfortable and durable, according to global aerospace business development manager Jeremy Jasiolek.

Compared with conventional aircraft seat cushioning materials, the Stimulite honeycomb product is much

slower to take the compression set that erodes comfort and limits the life of foams. It is also ventilated, having initially been designed for use in the medical field to prevent pressure sores among wheelchair users. "For this you need a technology that maps pressure well and offers superior weight distribution of the person," Jasiolek points out. "That's really what this technology does and why it can be so thin and still offer such a comfortable solution."

Supracor can control the properties of the honeycomb by varying both the thickness of the cell walls and the diameter of the individual cells. "By varying the cell size as well as the cell wall thickness, you can create structures that are very soft or very firm," Jasiolek explains. "It's a highly versatile, highly tunable technology."

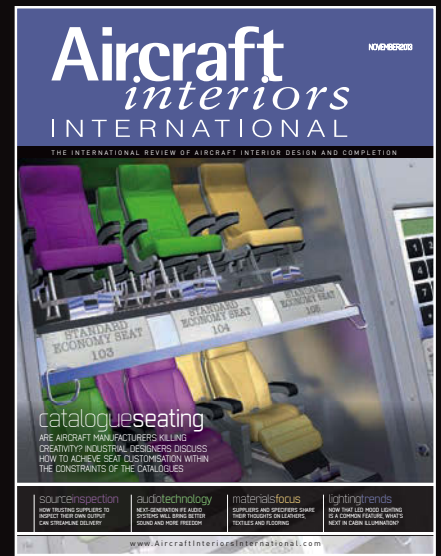
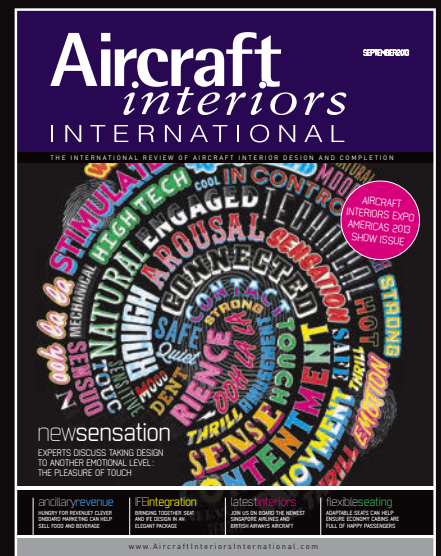
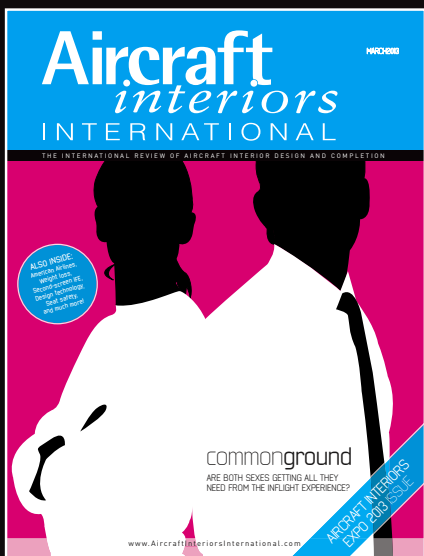
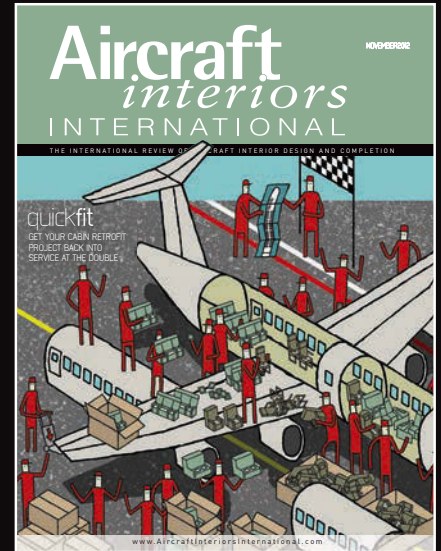
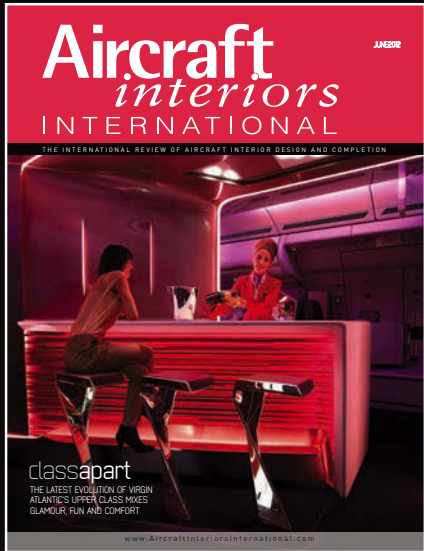
Where foams have the same compressive resistance in thickness, length and width, the honeycomb structure's greatest compressive resistance is in its thickness. "As you press down, the cells pull in from one another and radiate outward to contour to the body to provide a greater level of comfort in a much thinner profile."

Jasiolek says that Stimulite will have an economy seating application debuting in 2015. Currently it is used in the B787 crew rests as well as jet fighter cockpits and helicopter flight decks. "The Dreamliner application replaced 4in of foam with less than 1.5in of Stimulite," Jasiolek says, "and in blind tests we still came out subjectively more comfortable than the foam."

Perception may be an obstacle to its acceptance, though. "Airlines, aircraft OEMs and seating manufacturers usually have an idea of how they want the seat to look," he says. "The problem is that when people see our technology they have a pre-conceived level of comfort already in their head before they actually touch it or sit on it."

When the cushions do have to be replaced, the honeycomb is recyclable. "This material is fully reclaimable," he adds. "There are no adhesives holding it together – it's all fusion bonded. So when we're done with it the entire structure can be ground up, returned to its original state and reused." ☒



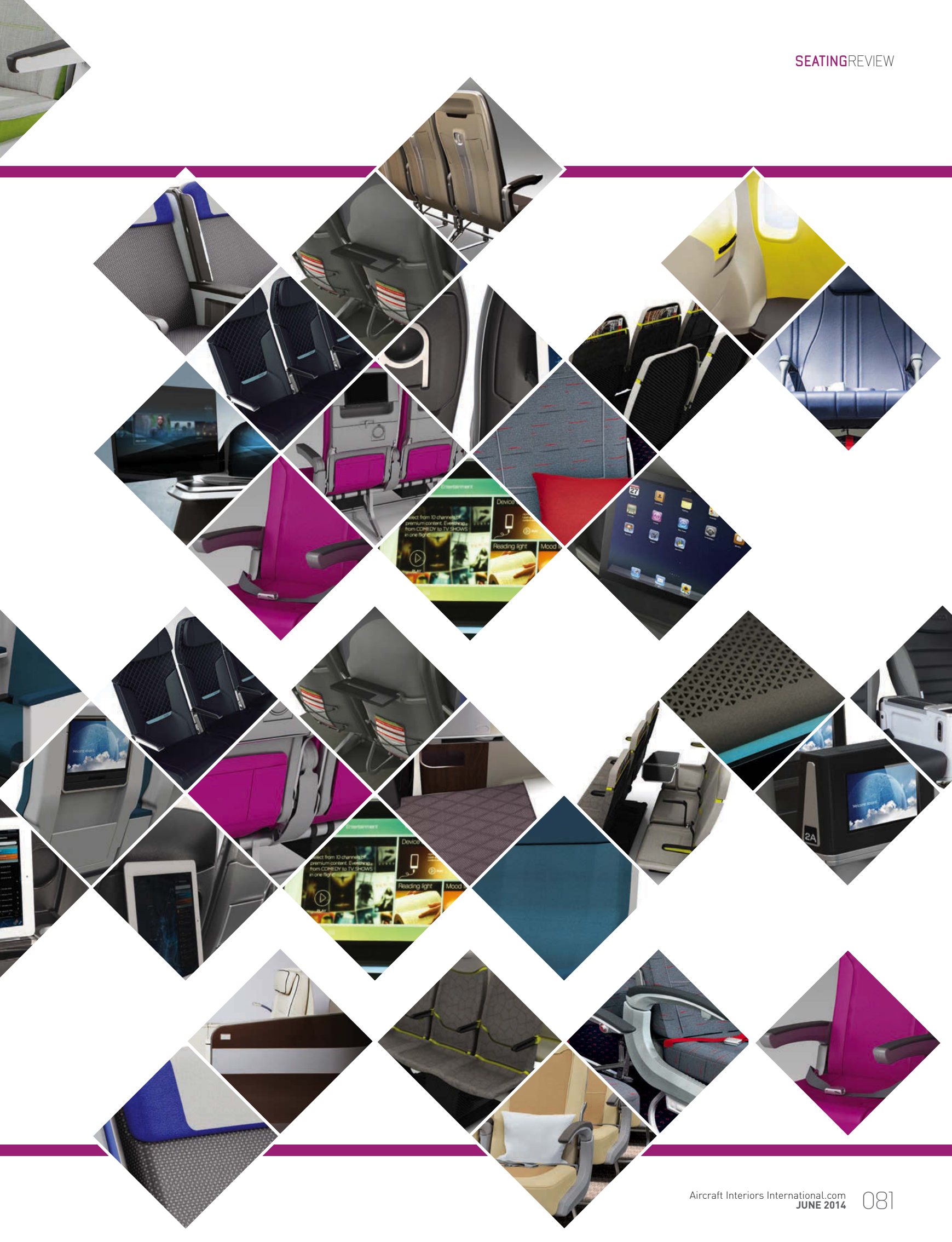


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The new Columbus economy class seat family.



Elan is already planning to develop a business class seat and a lie-flat sleeper seat



newentry

Elan Aircraft Seating is a joint venture being formed by the coming together of AVIC ALI Jiatai and Kapco Global. The company has not yet been formally established, but we have found out from a representative that it is likely to be located near Seattle, Washington; that its seats will be first certified in the USA and then in Europe; and that they will be built in North America and Asia.

The immediate goal of Elan is to introduce an economy seat that offers exceptional value, is easily customized, has a shorter lead-time than the industry norm and has a low cost of ownership. That seat, says Elan, is the E100, which has a planned launch date of winter 2014 or spring 2015.

The E100 will initially be targeted at Boeing and Airbus narrow-body operators. It will be IFE ready and has already been designed to accept the Rockwell Collins PAVES OnDemand system. Available features are expected to include integrated PED stowage, power ports, six-way adjustable headrests, and integrated cup holders.

Through the combination of an aluminum seat frame with composite parts, the seat is projected to weigh under 11kg per pax place (including seat belt and fabric covers), and the proposed design is suitable for a 29in minimum seat pitch. Elan seems confident about its proposed economy seat and is currently presenting it to a number of airlines, with first deliveries predicted to be in early 2015.



Ergoisgo

The Ergo economy seat has been designed and developed in-house by ST Aerospace in partnership with Japanese aircraft seat manufacturing company Tenryu Aero Component Co Ltd. The name 'Ergo' is derived from the term 'ergonomics' - the applied science of equipment specially designed for the user, with the intention of optimizing comfort and reducing fatigue.

Ergo is not just one seat - it is a range of economy seats with patented designs. The range comprises the 8.5kg Ergo Basic for short-haul flights, the 10kg Ergo Standard for medium- to long-range flights, and the 12kg Ergo Plus for long-haul flights on wide-body aircraft.

Seat features include an articulating seat pan, light weight, a high literature pocket and good shin clearance. Ergo has successfully passed the 16g test and will be available by the end of 2015. ST Aerospace can offer customers a complete turnkey solution, from engineering and design, to certification, supply and a short turnaround time for delivery.

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The EC-00 won the Passenger Hardware category of the Crystal Cabin Awards 2014

tightfit

The new EC-00 economy seat was developed by ZIM Flugsitz to fulfill the special requirements of short-haul operators of single-aisle aircraft in order to maximize cabin density without detracting from seating comfort. High-tech materials, an ergonomic backshell, a new seat geometry and a clever centrally mounted single-arm tray table combine to maximize living space. So much so that some demonstrator seats were set at a 28in pitch at their reveal at Aircraft Interiors Expo, and were generally found to be comfortable enough for a short-haul flight. As a bonus, there is an innovative connection between the backrest surface and the upholstery to make cleaning and maintenance easier.

ZIM also offers a range of customization options beyond mere trim and finish. The EC-00 will enter into operation at the end of 2014 with an as-yet unnamed customer.

centerofattention

Acro has designed its Ultra XC – an evolution of the original Superlight seat – to be wider and lighter than many economy seats, as its research has found that passengers are growing in stature. The seat width is 18.1in for the window and aisle seats, and the middle seat – usually the worst experience in a seat triple – is 19.3in, to create more personal space and greater comfort with reduced shoulder clash and armrest wars. Passenger legroom space is enhanced by the slim 3mm-thick backrest and a monospar chassis.

The seat is EASA and FAA certified, and Acro Aircraft Seating has already won a retrofit contract that saw the company begin fitting Airbus A320 aircraft with its Ultra XC seat from Q1 2014.

Cameron Allan, commercial director at Acro explains, “We are very excited to be working to supply a wider and more comfortable seat that will address the needs of passengers. When it comes to flying long haul in economy, an inch or so makes a huge difference.”



The Ultra XC has a 19.3in-wide middle seat and weighs 10.9kg per pax place



tablet table

Acro's tablet table is smaller than any other tray table on the market and, uniquely, features a 'latchless' latch designed to be simple, reliable and lightweight, with a low part count. Designed for low-cost carriers and selected by Spirit Airlines, the table is intended to hold nothing more than a tablet device and a drink. The table is a line-replaceable unit and can be replaced within 60 seconds by removing only two fasteners.

For Acro, the tablet table reflects the growing trend toward using PEDs for IFE. As Cameron Allan, commercial director, comments, “We think the trend toward passengers bringing their own IFE hardware on board warrants a need to consider the effectiveness of the table as a tablet support. Our smaller table is our first specific implementation of this, and we anticipate that this trend will continue across all airlines.”

The tablet table follows Acro's Ultra In Arm Table, which was a Crystal Cabin Awards finalist last year. This self-cleaning, lightweight table is line-replaceable in less than 60 seconds and is flying on more than 50 aircraft across four continents with 10 airlines – a number the company expects to double this year.

somethingextra

The new Recaro BL3530 short- to mid-haul seat is an evolution of the BL3520, which was launched in December 2010 and has already secured more than 200,000 sales. Comfort features from the BL3520, such as the space-saving backrest and high literature pocket, have been retained, with a few comfort modifications, including new cushions, a separate cup holder, fabric and leather dress covers, and an audio control unit in the armrest. The six-way adjustable headrest, which offers height and angle adjustment and V-shaped side wings, can be integrated into the contour of the backrest or attached to the surface. The BL3530 also features a new contour to the backrest and a baggage bar. Minimum pitch is 28in.

The main difference with the new model is that a tablet PC holder has been added, which enables ideal ergonomic positioning of tablet devices at an optimal viewing angle. The tablet holder is even functional when the tray table is folded down. An integrated power supply is also provided, and the Recaro team devised a smart pocket in which PEDs can be safely stowed and protected.

Even with all these new features, the BL3530 is lighter than its predecessor, weighing just over 10kg per seat, fully dressed.

Recaro offers a BL3530 modification kit for airlines already flying the BL3520, with the new BYOD features and the cup holder available as a separate retrofit upgrade package.

Recaro's CL3710 and CL3620 models are in the A350 XWD catalog



screen test

Yes, you have seen the CL3710 long-haul economy seat before, and it is proving popular thanks to its combination of light weight, comfort and modern design. However, this version is a little different as the seat's modular structure has been used to create a concept of how the economy class IFE experience could be improved. Recaro partnered with Panasonic Avionics and Teague to show how a 13in monitor could be slickly integrated in the CL3710.

The monitor has been seamlessly integrated into the seat, with the screen installed across the entire upper part of the backrest without a frame surround. The monitor, which the passenger can tilt for optimal viewing angle, fits perfectly into the architecture of the seat. Audio, USB and HDMI ports as well as a handset and a reading light are integrated under the monitor.

What is unique is the combination of such a large monitor, including a handset, with

the patented literature pocket, which has been removed from the knee area and placed above the tray table. It creates stowage space for on-board literature and provides maximum legroom. As a further benefit, the IFE box is mounted below the seat pan.



This is the largest IFE display ever mounted to a Recaro economy class seat

CL3710 update

Since its premiere in 2013, nearly 20,000 units of Recaro's CL3710 economy class seat have been ordered (orders in the "high double-digit million Euro range", according to CEO Mark Hiller), with the first order due to start flying later this year on long-haul routes. It's a big year for the CL3710 as its innovative design – 18 patent applications have been filed – also made it to the finals of the Crystal Cabin Awards 2014.

The CL3710 weighs less than 12kg, with features including a six-way adjustable headrest with height adjustment and an optimized neck support, and the seat offers maximum knee and legroom, even at a 29in seat pitch. The armrests on the center seat can be folded up so that they are flush with the backrest, even if the backrest has been reclined. Thanks to standardized interfaces, the seat can be adjusted to suit customer requirements.

As Hiller said of the updated seat at its launch: "On the one hand, we are showing the diversity of the innovative multifunction bridge in the backrest, into which we have integrated USB sockets, a power supply and a handset. On the other, we are exhibiting different IFE configurations. Finally, we are providing increased comfort on long-haul flights through cushions with reinforced foam thickness in the backrest and seat. The padded contour and the seat cover are also designed for added comfort."

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The name L3 came from the three "L"s that are key to its design: lightweight, lead time and living space



lightingtheway

The L3 has been designed by Zodiac to be a revolutionary medium- and short-haul seat, offering maximized living space, higher seat density (a 28in pitch is not uncomfortable) and light weight (below 4kg per passenger). The composite fixed backrest means that only the thickness of the shell is required between a passenger's knees and the back of the person in front, and with accessories such as the high tray table, the L3 is a surprisingly roomy proposition. Through a cooperation between Zodiac and Hexcel, the design takes the use of composites beyond the usual non-load bearing subassemblies and uses them for the entire seat

structure. In addition to low weight and high strength, the L3's design gives a quick manufacturing and delivery time, and the potential for composite material to be used to create ergonomically optimal seat geometries for seat comfort has been embraced.

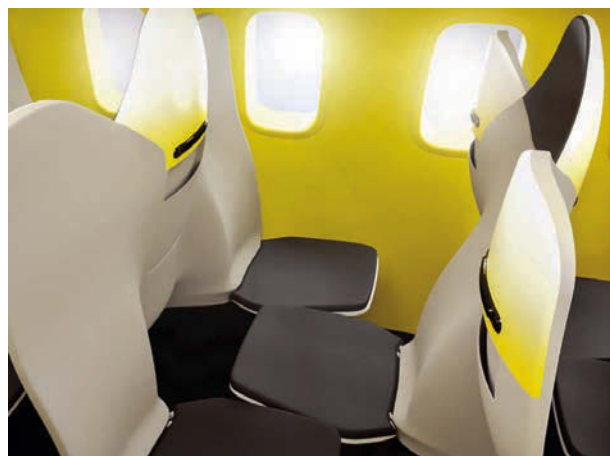
The L3 all-composite seat is manufactured from Hexcel's HexPly carbon fiber prepreps, while the armrests and tray tables are manufactured from Hexcel's HexMC compression molding process.

The certification process for the seat is progressing as development tests are processed, and once orders are fully qualified, the lead time is expected to be three months.

OPPOSITESATTRACT

Beyond the striking design, it is the numbers that make Zodiac's HD31 short- to medium-haul economy concept an arresting proposition: with seven-abreast seating (in a 4-3 configuration) at a 31in pitch, 250 seats can be fitted in an A321. This is an increase of 30 seats on average, and the same seat count could only be achieved with traditional forward-facing economy seats at a tight 27in pitch. Yes, with the HD31, the density that can usually only be achieved at a 27in pitch can be achieved at a 31in pitch. Furthermore, the 'yin yang' design offers a generous seat width of 21in outboard and 24in in the center seats. Further benefits include a sub-4kg weight through the use of composites and aluminum, fast boarding times thanks to the cross aisle spaces created by the design, and the possibility to offer unique spaces such as family zones.

The downside? Perhaps the public just isn't ready to spend a whole flight facing someone they don't know in such proximity. But then again, they may be willing to spend that time if the configuration means they can spend a little less money. As Zodiac said at the reveal, they just need to change the mindset of passengers and aviation authorities.



generationZ

In terms of current product, Zodiac has revealed two new seat models. The first – the Z300 pictured left – is designed to offer long-haul comfort, with an articulating seat pan and a fixed backrest as well as expanded amenities and the latest IFE capabilities. Its base structure includes lighter weight legs and a new spreader profile, while mechanical components have been minimized, providing more living space at a reduced weight. The Z300 offers a choice of a one-piece or bi-fold meal table, a lighter headrest and a contoured seat pan.

For high-density cabins, the Z100 delivers maximum value to both passengers and airlines. The IFE-capable Z100 offers good living space, expanded features and comfort. Customers can select their own comfort features, including a flat fixed pan, fabric diaphragm, ergonomically contoured pan, and a redesigned upper literature pocket.

Current lead time for orders is four months



simpleSUCCESS

Following Expliseat's much talked about reveal of the Titanium Seat last year, which sparked a lot of interest due to its weight of 4kg per pax (including dress cover, armrest and tray table), there have been developments with the design over the past 12 months. The big news includes receiving ETSO C39c certification from EASA, the first order being signed by Air Méditerranée for its A321s, a second contract being signed with a non-European airline, some further refinement of the styling, and some new high-tech materials for greater comfort.

The composite and titanium structure comprises only 30 parts per seat to ensure light weight and low maintenance (the company's engineers claim the seat can withstand 100,000 usage cycles); and the soft seatbacks afford an

extra 2in of leg space in front while absorbing shocks from the passenger behind (a 28in pitch can feel more like 30in).

If a full-service airline swapped 156 seats weighing 12kg each for Titanium Seats on an A320-200 flying a 133 minute/785 mile route between London and Madrid, with 3,972 annual flight hours and fuel costs at US\$1,033/mt, the 2.8% saving in fuel could equate to US\$295,000 per aircraft, per year.

If a low-cost airline swapped 180 seats weighing 12kg each for Titanium Seats on an A320-200 flying a 115 minute/638 mile route between London and Prague, with 4,344 annual flight hours and fuel costs at US\$1,033/mt, the 3.1% saving in fuel could equate to US\$370,000 per aircraft, per year.

TURKISHDELIGHT

TSI Aviation Seats, the first domestic aircraft seat manufacturer in Turkey, offers a range of single-aisle, short-range economy class and convertible class aircraft seats named Elesa – the name being derived from 'elegance' and 'safety'. Features of Elesa include 6in of recline, an articulating seat pan, a handicapped aisle armrest, an aft-mounted footrest, headrests that can be moved by 3in, and a minimum recommended pitch of 28in.

The slimline and lightweight (10-12kg per pax) Elesa seats have gained ADOA, POA and ETSO certificates from EASA. Following the acquisition of the necessary certificates, TSI started serial production in late 2013 and the first order was placed for the retrofit project of 25 Boeing 737-800 aircraft by Turkish Airlines in 2014.

TSI aims to offer its seats at a lower price than other seat manufacturers, with short production times. The company has a production capacity of 10,000 seats per year, which will be increased to around 100,000 seats per year in the near future.

TSI has also completed the design of a narrow-body business class seat, which will be presented at Aircraft Interiors Expo 2015.



Tests at Airbus found that passengers perceived 35% more space than with recliners



justrelax

Consideration of fellow passengers formed the core idea for the design of Optimares' Quadra concept. Whether a passenger in front is invading your already tight space, or you are concerned about doing the same to the passenger behind, the designers felt that key points of the space needed to be retained in order to preserve a sense of personal space – shin clearance, knee space and the tray table. The result is a seat that goes beyond just a fixed-back shell idea to offer 19° of recline (the seat has 7° built-in recline for TTOL) through a simple articulated movement system that controls the seat pan and the pivot center of the backrest. Indeed, as the seat cushion slides forward it actually creates more space for the passenger behind. A further benefit is that the monitor mounting follows the movement of the seat during recline so that an optimal viewing angle is retained.

The seat will be available in widths of 16-18.5in, a minimum installation pitch of 29in, and a weight of 9.5-14kg, depending on options.

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featherweight

TIMCO Aerosystems' 3040 FeatherWeight premium economy seat has been developed in response to growing demand from operators seeking to implement their own variations of the fast-growing premium economy cabin.

The new 3040 seat has been designed and built to provide long-haul passengers with increased personal space and amenities while using less space. TIMCO's engineers developed a reduced center console and redesigned the armrest to feel more 'premium'.

The seat can be installed at a 38in pitch and offers 10° of recline. For the passenger, the perceived living space is enhanced due to having greater hip clearance from the newly designed armrests, more under-seat clearance and a reduced center console. The seat provides comfort through innovations including the patented fabric passenger suspension system that adds comfort to the seat cushion and padding, while reducing weight for the operator. The seat is also equipped with an articulating seat pan combined with a traditional mechanical recline system.



The entire end bay rotates upward out of the lateral assist space to facilitate boarding of passengers requiring assistance

Key figures

- Minimum pitch: 38in
- Recommended pitch: 38 to 42in
- Weight: 22kg/pax
- Intended configuration: Multiple configurations depending on fleet type (e.g. 2-3-2 PY on twin aisle; 2-2 business on single aisle)

ENHANCEDCOMFORT

Zodiac considered that the dynamic premium economy class seat market deserves a more sophisticated seat, streamlined for style. Its new Z500 seat is raising the bar in comfort in this class with unique recline kinematics, ergonomic backrest structures and a generous living space and accessibility. A distinctive one-piece table stowed in the sleek center console was imagined specifically for this seat in order to enhance the passenger experience compared with traditional premium economy class seats. Another nice touch is that a large IFE monitor (up to 15in) is integrated into the backrest.

FEATUREPACKED

German seat manufacturer ZIM Flugsitz launched a yet-to-be-named premium economy seat at Aircraft Interiors Expo, claimed to offer many advantages over its economy counterparts, including more seat width, greater privacy, greater recline, headrests that can be adjusted for height and folded around the head, height-adjustable footrests, and approximately 10cm more room at the sides. Designed for a 38in pitch, each seat has its own wide armrest and there is a center console between the seats. Further features include space for a 12in touchscreen IFE display and options such as a bottle holder, electrical socket and lots of storage space for passengers' belongings.

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lipsmacker

Bacio (Italian for 'kiss') is Geven's first fully electric long-haul business seat. This angled lie-flat seat can be installed at a minimum pitch of 55in, while still offering a flat bed more than 71in long. In a double, a fully dressed Bacio weighs 150kg, excluding IFE.

The kinematics require just two actuators and suitable mechanical linkages. A cradle feature is also available as standard, which means the backrest, bottom cushion and leg rest all rotate backward together. Both the armrests are automatically lowered when in bed position, which increases the width by more than 5.5in.

The angled lie-flat version here is just the first in a series of long-range seats that will

feature Geven's new flexible mechanical architecture with several customization options, including: ottoman, side ledge, extended or full shells, and single or multiple actuators.

There has already been some airline interest in Bacio and, according to Geven, some big names have asked the company to carry out some studies and analysis on layouts and seat features for their A330s and B777s. This study phase is ongoing and Geven expects to make the first customer announcement by the end of 2014. As Bacio is at an advanced stage of design and testing, the company believes that the first delivery can be made 12 months after the ITCM with the launch customer.



Minimum recommended pitch: 42in

updatedclassic

A combination of space efficiency, a fully flat bed, reliability, and direct aisle access for all has seen the Solstys wide-body business seat from Sogerma become a successful product, with nearly 7,000 seats sold and more than 3,900 delivered on time so far.

The latest generation of the seat – Solstys III – has been co-developed with Mormedi, the Spanish industrial design house, and intensive R&D studies have been undertaken to solve the complex equation airlines are facing of how to combine a high passenger count with a premium full-flat bed. Solstys III gives the passenger more space and a horizontal 1.95m bed, while retaining the same cabin density. While the overall installation has the same width as the earlier versions, the seat itself can be up to 26in wide, whereas Solstys was previously limited to 23in.

This has been made possible by optimizing the shape of the shell, making the armrests retractable, and moving some of the technical components such as the computer. The use of new composite materials, in particular for the rear section of the seat shell, was another contributing factor, and also reduced the weight of the seat. The seat is nonetheless only slightly lighter than its predecessors because new storage compartments have been created.

Furthermore, a larger IFE display (18in instead of 16in) can be integrated into the seat shell, thus increasing the possibilities for personalization. It should even be possible to install 19in screens in the seats once the latest generations of IFE allow this.

businessclass

immersiveseat

Thales recently unveiled the latest incarnation of its innovative Immersive Business Class Seat, which is designed to plunge the occupant into the IFE experience by combining an ultra-high-definition (UHD) main display with directional sound and seat vibrations, so you can see, hear and feel every dramatic moment of a movie in vivid detail. Other technologies in the seat include gesture control and eye-tracking functions, which enable users to navigate the IFE system without using a handset, and a feature whereby the screen automatically tilts to give the optimum viewing angle at all times.

To ensure the seat itself has the quality, engineering and styling to match its technologies, Thales developed this latest version in conjunction with B/E Aerospace and design partner BMW DesignWorksUSA. B/E's engineers created a completely bespoke product for this concept, with the aim of blending the physical and virtual user interfaces into a seamless passenger experience.

Other technologies integrated into this sophisticated seat include a system that recognizes a passenger's personal device, pulls their personal IFE content and seat preferences from it, and even charges it wirelessly. Further innovations include touchpad controls integrated in the seat, and an Interactive Virtual Landscape Panel, which is a side panel that can display anything the passenger wishes, such as the view outside the aircraft (with a live external feed, every passenger can choose to enjoy the view from a window seat), a starry night to sleep by, or a passenger's own IFE content. These innovations are all cleverly and stylishly interfaced in the seat, with technology, aesthetics and comfort working in harmony.



hotelstyle

For the design of its new product – intended to be ‘a hotel room in the sky’ with a flat bed and generous living space – Recaro was inspired by contemporary interior design in hotels, clubs and lounges. While it is billed as a cost-effective long-haul business seat, the design offers luxury through a focus on comfort, and through the use of luxury materials, while the clear lines and contours emphasize a feeling of visual comfort and premium quality.

The CL6710 offers a compartment-like area with excellent living space, a high degree of privacy and direct aisle access due to its staggered design. The efficiency of this seat can be measured in numbers. The ratio of 1:1.8 is Recaro's formula for success with the CL6710 as this figure reflects the seat's ratio of pitch to bed length. At a seat pitch of 46in, Recaro says it can provide a bed length of up to 82in, benefiting both passenger comfort and cabin

density. Lightweight materials and reduced complexity also create an impressive weight figure, with the CL6710 coming in at 80kg, depending on aircraft type, layout and individual configuration.

In terms of comfort, in addition to a 180° flat bed that is particularly wide in the shoulder and waist areas, attention was paid to the lounging position, with the seat pan articulating into an angle pre-defined as ideal, further aided by an individually adjustable leg rest. The large one-piece table is suitable for working and dining, and through easy and intuitive adjustment of the table, the passenger can exit the seat while the dining table is in use. For further convenience, there is a large side table, a multipurpose top storage area for various items including water bottles, laptops, headphones and magazines, and a shoe stowage area in the lower part of the seat. A six-way headrest provides neck support, even while wearing headphones.



romanholiday

Iacobucci HF is expanding from the VIP seat market into the commercial aircraft seat market. The first of its new products is the Roma double-shell business seat, which weighs in at 179.5kg through the use of 2000 Series aluminum alloys and composite materials.

The 21in-wide seat is fully electromechanically operated via five actuators, with a wide range of possible



movements. The two-way headrest can be vertically adjusted by up to 3in and the side flex wings can be moved toward the passenger for better comfort. Due to the movement of the seat pan, leg rest and footrest, the seat can assume many positions. For example, in the fully upright position, it is possible to move the seat pan forward and rearward, and the leg rest and the footrest up and down.

Roma's privacy shell is made of composite fiberglass, epoxy resin and honeycomb material, and the rear side can be equipped with shelves, shoe compartments and a literature pocket. Options include 3.5in-wide outboard fixed armrests; a privacy divider; an adjustable headrest; an in-arm table; cup holders; reading lights; a 7in-wide central console with life vest and in-arm monitor compartment; and IFE provisioning (USB port, 10.6in in-arm monitor, PCU/audio jack).

MODULAR FAMILY

Canova is a new modular family of seats from Aviointeriors, comprising the Smart, with a 36in pitch and weighing 30.1kg/pax; the Comfort with a 38in pitch and weighing 40.3kg/pax; and the Superior, with a 44in pitch and weighing 41.7kg/pax. Designed to be versatile, with many options available to customers, Canova can be easily switched from being a premium economy seat to a business product. The seat is inspired by principles of aesthetics, functionality and linearity, and the company aims to achieve the right combination of production costs and airline investment.



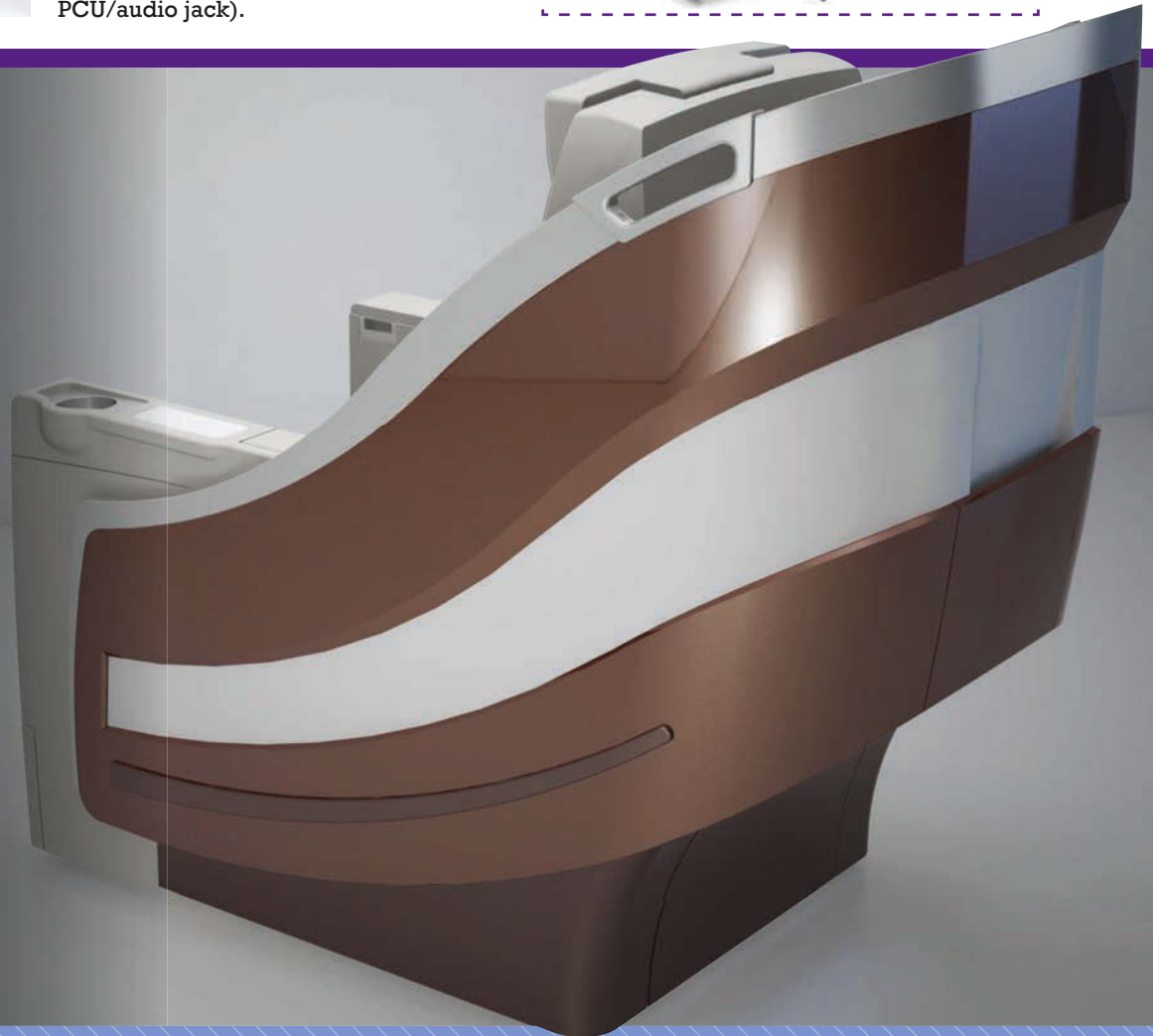
flyingsolo

Milano is the single-shell version of Iacobucci's Roma model. This sleek design is suitable for single- or twin-aisle aircraft, and the large shell is fully electromechanically operated, again featuring five actuators to create different configurations.

Milano is constructed from aluminum sheets and weighs in at 99.7kg (219.8 lb). The main features available are: 3.5in outboard fixed armrests; an adjustable headrest, an in-arm table (single leaf); a cup holder; a privacy shell; a reading light; a fuselage armrest with life vest and in-arm monitor compartment; and IFE provisioning (USB port, 10.6in in-arm monitor, PCU/audio jack).

Vital statistics

- Minimum pitch: 76in
- Weight: 99.7kg
- Width between armrests: 21in
- Overall width: 30.5in
- Armrest width: 3.5in
- Fuselage armrest height: 26.25in
- Fuselage armrest width: 3.5in





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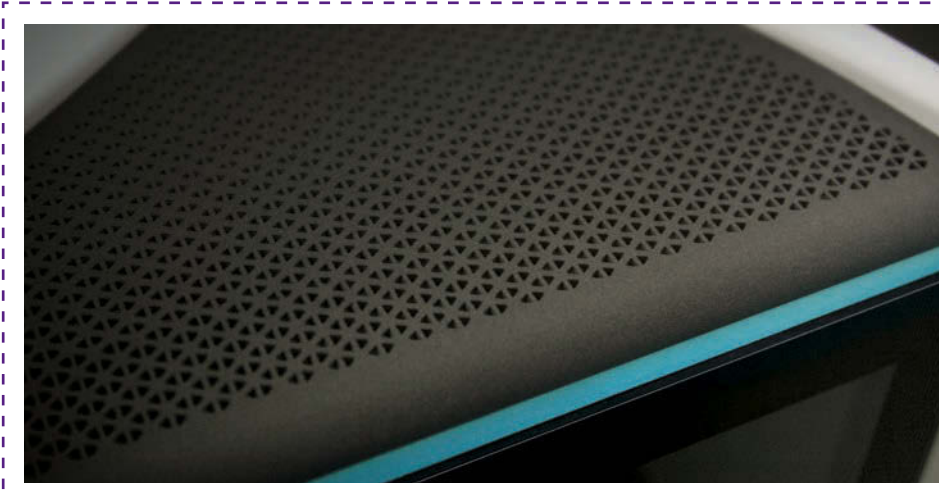
extramile

The 1-2-1 forward-facing XL has been developed from the successful Thompson Vantage platform in response to customer demand for a lower density version offering 100% direct aisle access.

The seat is offered with a wide range of customization and branding options; a seat width of 23in; a fully flat bed length of 79in at a 45in pitch; and many stowage options. Other features include a choice of reading lights, capacitive touch seat controls (PCU), integrated mood lighting that subtly changes brightness according to the seat position, and an optional lumbar and massage system. There is also a work surface and a large single-leaf table for dining. A number of USB and power outlets can be integrated, as can a monitor of up to 18in.

Vantage XL is due to enter service at the end of 2014 with launch customer Qantas for the new business cabins on its A330 domestic and international fleets. The Qantas XL program, which started in mid-2013, will be a fully customized seat to meet the styling and features driven by the Qantas design teams. Other as-yet-unnamed customers are due to launch with XL in early 2015.

Vantage XL comes in seat widths of 23-25in



DOVETAIL

Following continued positive airline feedback, Jamco and JPA Design officially announced the launch of their DoveTail premium class seat during Aircraft Interiors Expo 2014. DoveTail is uniquely configured and can be optimized for a range of different aircraft types. The innovative design offers direct aisle access, an increase of 10% or more in living space within the same effective seat pitch as competitor seats, and a range of enhanced passenger experience features. DoveTail also benefits from Jamco's experience of designing and manufacturing galleys, lavatories and stowages by offering smart space utilization.

DoveTail is still under wraps, but look out for further details in *Aircraft Interiors International* later this year.

wideangle

The Journey forward-facing seat – available in a 2-2-2 or 2-3-2 configuration at a minimum pitch of 74in – is claimed by Jamco to have the widest fully flat bed in the A350 catalog. The kinematic system ensures smooth transitions between TTOL and bed positions, and to minimize weight, this conversion is achieved using just a single actuator.

Options on the Journey include a full-height privacy divider, a newly designed personal LED reading light

and numerous personal stowage options for personal belongings, including an ottoman with stowage areas for larger items. Regarding IFE, there is provision for Panasonic's eX3 or Thales' TopSeries AVANT systems, as well as USB and video ports, and an AC power socket.

Journey will not be limited to A350 installations, as the seat was developed with cross-platform implementation in mind to ease its installation on other Airbus and Boeing aircraft.



LATAM is the launch customer for Journey, with installations beginning in early 2015

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bigbusiness

Many airlines are making a commercial decision to remove first class, but would like to retain those premium customers.

To address this need, Zodiac has created the Fusio seat, which is spacious and luxurious enough to satisfy passengers accustomed to first class (and really impress business class passengers), while offering a cabin density that will boost revenues. This

forward and backward configuration can be fitted four-abreast at a 53-57in pitch and offers a fully flat bed, direct aisle access and a sofa position.

The seat could be considered as a 'super business' class and weighs in at 100kg fully dressed. According to Zodiac, several airlines have expressed interest in Fusio, with one commenting, "This business class seat is better than our first class!"

Fusio figures

- Minimum pitch: 76in
- Width between armrests: up to 34in
- Overall bed length: 81.5in
- Bed width (shoulder and elbow level): 34in
- IFE display size: 27in
- Table size: 19 x 14in
- Lead time for orders: 24 months

Fusio is intended for the B777, B787 and A350



WIDERVERVIEW

The Gemini business seat concept from Zodiac features a '3D configuration' that has enabled an extra-wide flat bed. The forward and backward design is configured seven abreast on a B777, B787 or A350, and offers direct aisle access for all at a minimum pitch of 40.5in, and a full-length privacy divider. Zodiac is in discussions with several airlines interested in Gemini, and predicts a lead time for orders of 24 months for the first customer, and 18 months thereafter.

Gemini stats

- Minimum pitch: 40.5in
- Weight (fully dressed): 80kg/pax
- IFE display size: Up to 23in
- Width between armrests: 22.3in
- Bed length: 78.5in
- Bed width: 25.8-29.8in
- Table size: 20 x 12in

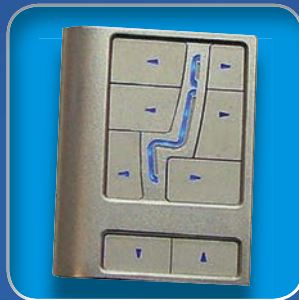
cleansheet

A complex seating system is concealed behind the clean and simple lines of Aviointeriors' new Giotto model. Designed in a staggered configuration, Giotto maximizes the passenger's living space through clever engineering solutions. Dedicated ergonomic studies have been carried out by the company's designers and engineers to ensure that, from the smallest to the tallest passenger, everyone enjoys the same comfort in the full-flat bed.

In addition, aisle access is optimized by moving potential encumbrances, such as the literature pocket, out of the passageway. The space between the seats has been carefully considered so no feeling of privacy is sacrificed, and the tray table area has been maximized by adopting a new special support mechanism.



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The travel experience expectations of today's premium passengers have never been higher, from the airline's website design, to the airport experience. The first-class cabins fitted to modern aircraft are undoubtedly great products, but can they measure up to the expectations created by the airline before the passenger sets foot on board?

Zodiac Aerospace Seats' Halo First Class Concept aims to deliver an extension of the lounge experience to the aircraft. Passengers are offered not just a seat, but their own personal environment, which they can tailor to their own requirements. It's an environment fitted with subtle technology that works to reduce the effects of fatigue on long flights; an environment that can be private or social, exciting or calming, and most of all, exclusive.

Each Halo cabin, accessed from a single aisle, includes two TTOL seats that double as dining chairs when the large table is deployed; and an 80in-long sofa that rotates to become a double bed with two seatbelts and a surface that is purely designed for sleep, not compromised with a seat function. For ultimate sleeping comfort, crew can add a mattress topper to the memory foam surface, which also features a heating and cooling system.

The space is not just comfortable; it is a veritable feast of technology. There is, of course, a huge IFE display facing the sofa, which can also be used for teleconferencing or presentations. But it goes much further. The fuselage wall is clad in a transparent LED display, which can display IFE content, geotainment or a range of backdrops, or it can function as a panoramic window that displays a feed from external cameras. Or if you prefer things to be simpler, it can be turned off to expose the aircraft windows.

The suite is even good for you, with mood lighting that automatically adapts to what you are doing, such as watching a movie, eating a meal, or sleeping.



The IFE monitor can be raised to reveal a mini spa, complete with hot and cold running water

softshell

Iacobucci HF's entry into the premium commercial aerospace segment goes beyond the Roma and Milano business seats, with the Venezia first class seat, which aims to achieve best-in-class passenger comfort. Step through the 23.25in-wide entrance and you are presented with a spacious 26in-wide seat and a sliding ottoman. The shells are extra-thin in order to maximize living space, and the rear shell offers another trick: if the occupant wants extra privacy, the shell can be raised at the press of a button, which also creates a cocoon effect in fully flat mode. There is also an electrical privacy divider panel for privacy when Venezia is specified as a double. For extra comfort in TTOL mode, the ottoman can be manually extended. Venezia is equipped with a single-leaf in-arm table, a reading light with adjustable intensity, a cup holder, a USB port and PCU, audio jack and room for a 22in IFE monitor.



Venezia by numbers

- Weight: 110kg
- Minimum pitch: 80in
- Armrest width: 4.5in inboard and 6.5in outboard
- Seat pan width: 26in
- External width: 39in
- Length: 83in
- Forward height: 48in
- Shell height (down) : 35.25in
- Shell height (up): 47.25in

crewtoo

Zodiac Technical Seats (ZTS), the crew seating division of Zodiac Seats France, has created a new generation of lightweight cabin attendant seats. The Kudos range has been designed in accordance with the latest safety and airworthiness regulations (CS/FAR 25, AS8049) and includes different seat types, from single floor-mounted, to double wall-mounted. ZTS claims the seats offer weight savings compared with existing products, with no compromise on design and comfort.



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crystalcabinawards

A trolley that can power a galley, a lightweight window, a sculpted lavatory, a convertible premium economy seat... A remarkable range of innovations was recognized at the Crystal Cabin Awards 2014



The eighth annual Crystal Cabin Awards were another success, with 54 submissions from 12 nations making it to the shortlist. On April 7, following initial voting from the 24-strong judging panel to decide which 21 entries would become finalists, the shortlisted entrants appeared in person in front of the jury for final questions before the seven ultimate category winners were decided.

Chairman of the judging panel, Prof. Dr Peter Vink of the Delft University of Technology, was impressed with the innovations presented this year, commenting, "This year's Crystal Cabin Awards winners are international role models for the industry. They have more than earned their trophies. They are impressive proof that, year after year, we keep seeing innovations in the aircraft interiors market."

GREENER CABIN, HEALTH, SAFETY & ENVIRONMENT

This category was won by Diehl Aerospace for DACAPO (Distributed Autonomous Cabin Power), an energy-

CRYSTAL CABIN AWARD®



01

autonomous cabin power system. This power-saving, self-sufficient cabin system concept separates the cabin systems and aircraft systems and gives them independent power networks. The magic happens in the galleys, or rather the MAGIC (Modular Autonomous Galley with Integrated power Cell) galleys, which are interconnected to create a redundant and reliable power grid. Electrical power for the cabin systems is generated by energy trolleys, which are ATLAS-sized trolleys containing a hybrid fuel cell and battery system that processes propylene glycol water. These battery trolleys are simply slotted into the galley units and can be swapped for new ones between flights under agreements with catering services companies, or simply recharged during aircraft ground time. The energy is clean, through weight savings created as fewer cables and components are required than in today's power systems, and because the APU may not be required when on the ground.

As well as 'green' opportunities, greater flexibility in cabin design is enabled. If any power-intensive changes are

wanted in galleys, the power is provided by the trolleys, without requiring additional power feeders.

Diehl is currently working with ASP Equipment, EaglePicher, DLR and IMM to develop the first functional prototype trolley, and expects it to be ready for feasibility demonstrations in 2015.

INDUSTRIAL DESIGN & VISIONARY CONCEPTS

Celebrations were in order for USA-based cooperative partners B/E Aerospace and Teague, whose Advanced Lavatory concept, a slimline toilet module, triumphed in this category. The contoured forward-facing wall of the module – a design named Spacewall – enables a more efficient use of space and frees-up 7in of cabin room to enable the addition of an extra six economy class seats without sacrificing space or comfort within the lavatory or the cabin, and without restricting the space for passengers in other seating rows. Indeed the contours of the sink and lower vanity area afford extra elbow and shoulder room, and

01. Of 54 shortlisted entries, only seven could win a coveted Crystal Cabin Award

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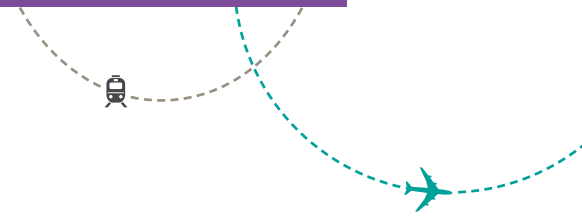
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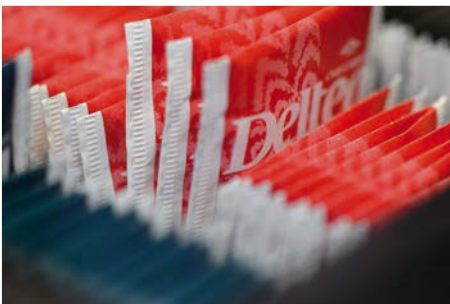
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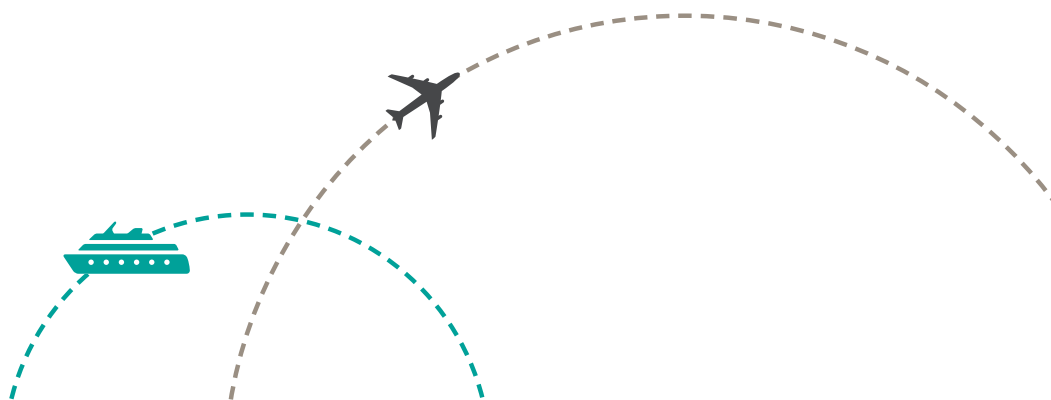
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The entry window for the 2015 awards will soon be open. Visit www.crystal-cabin-award.com to find out more

extra knee room when seated on the toilet. B/E says that the added seats can generate between US\$1m and US\$3m in additional revenue over a 15-year period.

The concept is now a reality, as following extensive testing, the Advanced Lavatory has entered service with Delta Airlines, and it is now line-fitted to all Boeing 737 aircraft.

MATERIAL & COMPONENTS German glass manufacturer Schott created an innovative lightweight glass structure for interior sidewall windows, made out of glass composites with a foil coating. The laminate structure is not only more robust and easier to clean than conventional window plastic, it also allows for significantly larger cabin window panes. Another major advantage is the reduction in both fuel consumption and emissions thanks to the 40% weight saving compared with conventional windows.

Schott worked with Diehl Aircabin to develop the laminated glass composite. As Dr Jochen Alkemper, head of product development at Schott explains, “For this new product, we pooled our expertise in developing the world’s strongest cover glass for smartphones and tablet PCs – Xensation Cover – with our long-term expertise in developing high-performance fire-resistant glazings. We are very happy about winning the Crystal Cabin Award. We see this award as a confirmation that our new product idea is interesting for the market, opening up new opportunities for interior aircraft designers.”

The glass composite fulfills the aviation safety regulations for cabins, including the strictest fire safety standards. Moreover, the composite panes are more scratch-resistant than conventional panes, requiring less frequent replacement and allowing passengers a clearer view to the outside for longer. The panes are also easier to clean, improving hygiene in the cabins.



THE ADDED SEATS CAN GENERATE BETWEEN US\$1M AND US\$3M OVER 15 YEARS



PASSENGER COMFORT HARDWARE The trophy for this category went to ZIM Flugsitz for the short-to-medium-haul EC-00 seat, with a new backrest concept that enables a 28in pitch with comfort comparable to a 30in pitch. The seat, which weighs less than 9kg, also includes a folding table structure with only one gooseneck, a new backrest, and an innovative connection between the backrest surface and the upholstery to make cleaning easier. Development work on the EC-00 began in 2012, and the seat is due to enter production and fly with the first customer this year.

PASSENGER COMFORT SYSTEMS Lufthansa Technik’s acWAP is a high-speed WLAN router that is based on wi-fi standard 802.11ac @1.3Gbps, and uses technology from Aruba Networks. This compact (404cm³), high-speed hotspot is the first WAP to feature integrated antennas and a housing that meets the latest ARINC 628 Part 1 standard.

02. The contoured wall of the Advanced Lavatory frees up an extra 7in of cabin space
03. Diehl’s DACAPO concept could revolutionize cabin power
04. Schott’s laminated glass composite is 40% lighter than conventional windows
05. Lufthansa is about to enter the acWAP into service
06. The winners celebrating their prizes during the official awards dinner in Hamburg





07

The Crystal Cabin Awards are about to enter their ninth year

08



09

try it yourself
 Think you have an innovation worthy of a Crystal Cabin Award? Why not enter it for consideration in next year's competition? As Carmen Krause, project manager of the Crystal Cabin Award Association says, "Within the next decade, cabin interiors will become a more and more important field, especially due to the programs taking place at the major aircraft manufacturers. This is one more reason to join the Crystal Cabin Awards, as they are an effective platform for showcasing innovative ideas and honoring outstanding concepts and products that must find their way into the aviation industry."

- 07. TU Delft's concept enhances the geotainment experience
- 08. The single table gooseneck on the ZIM EC-00 really aids knee room
- 09. With Caterpillar, airlines can optimize their cabin configuration prior to boarding

The 2kg acWAP can offer lower weight and installation costs than hard-wired LAN systems, and it supports such data-intensive applications as video streaming, online games, point-of-sale applications and real-time communications throughout the cabin, and it can be configured by operators according to their individual needs. The system will shortly enter into operation on board 20 of Lufthansa's A321 fleet.

PREMIUM CLASS & VIP Paperclip Design, a Hong Kong-based design studio that enjoyed previous Crystal Cabin success with the Paperclip Armrest concept, won this category with the Caterpillar convertible long-haul concept, a seating area that can be quickly converted from premium economy to a full-flat business option. This flexibility enables airlines to adapt the allocation of business and economy seats on a long-haul flight based on load factors.

Caterpillar is composed of units of staggered double seats, with the aisle seat offset backward. It is premium economy class when all seats are used. When used as business class, the inboard seat is simply flipped over to form a flat surface. The seating unit then becomes a private suite for one passenger, with a seat, a side couch, and direct aisle access. When passengers wish to sleep, they simply flip the aisle seat over as well, and that surface, together with the side couch, forms a large sleeping surface long enough for passengers to lay flat diagonally across.

At eight-abreast on a B777-sized cabin, the seat width is up to 21in between the armrests, which is as wide as many business seats in the market. At a 44in pitch in such a cabin, the bed is 77in long tip-to-tip, and up to a maximum of 44in-wide at the hip areas. In addition, a storage compartment in the middle armrest becomes naturally locked under the bed when the seat is transformed to the bed mode, essentially creating a secure locker where passengers can safely store their valuables as they sleep.

UNIVERSITY The final award was presented to TU Delft in the Netherlands, after three students convinced the judging panel with their 'Sense the Transitions' IFE concept. The team worked with Zodiac Aerospace to create a concept for economy class, where videos are projected onto the backrest of the seat in front, showing information about the culture, history and natural environment of the land currently below the aircraft. Informative, interactive pop-up menus and audiovisual infographics on a flexible OLED display can also be integrated to add to the depth of the experience.

"We wanted to show the aviation industry a new product, to inspire them to work with new partners," says Anna-Louisa Peeters – one of the team of three, including Karan Shah and Dorine van Meeuwen, representing the university in this category. "We hope to open the eyes of people within the aircraft interiors industry to the potential applicable innovation available outside it." ☒

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PGA ELECTRONIC IS INTRODUCING A BROAD RANGE OF PRODUCTS TO THE INTERIORS MARKET DURING 2014

 PGA Electronic, the Astronics Group's French subsidiary, which produces motion systems, lighting systems and IFEC/CMS systems, is introducing a new range of products for 2014.

PGA's complete IP audio/video IFEC/CMS system is based on Ethernet standard architecture, and offers simplicity, scalability and maintainability. The passenger can benefit from connectivity and comfort inside the cabin.

This system presents many advantages for the customer and the completion center. Firstly, it can be upgraded remotely. The latest technologies and IP services are integrated in the system, so future updates in the event of a retrofit or refurbishment project will be simple.

Secondly, the system is flexible, offering interchangeability between products. The products part list and spares management is facilitated for the aircraft operator using automatic software configuration. Finally, the IP technology is widely used and recognized all over the world in all application fields, aiding reliability.

The flagship product of the new system is the Global Entertainment Server (GES). Among its many features, the plug-and-play server allows users to store early content media, broadcast media using Ethernet streaming, and automatically manage the setup and configuration of all spare units.

Passengers can also enjoy high-quality audio and video with the new family of Xtra flatscreens and touchscreens, which ranges from 12.2in to 55in and offers sharp picture quality. The displays benefit from the latest technologies, including DLNA, IP TV, USB input, etc, and the system will soon include Early Window Content from Hollywood.



PGA now offers a complete IP audio/video/IFEC CMS system

The system offers freedom, flexibility and ease of media management whenever and wherever passengers demand it. Using their own tablets or smartphones, users can play audio/video media stored in the server directly on the devices, view personal media (family pictures, movies, etc) on the PGA Xtra flatscreens in the cabin, and use the device as a remote control to control in-cabin features ranging from lighting to the crew call function, etc.

In addition to IFE, PGA also manufactures individual seat lighting systems, with a wide range of reading and mood lights. These customizable products can be adapted to private jet

cabins, as well as airline business and first-class seats. These lighting products have already been installed on more than 70 major airlines and many more private jet cabins (BBJs and ACJs).

The latest product launch includes a Universal Rotary Spot Light with universal electronics from 5-28V DC, which can triple light intensity and provide better reading comfort for the passenger. Another product, the Azure Light, is the latest addition to the range of snake reading lights. It has been developed with a new head design and is available in different leather and coating options. There is also a new type of high-end reading lamp in its lighting range, for use as a bedside or desk lamp, and combines different materials. ☒

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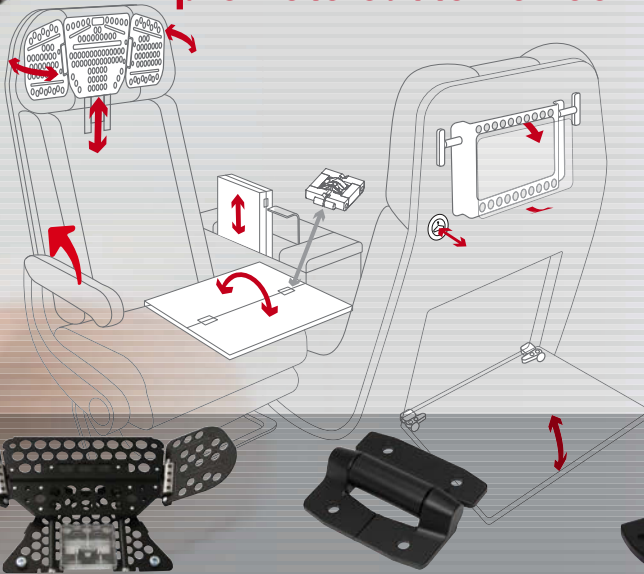
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ITALIAN SEAT MANUFACTURER GEVEN IS ENJOYING A PERIOD OF SUBSTANTIAL GROWTH



Geven has grown from a company relatively unknown in early 2000 to a recognized, well-positioned and reliable supplier of economy and business seats for short, medium and long haul.

The period 2012-2014 saw Geven's production capacity increase from 1,500 to 3,000 seats manufactured and delivered per month. This production volume increase was accompanied by a record of 100% on-time delivery to the final assembly line.

Geven is aiming to reach a production capacity of 5,000 passenger seats per month by the end of 2015. In order to achieve this, its production facility has recently been increased by an additional 4,000m² and an all-new 8,000m² manufacturing facility has been acquired. Geven is set to transfer all of its machined parts and subassembly manufacturing to the plant by October 2014.

Geven also cites an additional €8m investment in new manufacturing tools and a further new manufacturing facility, set to be opened early 2015, as two further reasons why it is confident that it can reach its predicted capacity.

Indicative of Geven's ambitions is its first long-range, full-electric, business-class seat, as presented at the 2014 Aircraft Interiors Expo in Hamburg.

This new seat model is in response to customer requirements, particularly those of global airlines who are looking for suppliers able to offer a variety of seats that can be fitted in the different classes and cabins of their aircraft. Geven's new seat is named Bacio (meaning kiss in Italian) and is an angled lie-flat seat. It is the first version of a flexible mechanical architecture, which forms the basis of a family of seats that serve long-haul. Several seat models were made in accordance with marketing requests.



South African Airways was a recent Geven customer, choosing the Comoda for its A320 business class

The seat can be a fully flat seat, with or without an ottoman and side ledges. The extensive customization options extend to light, extended or fully enveloping shells, automatic or actuated movements from single or numerous actuators, and the ability to mount video screens up to 21in as well as various other accessories and amenities.

Geven is currently undertaking R&D studies, prior to the launch of a new generation of economy seat, which will distinguish itself through innovative material choices (carbon fiber and magnesium whenever possible), all encased in an easy to build and maintain design. The aim of this new seat is to minimize the cost of ownership over its lifespan, while offering the lightest product on the market for the economy cabin segment.

In addition to the above, Geven is fully aware of the importance of continuously improving its product support and after-sales services. As a result, the company is investing heavily in this crucial area, to engender customer

satisfaction and loyalty. Geven is also currently building up an extensive worldwide network of spare parts distribution centers and qualified staff who are highly skilled and ready to provide on-site technical support and assistance across five continents.

Geven has more than 200 airlines as customers, flying its seating products all over the world. In addition it is also a recognized and qualified supplier to Airbus and ATR.

All the above is making Geven one of the most dynamic, and fastest growing companies of the last five years. The company has seen itself move from the status of a relatively unknown newcomer in the aircraft seating business to one of the most reliable and flexible suppliers today. At present, Geven can boast orders of approximately €250m – more than 150,000 seats.

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gameplan

IN A WORLD FIRST, SPORT 24 WILL DELIVER THE FIFA WORLD CUP LIVE TO AIRCRAFT

Passengers traveling with airlines including Emirates, Etihad Airways, Turkish

Airlines and Lufthansa need not miss a minute of action from the 2014 World Cup in Brazil thanks to a deal between FIFA and global sports media company IMG, whose inflight Sport 24 channel will show every game exclusively live for the first time.

According to Sport 24's vice president, Tim Wood, the airline market has long been considered the "last frontier" for live sport.

While IMG has made and delivered a range of magazine and highlights programs for IFE systems for many years, Sport 24 was launched only in 2012 as technology developed sufficiently to hit the sweet spot that enables aircraft to receive data from satellites.

"The idea for the channel came from the knowledge that one day the ability to deliver live pictures would become a reality, and we carved out a new rights category to cover it," explains Wood.

"After all, the standard territorially based rights structure doesn't cover a situation in which national borders can be crossed every few minutes.

"It has taken a lot of foresight and anticipation, and the serious conversations about the service started around six years ago. As technology developed, we made sure we were in a position where we had the rights and the facilities needed to deliver the service," he adds.

Sport 24 is delivered using Panasonic Avionics technology, which currently accounts for 80% of the inflight connectivity market. A company spokesman explained that it worked by using its global satellite network to seamlessly deliver a broadband pipe to aircraft in any location.



A whole new rights category had to be created to allow the Sport 24 channel to take to the air

Panasonic supplies hardware to 40 airlines, covering 2,000 aircraft, and recent deals with Airbus and Boeing mean that the systems are being line-fitted as well as retrofitted.

As far as Panasonic is concerned, the aim is to provide a global communications service that enables you to do everything in the air that you would expect to do on the ground.

"There is an irresistible need for connectivity and the Sport 24 service emerged as part of a broader conversation about how to achieve that," explains Wood.

The result is a sports superchannel that would be the envy of most broadcasters based on terra firma.

"Our focus is on acquiring rights for premium sports with global appeal, and providing a service for a 24-hour audience. In effect, it is a service that follows the sun around the world," Wood says.

In addition to the FIFA World Cup, the Sport 24 schedule includes: Wimbledon and the other Grand Slam tennis events; all four Golf Majors; every Formula 1 race; English Premier League football, including Saturday 3:00pm kick-offs not available in the UK; three weekly games from the Bundesliga; MotoGP; and the Ryder Cup. Just for good measure, passengers were also treated to live action from the London and Sochi Olympic Games.

"Airlines are increasingly looking to connectivity as a standard offering and we hope that live sport will become an important part of their passenger experience," states Wood. ☒

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ENGINEERED THERMOPLASTICS CAN OFFER WEIGHT-SAVING AND DESIGN ADVANTAGES OVER METALS AND PLASTICS

Among the many challenges faced by aerospace OEMs and designers, lightweighting, maintaining compliance in an ever-changing regulatory environment and finding cost-efficiencies in manufacturing top the list. The key to developing parts and systems that address these challenges is a deep understanding of material capabilities and which processing methods are best suited to each part or system.

High-performance engineered thermoplastic materials that meet regulatory requirements can play a role in nearly every aspect of an aircraft interior, such as: cabin interiors (windows and doors, PSUs, lighting and signage, overhead stowage and IFE); seating (shells, seating support structures, arm and footrests, tray tables and arms, and center consoles); galleys and lavs (trolleys, galley inserts, counters, sinks, mirrors and lavatory systems); and the 'hidden spaces' of an aircraft, which are home to wiring and fixings, connectors, conduits, ducting, insulation and brackets.

There are several potential benefits of using engineered thermoplastics rather than traditional materials, such as metal or other types of plastic. These include weight reduction, and the avoidance of secondary operations such as painting, which can introduce additional cost and also potentially release volatile organic compounds (VOCs). When using thermoplastics, it is often possible to consolidate several metal parts into one plastic component, with the potential benefit of reducing system costs. And, because of their versatility, engineered thermoplastics can offer design freedom and fabricating options that other materials may not be able to provide.

For example, aircraft tray table arms fabricated from 40% carbon fiber Ultem



When used in a structural design for a new PSU, Ultem 9085 and FST9705 resins created thinner walls for a 30% smaller unit

resin (a polyetherimide resin) can weigh up to 40% less than a similar arm made from machined aluminum. For an airline with 600 aircraft, the weight reduction translates into 500,000 gallons of fuel savings per year.

Lexan XHR6000 sheet, an FST-compliant polycarbonate material used for airline seating, can deliver weight savings of up to 12% compared with traditional PVC/PMMA. In addition, the sheet is available in more than 250 colors, with suede, polished and super-low-gloss velvet textures.

Low-volume parts with complex geometries can be produced quickly and cost-effectively by using Ultem 9085 resin in direct digital manufacturing – also known as 3D printing. Design and manufacturing engineers are able to create fully functional parts, such as air ducting, which are ideal for either advanced prototypes or end use without the cost or lead time of traditional tooling.

Sabic will showcase an expansion of its Lexan sheet portfolio for aircraft

interior applications at Aircraft Interiors Expo Americas on October 14-16.

Aircraft interior designers are often restricted by the clarity and compliance limitations of the transparent materials currently available to them. With 80% light transmission – the highest level of light transmission available in an OSU-compliant sheet material today – Sabic's new clear Lexan XHR2000 sheet is a pioneering option, while still meeting OSU 65/65 heat release and typical industry FST requirements (FAR25.853, BSS7239, ABD0031).

Sabic's new high-performance Lexan Light F6L300 sheet is the lightest thermoplastic sheet available today, regardless of base material, that complies with flame, smoke and OEM toxicity. With a specific gravity of 0.85g/cm³, it offers up to 40% weight savings when replacing PVC/PMMA-based sheet products for applications such as seating parts, partitions, luggage compartments and PSUs. Lexan Light sheets meet typical industry flame, smoke density and toxicity requirements (BSS7239, ABD0031).

Looking ahead, as regulations become more stringent and technologies improve, the aerospace manufacturing industry is seeing a desire by customers to comply with or exceed regulations whenever possible, and to take full advantage of the level of interior customization enabled by the newest generation of innovative thermoplastics. With material manufacturing technologies continually evolving, Sabic continues to work collaboratively with aerospace OEMs at the forefront of design to anticipate the next set of industry challenges. ☒

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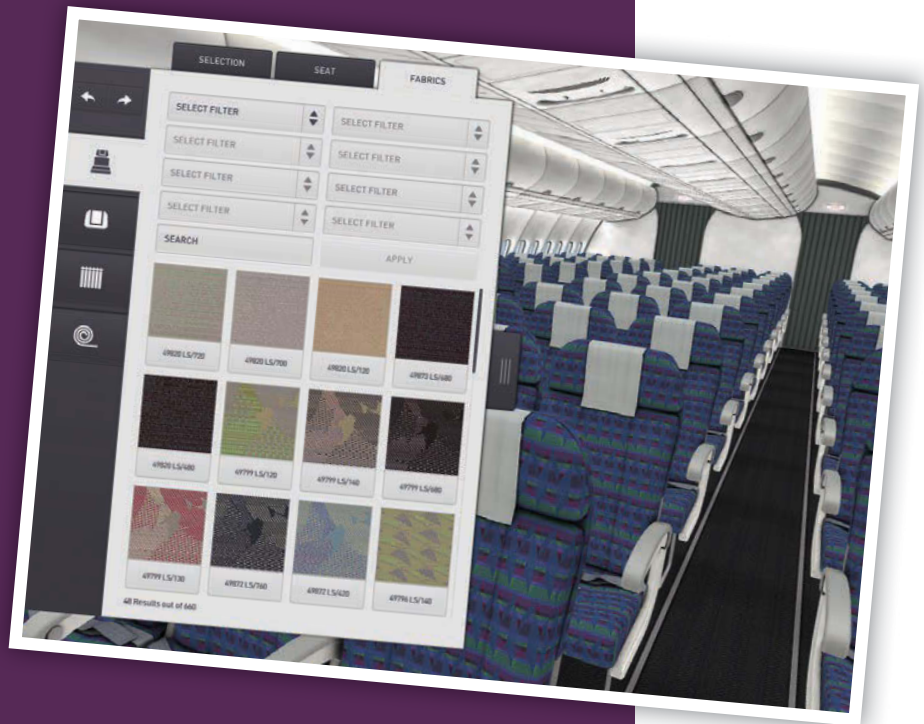
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In 2014, the aircraft unit of Lantal Textiles – the unit that has become a fundamentally important part of this traditional Swiss mill – turned a youthful 60 years old. Aircraft cabin design has always been very important to Lantal, whose vision is to provide complete soft interior solutions that ensure the ultimate in well-being for passengers.

It was in 1954 that the Dutch representative of Möbelstoffweberei Langenthal called on KLM, hoping to sell seat cover fabrics for the airline's office furniture. Although this deal did not materialize, he returned to Langenthal with the mill's first order for aircraft seat covers. It was a first step into the transportation textiles market, and it changed everything. The order put the Swiss company among the world's first textile mills to enter the field of soft interiors for passenger aircraft.

Since then much more has changed, with Lantal evolving from being a yardage supplier to a provider of all-in-one solutions. Lantal's global leadership position in textiles, parts and services for the passenger transportation industries has been attained because the company repeatedly implements innovative ideas and consistently offers products of high quality.

An interactive online configurator is one of Lantal's latest innovations. With just a few keystrokes, users can appoint an interior to suit their personal taste. Once the aircraft type and class have been defined, cabins can be outfitted individually with Lantal's seat cover fabrics, curtains, leathers and carpets. In just seconds, the aircraft configurator will visualize the



resulting interior. The gyroscope function is a highlight of the configurator system, enabling iPad users to navigate the cabin through 360° by simply moving their device. This creates a vivid three-dimensional impression of a walk through the user-customized interior.

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1947: stratocruiser

An aircraft closely related to a military cargo transporter may not sound like the height of comfort and glamour, but in the 1950s the Boeing 377 Stratocruiser was one of the ultimate aircraft for a luxury passenger experience, especially since it was one of the first to offer 'altitude conditioning' and cabin air circulation systems.

Indeed, its luxurious appointments were appreciated by one of the world's coolest frequent flyers, as documented in a short story published in 1960: "Bond took the Friday Comet to Montreal. He did not care for it. It flew too high and too fast, and there were too many passengers. He regretted the days of the old Stratocruiser – that fine lumbering old airplane that took 10 hours to cross the Atlantic. Then one had been able to have dinner in peace, sleep for seven hours in a comfortable bunk, and get up in time to wander down to the lower deck and have that ridiculous BOAC 'country house' breakfast while the dawn came up and flooded the cabin with the first bright gold of the Western hemisphere." The Bond in question was of course British secret agent James Bond, in Ian Fleming's 1960 classic *For Your Eyes Only*, and he is a gentleman who certainly enjoys traveling in style.

Boeing offered flexible configurations for the 6,600ft³ (187m³) of interior space spread over the Stratocruiser's two decks in the figure-eight-shaped fuselage. A 114-seat all-economy aircraft could be ordered, but a more popular and luxurious option was to have 75 seats, 56 of which could be converted into lie-flat 'sleeper

berths' similar to bunk beds, complete with privacy curtains, and the remaining 19 seats being recliners.

On the more luxurious flights, such as BOAC's Monarch service where you would find the likes of Mr Bond, the service was impeccable, with caviar, duck, champagne and after-dinner cigars to help sustain you over those 10 hours from London to New York. Passengers also had a fantastic destination space, as when they descended the midship spiral staircase, they arrived at a horseshoe-shaped lounge in the lower lobe area with room for 14, complete with a cocktail bar under the stairs. Some carriers also laid on extravagant buffets in the aft galleys, giving passengers another place to visit and to socialize.

Thus sated, guests could change into their nightwear in the spacious dressing rooms (one for gentlemen and a rather better appointed one for ladies, both of which could accommodate at least three people) before retiring to their bunks ahead of that ridiculous breakfast. Some carriers even had a 'Stateroom' in a forward compartment, which could seat five or be converted into a bedroom for two passengers to share.

It sounds impossibly glamorous, and the Stratocruiser embodies the type of experience referred to when jaded travelers mention the 'golden age of air travel'. But 60 years later, the experience also sounds suddenly familiar again, with Etihad's A380 bringing back some of that old-school glamour. We suspect James Bond would approve of The Residence. ☒

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