

Aircraft *interiors* INTERNATIONAL

JUNE 2015

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Forthcoming changes in seat certification rules may create new opportunities for innovation

COMFORT AND JOY

Lavs are a key point of the passenger experience, and this should be better reflected in their design

CREW RESTS

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SEATING SPECIAL

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

SHOULD THE
INDUSTRY BREAK
THE FLIGHT DECK
DOOR CODE
OF SILENCE?

EXCEPTIONAL SEATING COMFORT

The new business class seat CL5710 for short- and medium-haul flights



The innovative RECARO CL5710 combines comfort and efficiency in an outstanding way. Its contemporary design and enhanced passenger comfort features make this electrically actuated seat the first choice for single-aisle aircraft on short- and medium-haul flights.

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LOCK

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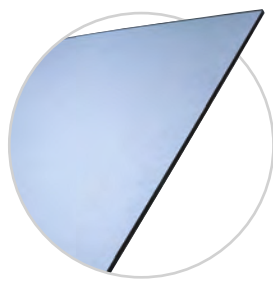
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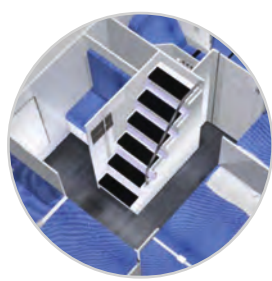
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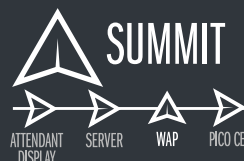


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SIT TIGHT

Are you sitting comfortably? Some passengers traveling in ever-denser economy cabins might say they aren't, although they're unlikely to be heard complaining about the low fare they paid. Things are changing though, and comfort can be found in small spaces, as many of the new models in our annual seating review (p82) illustrate. Big changes in economy seat design are being driven by the new opportunities that composites offer to carve out valuable extra inches in the passenger envelope, as well as to sculpt seats to create ergonomic comfort with minimal padding – and, of course, weight savings.

A colleague who read the seating review asked me why there have been so many launches in the past 12 months, saying that an economy passenger would choose an airline based on airport, price and departure time – not the seat. He might have a point, but today's economy seats are far from generic, and the airline is the customer, not the passenger. So how does an airline choose a seat? Weight and purchase price? Well, yes, but passenger comfort is also an important consideration – why would you wilfully select an uncomfortable seat? Also, as supply chain pressures increase and airframer

deadlines further increase pressure on suppliers, there is room in the seating market for new blood – recent entrants including Lift by EnCore, Expliseat, Toyota Boshoku and Jamco. It's great to see such new players being bold and innovative, and indeed Rebel.Aero's flip seat is one of the bravest entries into the market we've seen. There is great innovation taking place in the economy seating field right now, with real product differentiation and a lot less generic styling.

Speaking of innovation – and we always are – we sent Marisa Garcia to find out how some imminent changes to seat certification rules can help enable further innovation in future seat designs. The changes will take effect in the coming years and we look forward to seeing how seat design will evolve and safety improve even further. You can read her report on p24.

Another safety issue we consider is cockpit door security (p46). The Germanwings Flight 9525 tragedy has rocked the airline community and shocked the world. Changes are clearly needed, and not just knee-jerk decisions. John Walton investigates this issue and considers what should be done. Maximum security isn't necessarily maximum safety...

Adam Gavine, editor



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for exclusive
images of this
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interior

ONE VISION

Sadly canceled, Skymark's A380s would have been an interesting and unique proposition. Take an exclusive look inside the all-premium bird

1. THE LEADING EDGE OF THE SEAT CUSHION WAS GIVEN A SOFT CURVE FOR GREATER COMFORT UNDER THE LEGS OVER TIME. IT ALSO MEANS THAT THE FEET OF SHORTER CUSTOMERS WOULD BE MORE LIKELY TO TOUCH THE FLOOR

2. THE SEAT FABRIC WAS DESIGNED AROUND THE CABIN CONCEPT OF A CASUAL URBAN CAFÉ IN TOKYO, WITH A REFRESHING, YOUTHFUL APPEARANCE AND CLEAR DIFFERENTIATION FROM THE COMPETITION

3. THE SIMPLE, CLEAN TRIM OF THE FORWARD UPPER DECK LAV COMPLEMENTS THE SEATING ZONES. RENDERING BY AIRBUS

When Japanese carrier Skymark placed an order in 2010 for four A380s plus two options, its proposed 394-seat configuration raised eyebrows. Indeed the proposed all-premium aircraft would have had the lowest seat count of any A380, and every seat would have a fully flat bed: quite a feat for a low-cost carrier flying single-class B737-800s on domestic Japan routes.

The plans for the lower deck remain confidential, but Daniel Baron, CEO of Lift Strategic Design, which Skymark brought in to design the interiors, shared a few details about the upper deck. "The seats were not meant to be 'business class' in the traditional sense. Business class fares from Japan to Europe and North America are extremely high, particularly last-minute fares. The vision of the CEO [then Shinichi Nishikubo] was to provide beds at a premium economy fare [still high in the Japanese market] and fill up his aircraft with SME owners and corporate middle managers who could not justify the cost of flying long-haul business class on the established network airlines."

A flat bed for a premium economy fare is remarkable, but certain elements are closer to an economy offer, such as having no embedded IFE, and only a basic food and beverage service. No-frills comfort, if you will. It's just a shame the Skymark A380 program was terminated before customers ever had a chance to enjoy a unique proposition. ✕

NEW DIMENSION

Skymark and its interiors design partner, Tokyo-based Lift Strategic Design, decided upon a customized version of the Equinox 3D seat from Stelia Aerospace (formerly Sogerma) for the upper deck. Over a period of three years, it was given many changes that they felt would appeal to the airline's Japanese customer base and fit in with the cabin's overall Japanese urban café aesthetic – the height difference in bed mode was also eliminated. Daniel Baron, CEO of Lift, explained the seat customization: "The seat design does not feature the sexy deep 3D curves of other products. It was conceived to be highly economical for the airline customer, and this drove every aspect of the design. That said, we created tangible 'wow' by incorporating funky elements where possible, such as a stowages with mood lighting."



Visit aircraftinteriorsinternational.com for the latest passenger experience news



BIRTHDAY GIRL

Can you believe the A380 is 10 already? She still looks great, and with the -900 variant being put on ice, she's still the same livery size. We recall a few moments that make the A380 such a special aircraft...

2

EMIRATES' SPRINKLE OF MAGIC

As the biggest operator of the A380, with 60 in its fleet and 80 on order, Emirates clearly loves the aircraft. The private suites, bar and bling trim and finish made this one of the flashiest aircraft in the skies, but there was one thing that amazed everyone at the 2008 launch: the onboard showers. First class guests can book a



30-minute slot in one of the two shower suites, which are of course staffed by dedicated shower attendants. There is only five minutes of actual shower time, but getting soapy at 30,000ft is really something special.

4

QATAR'S BEST BAR NONE

Launched in 2014, Qatar's flagship oozes class and quality throughout, but the upper deck is exceptional. The first class suites and the luxurious business class seats are truly impressive, but it's the Premium Lounge that astonishes passengers. This spacious lounge includes elegant couches and the longest bar in the sky, all illuminated by striking Arabian-styled light fixtures. Although the lounge is primarily intended for the 48 business class guests, the top Krug champagne is available just in case a first class guest pays a visit.



The A380's 478m² of cabin floor area is 49% more than in the B747-400

1

SINGAPORE'S DOUBLE DELIGHT

In 2007, two years after the A380's maiden flight, Singapore Airlines took the first delivery of the aircraft. The public couldn't wait to see what was on board, and although it didn't include any of the wilder speculated features such as bowling alleys or casinos, it did have something that got people talking: double beds. Guests traveling together in the super-luxurious Suites class can opt for the center suites, stow the central divider, and have a two-person private cabin, complete with mattress. Cue many mile-high jokes...



3

KOREAN'S CONSUMER CHAMPION

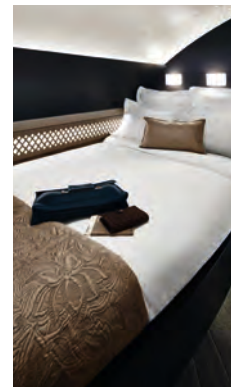
Korean really went for the wow factor for its flagship, sacrificing seat count (only 407) for some rather special features. The top deck is dedicated to business class and boasts not one but two cool bar lounges branded by Absolut vodka. There is something special for everyone on board though, with a duty-free shop located at the rear of the main cabin. The success of this retail destination has made Korean a king among inflight revenue earners.



5

ETIHAD'S AIRBORNE HOTEL

Just when we thought the zenith of A380 luxury had been reached, in December 2014 Etihad launched something quite incredible. Almost everything on board its flagship has been specially designed for the airline, with the all-premium upper deck designed to evoke the feel of a boutique hotel. Even the bespoke Door 2 galley looks nothing like a typical aircraft galley and the Lobby lounge offers elegant loafing. The first class Apartments are world-leading in their space and plushness, but the Residence offers the ultimate in commercial air travel: a living room, double bedroom, shower room – and butler.



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UP, UP AND AWAY

The only way is up for the aircraft interiors industry, as illustrated by these figures gathered during the second quarter of 2015



How pax from **North America** compare with those from the **rest of the world**:

Interested in inflight wi-fi –



Interested in wireless IFE –



Gogo study

CONNECTED CASH

Revenues from inflight connectivity will reach

US\$3.2bn

by 2024

Northern Sky Research



The Asia-Pacific cabin interior market will grow at a CAGR of 8.51% to reach US\$3.45bn by 2019

MicroMarket Monitor



of single Millennials (aged 18-34) would use an inflight dating app, while only 9.1% of Gen Xers (38-54) would

Hipmunk report

There is a **ten-fold** increase in wi-fi use when the service is free

SITA research

x10
increase

Smarten up

19% of passengers wish their fellow passengers were better dressed

Go Airport Express survey



Approximately **3,300** commercial aircraft have broadband capabilities today, and by **2023** the number is set to increase to at least **13,000**

WireMasters research



In 2014, US passenger airlines collected a total of **US\$3.5bn** in baggage fees

US Bureau of Transportation Statistics



BIG PLANES, BIG BUSINESS

Seating in very large aircraft is expected to be the fastest-growing segment in the European aircraft seating market, and is projected to grow at the highest CAGR of **13.1%** from 2014 to 2019

MicroMarketMonitor report



The global commercial aircraft seating market is expected to grow at CAGRs of **7.7%** and **6.85%** in terms of revenue and unit shipment from 2014-2019

Research and Markets

By 2025 70% of the global aircraft fleet will have connectivity
Thales

Top five activities on SITA's Internet OnAir system:

- 1: Facebook**
- 2: WhatsApp**
- 3: Google**
- 4: iMessage**
- 5: Snapchat**

SITA data



75%

75% of UAE pax would sacrifice extras such as pre-bookable seats or inflight meals for free inflight wi-fi

Honeywell survey



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Our website features Virgin Atlantic blogs, reviews, and a history of its Clubhouses



HOORAY FOR HOLLYWOOD

What better way for Virgin Atlantic to celebrate 25 years of flying the London to LA route than with a glamorous new Clubhouse?

Recent visitors to Terminal 2 at LAX may have noticed a few improvements taking place, the latest of which is Virgin Atlantic's new £2.5m (US\$3.9m), 4,000ft² Clubhouse on the upper level, designed to reflect the laid-back lifestyle and gorgeous scenery of California, with a few fun nods to London culture.

The space was originally rectangular, but the airline's internal design team worked with Manhattan-based Slade Architecture (which also worked on the JFK and Newark Clubhouses) to divide the space diagonally, with back-of-house operations such as the kitchens and restrooms in the inner half, and the lounge space in the outer.

Upon entering the space the eye is drawn to the sculpted ceiling, created by stretching a white plastic membrane into place using heat. What the feature takes in ceiling height, it adds in drama, while also pulling the ceiling line down from the skylight to the top of the windows, giving them a full-height effect. The double-aspect north-easterly outlook through those windows offers views of the Hollywood hills and the apron.

A key destination point of the space is the bar area, with the undulating copper on its surrounding 'Flow Wall' symbolizing the mountains, warmth and sunshine of California. The white Corian on the bar surface also

ART HOUSE

The rear wall in the bistro area acts as the lounge's focal point, with the eye drawn to a video installation by California-based digital artist Diana Reichenbach, which is a vignette of LA, showing shifting lights and the ocean through dusk, dawn and daytime on a 30-minute loop.

At the other end of the lounge is a tattoo-style mural by London artist Vic Lee. Named LOLA (To London with love Los Angeles), the work brings together the cities through witty words and images.

Both artworks engage the viewer, which is important to the space. Jeremy Brown, senior design manager for customer experience at Virgin Atlantic, explained, "Clubhouses are a third about Virgin Atlantic's internal design philosophy, a third about the location, and a third about expression, like the artworks."

references the Corian used in the B787 bar area, pulling together the travel experience.

Beyond the bar, at the rear of the lounge, is a bistro area for dining, where travel-friendly meals designed by the Century City hotspot Hinoki & The Bird can be enjoyed without being disturbed by bar traffic.

The space is sophisticated, but Virgin Atlantic shows its cheeky side in the restrooms, with an unexpected riot of color provided by the wall tiles, custom printed with photos of well-worn skateboards (a big theme of Venice Beach). It takes a moment to work out what the images represent, with this fun element increasing passenger engagement and enjoyment of the lounge experience – and thus the broader passenger experience. ✕

1. THE VIEW TOWARD THE REAR WITH ITS VIDEO ART INSTALLATION. AS WITH CABIN DESIGN, THE POPULARITY OF PEDS HAS CHANGED LOUNGES. BUSINESS AREAS AND TELEVISIONS ARE NO LONGER NEEDED – JUST FAST AND FREE WI-FI

2. THE CORIAN AND COPPER BAR. AS THE LOUNGE ONLY HAS TO CATER FOR THE MIX OF A340-600S AND B787S CURRENTLY FLYING THE ROUTE (47 AND 31 UPPER CLASS SEATS, RESPECTIVELY), THE 90-GUEST CAPACITY IS AMPLE, ESPECIALLY GIVEN THAT THE ROUTE BECOMES ALL-DREAMLINER IN 2016. ACCESS FOR OTHERS IS ALSO POSSIBLE – SEE OUR WEBSITE FOR DETAILS

Visit www.AircraftInteriorsInternational.com for the full Clubhouse story and extra images



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PUSH AND PULL

There is a lot of potential for galley carts to improve operational efficiency and make crews' lives a little easier, as these concepts show

2

TIGHT SQUEEZE

Conventional trash compactor units are based on electromechanical compactors that can be heavy (80-113kg) and space-inefficient, as the compaction mechanism takes up almost two-thirds of the 35-70 liters of space in a unit. With a little support from Airbus, Hamburg University of Applied Sciences has created the Mobile Vacuum Trash Compactor cart concept, which uses existing onboard vacuum systems as a pressure source for an in-trolley compaction mechanism to create a 75% weight reduction and 50% capacity increase. A demonstrator of the 24kg, 150-liter capacity device has been successfully tested under operational conditions.



3

SMART THINKING

An interesting contender in Airbus's 'Fly Your Ideas' contest this year is the Retrolley, devised by a team of students from São Paulo. The concept trash cart addresses the issue of reducing waste in flight and cutting down the time taken to collect and sort rubbish post-flight, speeding up airline operations, particularly on short-haul routes. The trolley concept intelligently sorts rubbish and recycling by using smart stacking and piling to minimize the volume of foils, paper and plastic, as well as collecting residual fluid.



Diehl won a 2014 Crystal Cabin Award for its DACAPO concept

1

A MAGIC IDEA

The DACAPO (Distributed Autonomous Cabin Power) concept by Diehl Aerospace makes the trolley a key part of the aircraft. 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 power grid. Electrical power for the cabin systems is generated by 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 recharged during aircraft ground time. The energy is clean, and the reduced cabling and componentry saves weight, and the APU may not be required on the ground. Diehl is working to develop the first functional prototype trolley, and expects it to be ready for feasibility demonstrations later this year.



4

THE FIGURES STACK UP

A lack of galley space can limit inflight sales stock levels, which can hamper the generation of inflight revenue. Onboard Logistics' Flex-e-Drawer design is a set of drawers that nest on top of each other in a cart. When empty, the drawers can be stacked into each other, and put into the bottom of the trolley or stowed in an ATLAS container. The empty space in the trolley can then be filled with a bag to create a waste cart. Benefits to airlines include reduced warehouse space requirements as the drawers are delivered stacked.



5

A HELPING HAND

This Inflight Food Delivery Concept by Swedish industrial designer Jens Andersson enables crew to switch between different serving situations such as food, drinks or retail. An interesting aspect is that the carts remain on the aircraft, with neatly packaged food box modules brought directly into the galley, instead of having a stock of carts around the world, loaded at every destination. This idea reduces the cart stock required to maintain an operationally effective system. The concept also considers cabin crew ergonomics, with the motorized wheels eliminating strenuous pulling and pushing, and a secondary motor that automatically raises the food shelves every time the top tray is removed, eliminating bending down.



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3000 BC | Candle light



1802 | Incandescent light bulb



1938 | Fluorescent tube



2009 | LED stripe



2012 | HelioJet® White



2014 | HelioJet® Spectrum^{CC}



2015 | HelioJet® Spectrum^{CC} now on A330

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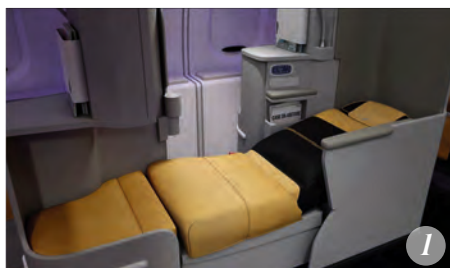
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ITALIAN RENAISSANCE

Under the tutelage of Etihad, Alitalia is aiming to regain its former glory. The first cabin reveal shows a brighter aesthetic for a brighter future

Check the video section of our site to see how glamorous Alitalia was in the '50s

Etihad is an airline on a mission, with the latest stage in its global plans being the first enhancement to the Alitalia fleet. As part of an overall €1.76bn (US\$1.96bn) package with other investors, Etihad has sunk €560m (US\$624m) into a 49% stake in the airline, and through a scheme of restructuring, new routes and cost-saving measures, the partners hope to move the airline from its history of financial losses and government bailouts, to posting a €100m (US\$112m) profit by 2017.

Another key part of the plan is to create a 5-star passenger experience through a focus on people, service, product and brand. As Alitalia's recently appointed chairman, Luca di Montezemolo, has stated, "Alitalia has to become a sexy company."

The first glimpse of the sexiness is the reveal of the facelifted cabins on Alitalia's two new A330-200s, leased from Etihad. By happy coincidence, Etihad's outgoing fleet features the Stelia Solstys seat in business class, which is the same as used in Alitalia's existing Magnifica business class. The seat is of a high enough standard that just a trim and finish project across the long-haul fleet is possible, with stitched Poltrona Frau leather selected for the seat covers (as also featured on Etihad's premium seats).

The economy seats have also been refreshed, with fresh and colorful fabrics replacing the grays of old, lifted by a cushion that picks out detail of the new livery (see right) in a similar style to Etihad's new brand cushions. Only the rather messily arranged and dated seatbacks hint that the economy seats aren't brand new. The only thing missing

in the two new A330s is premium economy, which Etihad has never offered, but which is being refreshed in the remainder of Alitalia's long-haul fleet.

New brand elements are also being introduced across all three classes, with new branding panels, and redesigned soft furnishings such as curtains, headrests and cushions. The contemporary new designs also feature on menu cards, onboard amenities, and on the branding of inflight programming and reading material. ☒



PLAN 'A'

Landor created the long-serving Alitalia livery in 1969, and was brought in again to update it with a "young and seductive new look" to represent the airline's ambitions.

The stylized empennage logo has been updated and refined, with a modernized logotype and a more dominant 'A', all naturally in the familiar green, red and white colors of the Italian flag. Landor felt that increasing the number of primary color tones used on the logo's palette portrays greater depth and richness.

Landor's team was inspired in part by the striking lines on Formula 1 racing cars, adding striations to the red triangular interior of the Alitalia 'A', creating a pinstripe effect.

The new branding is also being extended to the cabin décor of Alitalia's fleet of Airbus, Boeing and Embraer aircraft, and throughout the passenger experience – from website, to check-in counters, to advertising.

The stylized 'A' appears subtly on cabin brand panelling, and on soft furnishings such as curtains, headrests and cushions. The vibrant and contemporary new designs will also feature on menu cards, onboard amenities and on the branding of the IFE interface and reading materials such as the *Ulisse* inflight magazine.

1. WITH THE CABIN UPDATED, SERVICE IS THE NEXT KEY AREA OF ATTENTION, AND MORE THAN 4,500 ALITALIA STAFF, INCLUDING CABIN CREW, GROUND CREW AND LOUNGE STAFF, ARE ATTENDING WORKSHOPS AT ETIHAD'S HQ TO RAISE THEIR LEVEL OF SERVICE

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TWISTED THINKING



BRIEF

The key elements of a narrow-body VIP and VVIP jet cabin – the ceiling, walls and floors – can be made into something aesthetically pleasing and luxurious. However, as some of the world's most demanding and exacting customers increasingly ask for unique cabin interiors, the conventional separation of those three elements can limit design expression. After all, what self-respecting billionaire wants the same interior as a rival, just in a different color scheme? Some fresh thinking is required to open up new possibilities to create something a little more special.

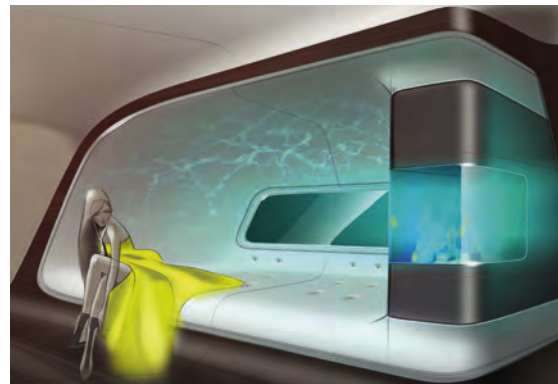
DESCRIPTION

Lufthansa Technik has collaborated with Mercedes-Benz Style to create a concept that works outside the usual narrow-body cabin boundaries, replacing the typical arrangement of seat and wall elements with a helical layout that sees the floor, walls and ceiling twist into each other to create independent yet flowing spaces.

The effect is really felt between the zones, for example as the timber floor of the bedroom twists as it enters the lounge area to become part of the ceiling. Zones are clearly delineated, but in a much softer, calmer way than through the use of walls or straight lines, and in a way that really works well with a tubular shape.

The soft, swoopy aesthetic of the space is complemented by the curves of the cabin furniture. A great example is the banquette-style seating area, which is perfect for dining or meetings, with its space clearly defined by the overhead 'skylight'. The helical cabin design means that the furnishings appear as a part of the overall design rather than something bolted to the floor, making the whole space feel – apologies for the cliché – organic.

According to the Mercedes-Benz Style team, key to the success of the scheme is a strong emphasis on contrast in terms of material, color and lighting – something the studio sees as one of its hallmarks and talents. Meanwhile, the technical experts at Lufthansa Technik have reality-checked the design to ensure it is feasible.

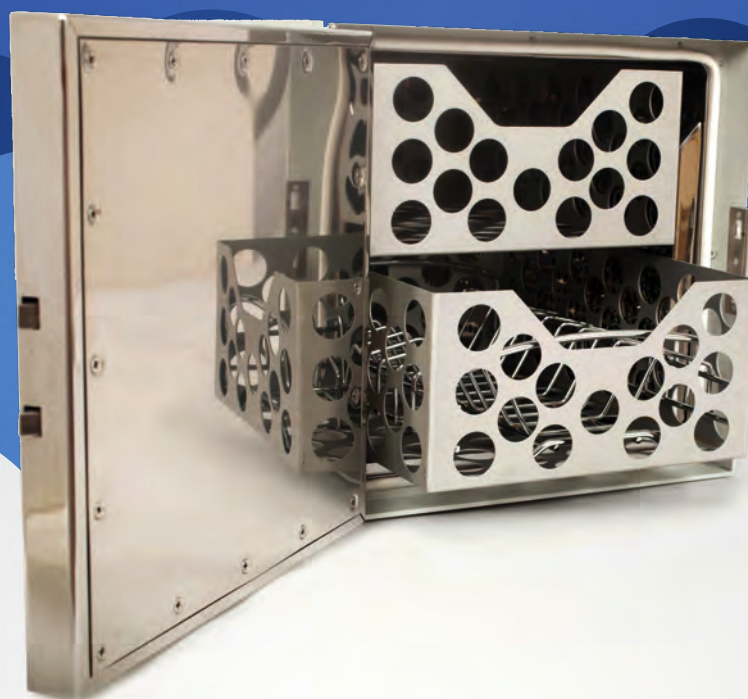


VERDICT

The beauty is in the helix, a shape that is a perfect fit for a tubular structure. If that interior were symmetrical, with dark sidewalls, dark furnishings and white seat coverings, it would be rather dull and gloomy. But by introducing that twist, the simple two-tone contrasting color scheme becomes intriguing and the dark wood doesn't overpower. The only negative is for those who love the aesthetic but also want more privacy in the bedroom area, because adding a wall would destroy the flow of the space.



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MAKING WAVES



BRIEF

Our magazine is so successful that we have decided to splash out on a corporate jet – probably an ACJ or BBJ. Obviously, as cabin geeks, we want the seating to be a little different, combining a slick aesthetic with long-haul comfort.

DESCRIPTION

Swiss design house Yasava has answered the brief with its Aïana Wave seat design, designed to complement its Astral modular cabin layout. The seat's aesthetics certainly stand out, with its sculpted form following the recent trend of seats not having to be heavily padded to offer comfort. Motion is electrically controlled and locked, with optional track and swivel, and the shape allows comfort in many positions, including sitting side-saddle.

But what of sleeping comfort? The seat may recline 180° but it's not exactly flat. Yasava says the seat is optimized for sleep, with the form optimizing blood flow and minimizing DVT risk, and the cushioning optimizing body-mass pressure distribution. The articulation also works within a compact seat pitch, meaning the whole team can travel. There is also the option of double pods, and a mini-suite (a seat and adjacent flat mattress) for the editor.



VERDICT

The styling is *The Matrix* meets dentist chair, but as we don't want a corporate look, we think it works well. Being able to mix up the feel and functions of the cabin with singles, doubles and suites also helps our goal of making the interior cool, fun, comfortable and multifunctional. Aïana Wave is up against some tough competition, but it's on the shortlist.



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ANY DISCUSSION ON THE FUTURE OF AIRCRAFT SEATING SHOULD CONSIDER THE REGULATORY ENVIRONMENT. THERE ARE CHANGES IN STORE FOR FUTURE SEAT CERTIFICATION PROGRAMS

Words by Marisa Garcia. Illustration by José Luis Merino





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“To define standards, regulators need specific and measurable injury criteria”

The long lead times and high cost of developing aircraft seats mean that keeping abreast of changes to regulations, testing requirements and standard practices is critical to the satisfactory completion of any new aircraft seat development program. But these changes don't happen overnight. Defining and validating program requirements can be a process that takes years, which gives manufacturers time to prepare.

Manufacturers who participate in the Society of Automotive Engineers (SAE) Aircraft Seat Committee, a group of manufacturers and regulatory representatives dedicated to the review and drafting of seat standards, have the advantage of knowing what is coming, and also the opportunity to help shape that policy. The SAE Aircraft Seat Committee brings together representatives of international regulators and manufacturers who review the processes of development approvals of aircraft seats and draft standardized practices and certification requirements. The group is dedicated to ensuring consistent processes, high safety standards and practical certification requirements, which encourage innovation and the introduction of new seating products.

OBlique VIEW

Research launched by the FAA's Civil Aeromedical Institute (CAMI) into the injury criteria for oblique-type seats, qualifying virtual testing models, developing standards for composite seating, and a new draft revision of the technical standard order (TSO) that governs all seats are some of the items on the agenda of the Aircraft Seat Committee.

We discussed these ongoing projects with Rakibul Islam, vice president of compliance and certification at Zodiac Aerospace's seating segment, who has served as chairman of the SAE Aircraft Seat Committee since 2010.

“Airlines are choosing oblique seats in business class because you can have a high-density cabin, but there was

no published regulation for such seats. When they were introduced several years back, the FAA was looking at anthropomorphic test device (ATD) alignment with an aircraft's longitudinal axis compared with forward-facing seats to establish an equivalent level of safety,” Islam explains. The ATD is a test dummy, “but determining whether a particular seat was acceptable or not was through comparison and personal interpretation. It was a subjective evaluation,” he adds.

Developing a prototype without clearly defined test protocols and quantifiable product performance data to prove against, is an expensive process of trial and error for manufacturers. But to define those standards, regulators need specific and measurable injury criteria.

“In November 2012 CAMI launched a research project to define the injury criteria for oblique-type seats. Since then the FAA has come up with issue papers and special conditions that define the injury criteria for an oblique seat,” Islam says. “Tests are run to show compliance with the neck and spinal injury criteria specified on the issue paper or special condition. EASA is finalizing the same through certification review items (CRIs).”

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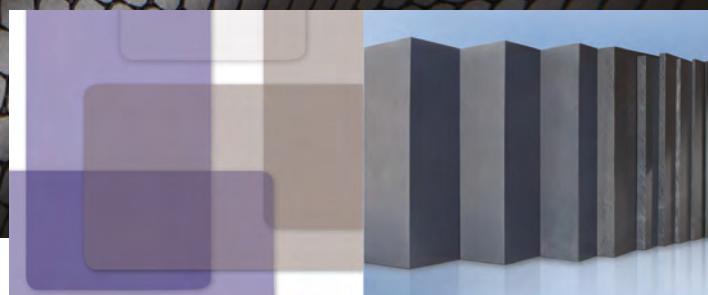
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While CAMI has started trials and shared insights with SAE members, industry and regulators, it has yet to publish test data that could guide the drafting of new standards. There is insufficient data gathered by industry on these injury factors, which leaves regulators making an educated judgment call on each seat proposal on a case-by-case basis, which makes the process somewhat arbitrary.

“That is why we at the SAE Aircraft Seat Committee are developing an aerospace recommended practice for oblique seat injury criteria (ARP6316),” says Islam. “We’ve finished the final draft and it’s going through final review to define the injury criteria. The FAA will then issue a policy memo formally making that ARP an acceptable means of compliance. We are also working with EASA to get its acceptance on the ARP. This will help the entire industry to develop safe products that are also compliant with regulation.”

Islam has big news relating to forward-facing seats: “Based on the developments of neck injury criteria related to oblique seating, the FAA has started to look at forward-



“New standards must also result in processes that are financially viable for manufacturers”

CAMI TESTING

In a memorandum entitled *Initial Evaluation of ATDs for Testing of Obliquely Oriented Seats*, prepared by FAA officials Amanda Taylor, Richard DeWeese and David Moorcroft of the FAA’s Civil Aeromedical Institute (CAMI), the authors explain the challenges that oblique and herringbone seat layouts pose to those working to develop clear and universal standards for injury criteria.

“This orientation exceeds the standard 18° of a forward-facing seat, but is not purely side facing. The anthropomorphic test devices (ATDs) used in aviation impact testing are designed to perform in a relatively confined environment – automotive interiors – and can be loaded in forward, sideward and rearward directions. Oblique seats present a novel loading environment that may permit considerable flailing and have an off-axis loading direction. An ATD capable of evaluating injury risks due to combined forward and lateral loading is necessary.”

After evaluating the performance of various ATDs, CAMI conducted 16g, 44ft/s deceleration sled tests as defined in 14 CFR 25.562, using the FAA Hybrid III ATD,

selected “because of its expanded set of instrumentation which allows a greater ability to measure potential injury risks”. The results of these tests highlighted the potential for injury if a passenger seated in an oblique seat flails in crash conditions.

“Potential injuries include fractures to the sternum, pelvis and ribs due to contact with a structure, leg fractures due to inertial loading, and head and neck injuries due to either direct contact or inertial loading,” the authors of the CAMI memorandum indicate. “This is essentially a combination of the risks of both a purely side-facing occupant and a purely forward-facing occupant. The fully instrumented FAA Hybrid III was able to measure parameters that can be used to predict some potential injuries and is the best choice for oblique seat research tests. A follow-on study funded by the FAA is being conducted by the Medical College of Wisconsin to determine what specific injuries occur in these oblique orientations, and to develop injury criteria.”

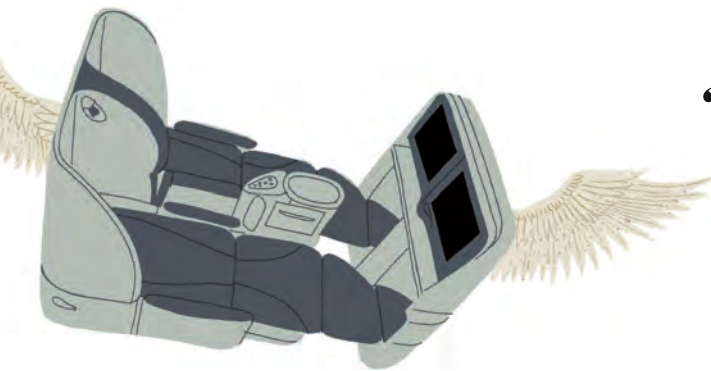
facing seats from the same perspective. That would be a huge game changer for forward-facing seats. Right now, we look exclusively at head injury criteria and lumbar load. If we incorporate neck injury, that puts forward-facing seat programs in a new context.”

THE COST OF SAFETY

Ensuring passenger safety is the top priority of all parties involved in the process of defining aircraft seat test processes and performance standards, but for the industry to reap the safety benefits of this new learning, the new standards that follow must also result in processes that are financially viable for manufacturers.

Aircraft seat sled tests cost US\$6,000 to US\$10,000, according to Islam. René Dankwerth, EVP of R&D at





“Our goal is to use crash simulation for certification by analysis to reduce certification cost and time”

Recaro Aircraft Seating, explains the cost: “The certification of new seats is a major effort due to the necessity of physical seat and parts testing. Test seats cannot be used after the test.”

In Dankwerth’s experience, total test costs can vary case-to-case, depending on the combination of sled tests and flammability tests required, but the costs of the physical prototypes that are destroyed in testing can exceed the costs of the tests themselves.

Virtual modeling and component-level testing would help reduce those costs. Component test procedures, such as those being developed for IFE, take time to define and agree, but will reduce the complexity of full assembly tests. When these standards are defined, head impact criteria testing for these products will not require the full destruction of production seats or IFE assemblies. Virtual modeling, defined by the SAE Aircraft Seat Committee under ARP5765, also promises to reduce the costs of certification testing. Once a virtual model can be proved to accurately represent and duplicate the dynamics of physical tests, subsequent testing can be done through CAD modeling.

“Let’s say you have a B777 economy seat, on which you would run 14 dynamic tests for certification. With crash simulation we can reduce those tests from 14 to 10, or even down to seven, so with proper use, development and testing costs will go down,” says Islam. “Our goal is to use crash simulation for certification by analysis (CBA) to



reduce certification cost and time. This is part of seat certification streamlining under the H.R.1000 [Public Law 106-181 of the 106th Congress] rule.”

US House of Representatives bill H.R.1000, established in 2000, called on the FAA to reduce seat certification costs by 50%, and establishing standards for CBA is an integral part of the bill. “Crash simulations have to correlate and be validated by actual test data. They have to represent the dummy behavior and actual dynamics of the sled test,” Islam emphasizes, but “once the computer model is validated as per ARP5765 and AC 20-146” it can be used to prove “compliance with the dynamic test requirements in CFR 25.562.”

Other changes on the agenda, including the requirement to use FAA Hybrid III ATDs to test for neck and spinal injuries, will add costs, because acquiring the data transmitted by these ATDs requires new instrumentation. But in the long term, those costs will be offset by greater overall efficiencies in the process. “When 16g tests were introduced, we went through a similar learning experience until, with standardized criteria and processes, we finally drove the costs down.”





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COMPOSITE STANDARDS

The recent introduction of composite materials in seating generates another undefined element for the SAE Aircraft Seat Committee to address, but its experience in addressing new developments makes the process smoother. “Composite seating is a great example of how we prepare for developing trends,” says Islam. “Everyone knows it’s coming, so it’s better that, as a committee, we address it now. We’re developing a new standard for composite seats – ARP6337. There is no regulation for composite seat primary structures, so we created a working committee to develop a standard. We’re bringing the industry and the regulators together.”

CHANGES IN THE AIR

“The seat committee holds a web conference every week,” says Islam. “Within the auspices of the SAE we prepare comments for the FAA on documents open for public comment.” Because of the active participation of international regulators in the committee, progress is made beyond the limits of the FAA’s regional authority, benefiting the industry around the world.

As Recaro’s Dankwerth tells us: “This committee helps us to get aligned within the industry and to implement changes in regulations that would not be possible otherwise. For example, with the release of new materials in the cabin.”

Also on the SAE committee’s agenda is a draft of the next revision of the TSO for all aircraft seats: TSO-C127d.

“There is no regulation for composite seat primary structures, so we created a working committee”



“It will be developed over the next few years,” Islam states. “We discuss the current TSO and contribute comments on what should be on the next revision so that the FAA has our feedback of what should be addressed.”

This is even before the draft is published for formal public comment. Knowing what lays ahead gives manufacturers that actively participate in the SAE Aircraft Seat Committee more time to prepare for changes, and to help shape them so that future regulations make developing new products feasible.

KNOWLEDGE IS POWER

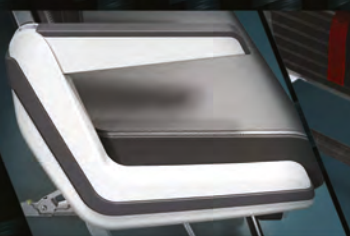
Manufacturers can develop and certify new seat products without participating in the SAE Aircraft Seat Committee, by understanding the regulations and working closely with their regulatory representatives throughout the product development process.

Acro Aircraft Seating, for example, is not an active participant in the committee at this time, but has nonetheless successfully certified a number of innovative seats. As Cameron Allan, EVP of Acro, says, the key to success in certifying any seat is to maintain a good working relationship with local regulatory authorities and to maintain an open dialog with them throughout the development process. Allan admits that it helps to have strong engineers on staff, with decades of combined industry experience.

For manufacturers whose staff may be less familiar with the inner workings of the regulatory approvals process, though, participation in the SAE Aircraft Seat Committee quickly addresses any gaps. Through its collaborative efforts, product innovation is made possible and feasible, while ensuring that passenger safety remains at the forefront of the agenda.

“Any standardization will help everyone in the industry – including airlines – by making their modifications and changes easier,” says Islam. “What we do will increase safety. A seat is the closest thing in the cabin to the passenger, with whom it is in physical contact throughout the flight. That’s why the safety of seating is our primary concern. If the industry and the regulatory authorities can continue to work together to develop safer standards, which are consistent, that will ultimately lead to a better, safer passenger experience.” ✖

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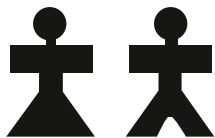
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WHATEVER CLASS PEOPLE ARE TRAVELING IN, THEY HAVE SOMETHING IN COMMON: A VISIT TO THE LAV ON A LONG-HAUL FLIGHT IS INEVITABLE. LET'S MAKE SURE THE NEXT-GENERATION LAVS ARE NOT A LOW POINT OF THE FLIGHT EXPERIENCE

Words by Adam Gavine

The smallest room in an aircraft deserves a little more love and design attention. After all, according to IATA, in 2014 on average more than eight million people flew every day, and this figure is increasing rapidly. Clearly a lot of people use the lav, so its importance to the travel and brand experience should not be played down. Indeed without the vacuum lav, long-haul flights would simply not be practical.

However, as the space is functional, it is usually treated as such by airlines and OEMs, which typically focus on weight, maintenance and cost when designing and selecting units – even its blunt industry monicker of ‘lav’ lacks glamour. With today’s focus on expressing brand values and differentiating product, it is time to make hygiene and function the minimum expectation of lavs, not the focus.

As Ugur Ipek, founder of Ugur Ipek Design, a studio that often works with Airbus, says, “The lavatory in an aircraft is a retreat, a place where you feel free, relaxed, undisturbed and on your own. Where else in an aircraft than in a lavatory can you feel like this, unless you are sitting in a mini-suite of a first class cabin or in a shower on the upper deck of an A380? But the reality for most of us is a bit different.”

PRIVATE SPACE

Let’s consider that space for a moment. As Ipek says, the reality for most passengers is far from the rarefied atmosphere of first class. Indeed 90% of those eight million people who take to the skies every day fly in economy, and in the economy cabin, the squeeze is on.



THE VARIOUS FUNCTIONS OF
FACTORYDESIGN'S L-A-V CONCEPT
ARE CONCEALED UNTIL THE
OCCUPANT SUMMONS THEM
WITH A WAVE OF THE HAND

“Lavatories have traditionally been considered quite separately from the rest of the cabin”

WHILE WORKING ON THE FAIRCHILD DORNIER 728 REGIONAL JET IN 1998, ACUMEN DESIGNED THE INDUSTRY'S FIRST DIAGONALLY POSITIONED LAV



James Tanner, an associate at Factorydesign explains, “Seat innovations have allowed for thinner, lighter, better packaged seats, giving the passenger extra space or the carrier another row – now the focus is shifting to find the optimum use of space in other areas. Lavs will be developed with a footprint about the same size as a triple economy seat – this will be made possible with a better use of three-dimensional space, materials and technology. The limited space will force an innovative use of design and materials to improve the passenger experience so it will no longer be an ordeal similar to that of visiting the toilet on the third day of a music festival.”

ABOVE AND BELOW: ZODIAC'S MODULAR LAV OFFERS CLEANLINESS, COMFORT AND AESTHETICS IN AN EFFICIENT PACKAGE

That squeeze brings challenges though. Philip Bailey, a project manager at Honour Branding, is of the opinion that as lavs have evolved in design, some of the basic customer requirements and ergonomics are not being met. “For many flying long haul, the lavs are a place to freshen up, or even to cleanse before prayer, but given the size and ergonomics of the space, it is almost impossible to do this without splashing water on the floor or hitting your head on the vanity unit as you try to get your head somewhere over the sink to wash your face. This then brings other challenges for airlines in order to maintain a high level of cleanliness and hygiene,” says Bailey. One suggestion he comes up with is “heated floors that keep the floor dry – and your bed socks too!”

As two-thirds of the Etihad Design Consortium, Factorydesign and Honour Branding worked together on the most coveted lav in commercial aviation – the private shower room in Etihad's Residence. The third design partner was Acumen Design Associates, which also worked on defining the baseline interiors of the Fairchild Dornier 728 regional jet family in 1998, creating the industry's first diagonally positioned lav.

Anthony Harcup, an associate at Acumen, adds his design perspective: “Lavatories have traditionally been considered quite separately from the rest of the cabin – at best some common trim and finish might be used on the doors and exterior panels to visually integrate the bulk, but by and large they are ‘standalone’ zones, which are defined as separate right from the get-go

PRIVATE VIEW

Don't think that business jet flyers are luxuriating in marble bathtubs. Design Q has designed many business jet lavs, ranging from tiny cubicles to shower rooms, but there are some common design rules that the studio implements in its lav designs. CEO Howard Guy explains, “Business jets can have anything from the tiniest lavatory to a full-on shower room, depending upon the size of the aircraft. Space is premium and this is an area that is sometimes cut to maximize room elsewhere.

“When you enter a lavatory you sometimes feel like you've become Alice in Wonderland, where everything is the wrong scale, and seemingly made from one piece of material from top to bottom.

“However, this doesn't have to be the case. By using two windows, you can let light and a sense of warmth into the room. Strategically positioning the lavatory in the widest possible space and placing the wash basin, with a newly designed tap, in a separate standalone unit conveys space, while mirrors and hidden lighting from strategic reveals give the perception of depth.”



“Lavatories are a key passenger experience touchpoint, so they should be bigger and more modern”

of the initial LOPA design. Perhaps this is where we are missing a trick?”

Acumen has found that business seats, whether in-line, herringbone or staggered, leave ‘dead zones’ or ‘negative spaces’ at the front and rear of the seat rows, which are often filled with bespoke furniture. However, it would be of greater benefit to give this space to the lavatories.

This reallocation of space would yield an obvious benefit to the passenger experience, but Harcup sees further potential: “Manufacturers might succeed in differentiating themselves by offering the option of working in a more integrated way with designers from the outset. By considering lavatories as 3D objects that are integrated into the seat layout, net space gains can

RIGHT: GOOD LIGHTING IS A KEY PART OF CREATING A PLEASANT VISIT TO THE RESTROOM. WHY NOT FLATTER THE PASSENGER A LITTLE MORE?



be made beyond the traditional silo thinking of simply allocating a space for a standard lavatory.

“A change in the design process might permit the smart integration of lavs with other cabin elements, freeing up currently unused available space to create exciting alternatives to the norm – perhaps compact, communal freshen-up zones, or changing areas. This way, we might increase the availability of the bathroom for those who really need it, enhancing the experience for all passengers – not just those who turn left...”

CLEAN SHEET

For Jaime Moreno, CEO and creative director of Mormedi, the lav represents the weakest point of the passenger experience, particularly for economy passengers in a wide-body. He presents what he sees as a typical scenario: “After a lovely meal, you need to stretch your legs and use the lavatory, but you have had the same idea as at least a dozen passengers who queued up patiently before you. When you finally enter and close the door, you see the results of the dirty, bad habits of some passengers and even the effects of turbulence. There aren’t many worse inflight experiences than this.”

Grim indeed, and Moreno says there is work to be done: “Today, technology lets us to clean and disinfect public lavatories after usage, but with the safety, maintenance and weight restrictions, this can be impossible in an aircraft. Why does the look and feel of lavs remain very similar now to what it was a few years ago, while cabins and seats have evolved to offer new experiences? Lavatories are a key passenger experience touchpoint, so they should be bigger and more modern.”

QUICK IN AND OUT

ZEO, the creative design studio of Zodiac Aerospace, has not noticed many fundamental changes in aircraft lavs over the past 30 years, and is seeing innovation discussions typically centering on aspects such as new materials, lighting, self-diagnosis, scents and sterilization.

Scott Savian, EVP of customer and product at ZEO, is seeking major changes. “We see the need to create a lav that improves performance in the traditional sense and that supports today’s needs,” he says. “The ability to execute and deliver these needs requires a complete re-imagining of the product architecture (think automotive-like modularity) to enable fully flexible sizing (versus just a single skinny size), substantial branding opportunities, and a dramatically improved passenger experience. Herein lies the true innovation to come.”

ZEO’s vision is of a fully flexible lavatory with 75% fewer parts than

a typical 4,500-part lav structure, resulting in lower cost and weight (over 500 lb on a wide-body), simpler maintenance and improved passenger space. The modular structure comprises a flexible shell, door, ceiling, wash cabinet, mirrored cabinet and toilet unit, all of which have some degree of customization opportunity – some more than others.

To keep the lav looking and smelling fresh, modules can be quickly removed and cleaned and the empty shell deep cleaned, without requiring the time-intensive removal of the entire unit from an aircraft, meaning more frequent deep cleans are possible.



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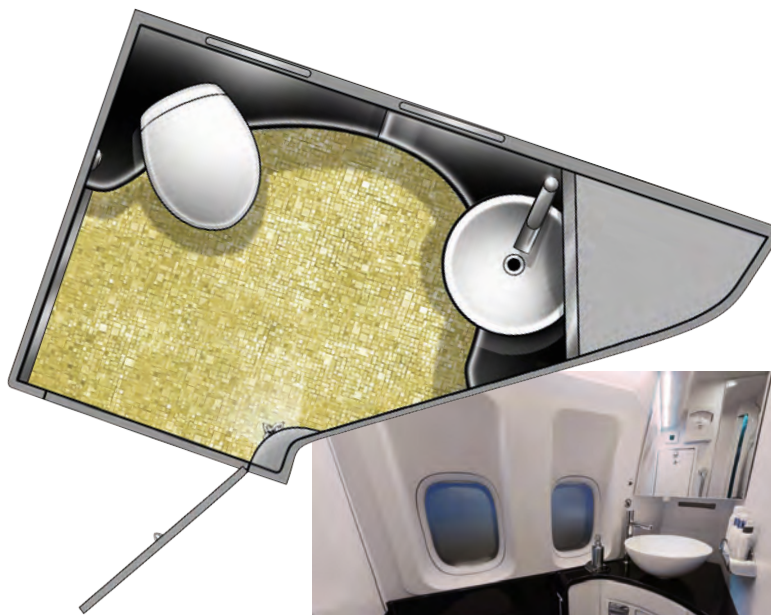
Tanner at Factorydesign has experienced similar horrors, but he and his team have devised a space-efficient solution that addresses the different uses of the space: the L-A-V. Upon entry the L-A-V is a minimal and spacious changing room, with the toilet, basin, baby change table and other amenities hidden out of view, built into the back wall, with all functions accessed via touchless controls.

So, down to business. To use the toilet, the passenger waves their hand over the appropriate icon and the bowl emerges from the back wall. After use, the bowl retracts back into the wall, where it is sterilized, ready for its next use. A wave over the basin icon causes it to appear, and it retracts again when hand-washing is finished. Soundproofed walls and noise-canceling technology built into the lavatory ensure minimal disturbance to passengers sleeping in the cabin outside.

When the passenger leaves, the floor self-cleans, the flower design (which gives the space a softer, more human feel) sprays deodorizer, and the lights change from a mood light to a UV germicidal light.

PriestmanGoode is also seeking ways to make lavs extremely sterile without feeling so, with its in-house materials and finishes department pushing suppliers to create technology to match the contemporary bathrooms customers enjoy on the ground. Touchless technology is being pushed, and for first class cabins, especially on the spacious A380, the studio is seeing interesting scope for creative development.

Co-founder Nigel Goode explains, “We’re developing more and more luxurious spaces for passengers to refresh, inspired by spa design (like on Qatar’s A380). These areas are often used by passengers to change clothes during a flight, so we ensure that the space is practical, with suitable surface space for amenities and such. And we’re also developing bespoke fixture and fittings, like the waterfall tap on the Qatar A380. While these are details, designing intuitive fixtures is a great way for airlines to show their commitment to the passenger experience.



ABOVE AND RIGHT: DESIGN Q BELIEVES THAT WINDOWS ARE KEY TO A PLEASANT EXPERIENCE, AND THAT KEEPING DISTANCE BETWEEN THE LAV AND SINK MAKES THE SPACE FEEL LARGER



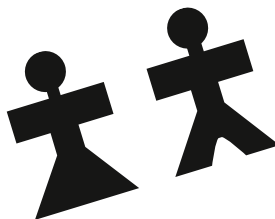
“Across the board, however, lavatory space is being squeezed to a minimum as airlines prioritize seat count, so where space is limited, our key areas for development are improving materials for hygiene and honing designs to eliminate dirt traps.”

THE HOLISTIC EXPERIENCE

Factorydesign and PriestmanGoode’s ideas certainly aid health through hygiene features, but Cristian Sutter, a cabin design specialist with experience at Thomson Airways, BA and Jet Aviation Basel, sees further possibilities for passenger well-being. “In the future, the main function of lavs will change from sanitary and grooming, to a holistic well-being experience including aromatherapy, increasing the lavatory’s importance as a branding touchpoint.”

In Sutter’s vision, passengers will place their hands in a designated area over the vanity mirror, and integrated

sensors will monitor and display their blood pressure, hydration levels and even body temperature, enabling them to tailor their onboard food and beverage intake accordingly, as well as adjusting their sleeping patterns and deciding when would be the best time to exercise for a healthier flying experience and reduced jetlag. By linking the passengers’



BELOW: FACTORYDESIGN ENVISIONS THE LAV’S VARIOUS FUNCTIONS ONLY APPEARING AS THEY ARE REQUIRED





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own smart devices to the aircraft cabin network, this information could be downloaded onto their health and fitness apps, enabling them to create a 'healthy flying profile' so they can adjust their onboard behavior on future flights.

"In the near future, lavatories will become well-being stations, playing a fundamental role in enhancing the passengers' flying experience," states Sutter.

SURPRISE AND DELIGHT

The future of lavs looks high-tech, but it should also look pleasing. So how can the styling of these oases of calm surprise and delight the passenger, and differentiate the airline?

"Lavs are quite often the most overlooked opportunity for airlines to make a point of differentiation in their brand experience," says Honour Branding's Bailey. He recognizes that in hotel and restaurant design, toilets and washrooms are considered and designed with equal attention as the front of house, as they represent significant brand touchpoints.

RIGHT: BY PUTTING DISTANCE BETWEEN THE VARIOUS UNITS, PASSENGERS WILL GET A GREATER FEELING OF SPACE AS THEY MOVE BETWEEN THEM. IMAGE: DESIGN Q



POWDER ROOM TALK

Ugur Ipek has drawn up a few recommendations that could enhance perceived quality in lavs and create new experiences for passengers across all travel classes

- **Space:** Even for a sporty adult, it is not comfortable to move around in an aircraft lav. Can't we fold just one wall out into the cross aisle? Every single inch matters.
- **Windows:** The right illumination changes the perception of space and its impact on the viewer (see right).
- **Noise:** The claustrophobic threat of gray and silver dominated lavatories is sometimes underlined with loud rattling noises. The lav acts like a resonator. Some might like the idea of having background noise, but some would like it rather more quiet. Smart sound insulation concepts will create more trust, especially for timid passengers.
- **Materials:** Anything we do not need to touch is a winner in a lavatory, even though we designers love to stress the importance of haptic experiences. We

appreciate the clean and pure look of surfaces that reassure passengers about hygiene on board. Easy-to-clean nano surfaces are more than welcome.

- **Shape:** The boxy appearance of many cabinets is not necessarily connected with practicality anymore. Nowadays, we are used to having things around us that are shaped by their function and service ideals. Look at the dashboards of some cars that wrap around the driver, putting him/her in the center. Service-oriented ergonomic evaluation is an essential part of successful product development.

It is clear that there are different demands on short- and long-haul flights and between the different cabin classes, but we strive for the best, don't we? And for this we need to address all sensory receptors – even if we don't want to touch anything.

However, things are a little more difficult in the air. "With an increasingly catalog-driven approach to new aircraft interiors, airlines are left with few design opportunities to make a difference, such as minimal floor and wall décor changes, and a choice of basin colors," he states. "Only some forward-thinking airlines are pushing the envelope to customize further, creating signature moments and another talking point for their brand."

The solution in Bailey's eyes is a more modular approach: "While the OEMs push for more standardization to make production and certification easier, perhaps lavatories could be designed to be more modular, giving a greater number of design modules and variants to the existing footprint of a standard lavatory. They could also allow for a greater range of finishes and textures, which when combined may begin to meet the diverse range of airline brands that they are marketing to."

LIGHT RELIEF

Lighting is playing an increasingly important role in making the smallest room feel a little larger, especially as it can be implemented and adjusted quickly to

BELOW: DIEHL COMFORT MODULES' NG7 (NEXT GENERATION) LAVATORY, INCORPORATES AN 'EASY DOOR', WHICH CAN BE OPERATED ONE-HANDED
 RIGHT: IN ETIHAD'S A380 FIRST APARTMENTS YOU CAN WORK ON YOUR MAKEUP WITHOUT LEAVING YOUR SUITE



VANITY FAIR

Aircraft lavatories are the only fully private space on an aircraft for the vast majority of passengers, and as such they are often used for more than a simple answer to the call of nature. Passengers get changed in them and use them to wash and freshen up, which can lead to congested aisles.

To help keep aisles clear and prevent experience-damaging waiting, Etihad introduced vanity units in the First Apartments on its A380s. Creating an individual vanity zone within each first class suite with a full range of high-end amenity items helps ensure the shower and toilet facilities are used for their primary purpose. Acumen Design Associates (part of the Etihad Design Consortium, which also includes Honour Branding and Factorydesign) initially hoped to include running water in the vanity units, but this proved excessively difficult to implement across the nine suites.



increase passengers' perception of space and mood.

As John Heath, group design and technical director at AIM Altitude, comments,

"Lighting is often an issue in lavs. The aircraft-certified technology already exists to enable lighting to slowly fade up and down automatically as the door is opened. This would eliminate the problem of glare for the occupant. More importantly, it would also lessen light-spill, which affects passengers in the cabin on night flights."

He also sees benefits of improved lighting for those using the lav as a changing room, as it would justify the provision of larger, more functional mirrors and vanity unit counters, complemented by a small ottoman and more decorative finishes.

"While this is clearly a small space, it still offers the opportunity for airlines to provide something unique, that will attract attention and challenge the standard suppliers," says Heath.

ROOM WITH A VIEW

Of course the ultimate light is daylight, and for daytime flights, what better than a window? Bailey mentions the surprise and delight of an unexpectedly swish facility in

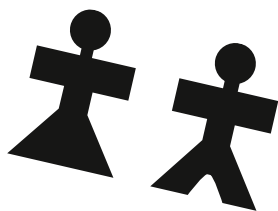
a hotel, but the view from an aircraft window would even better that of the famous restrooms in Kowloon's Ozone bar – the highest bar in the world.

Some airlines have opted to position their lavs around a window to give a 'loo with a view', including British Airways' B747 first class (switchable privacy glass) and ANA's B787 (electrochromatic window). ANA famously opted for a belt-and-braces approach to the Dreamliner's new window technology, by opting to fit an additional shade to spare any potential blushes at 30,000ft.

For some, this simple pleasure of a private moment with a glorious view out of a window is enough to lift the entire flight experience and a reminder of the wonder of flight. One such person is Ugur Ipek, who had a revelation on an SAS flight from Copenhagen to Seattle (SAS has included windows in many lavs in premium cabins across its fleet, even narrow-bodies).

"I experienced a true paradigm shift in a lavatory: a window. What a big surprise it was. It wasn't just the beauty of the arctic landscape in bright sunshine outside making me smile, it was also having real sunlight in a lavatory. Okay it was a business class lavatory, but you don't forget these kinds of encounters.

"So for lavs in economy cabins we would love to arrange lighting that is similar to sunlight. The right illumination changes the perception of space and its impact on the viewer." ❀



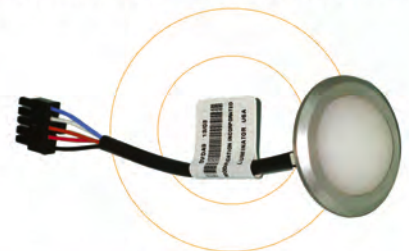
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SHOULD THE INDUSTRY BREAK THE FLIGHT DECK DOOR CODE OF SILENCE?

Words by John Walton. Illustration by Mikel Jaso

The aviation industry is remarkably reticent to speak about flight deck doors. In the interest of starting a conversation about safety and regulation at a time when minds are focused on the Germanwings 9525 incident, *Aircraft Interiors International* submitted a range of questions to door manufacturers, airframers and regulators.

EASA and Airbus did not respond to requests for comment. Boeing did respond, but only to decline to comment. The US FAA would only speak on background, and the UK CAA directed all *Aircraft Interiors International*'s queries to the non-responsive EASA.

After the events of September 11, 2001 a new set of flight deck door specifications was created, harmonized and introduced across states and their airlines. This extensive work to match regulations internationally was useful, not least given the rise in aircraft leasing across the same period.

Yet processes around the operation of flight deck doors, and the ways that airlines of different states introduce their own safeguards, are quite different – or at least they were until the crash of Germanwings flight 9525 drove an almost instantaneous adoption of US FAA-

style requirements for having two people on the flight deck at all times.

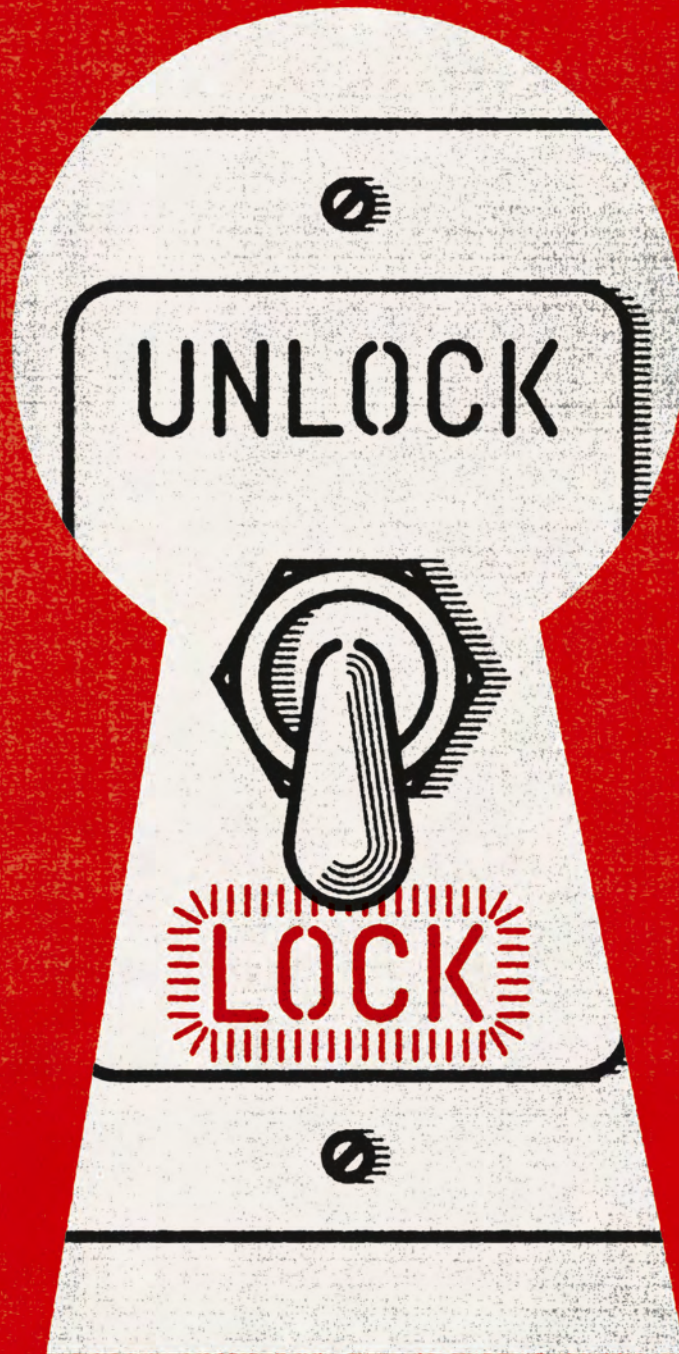
Security expert Bruce Schneier has stated that just two factors have made aviation safer since 9/11: armoring the flight deck door, and the fact that passengers now know they need to fight back against hijackings or other attempts to affect the safe flight of their aircraft.

Important questions exist. Are we relying on Schneier's first law too much in the context of increasing workloads and stresses on pilots? In the context that pilots are now being considered as threats by some, might we rely on Schneier's second law and develop standards and procedures that mean access to the flight deck against the desires of the pilots within is merely delayed to allow for interception, rather than completely impossible? And would such a delay have led to a materially different outcome given the 10-minute descent of Germanwings 9525?

INTERNATIONAL HARMONIZATION DRIVES STANDARDS CONSISTENCY

The regulations around the ballistic and other standards for flight deck doors are increasingly compatible,

safe and



secure?

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especially between the USA, Europe, Canada and Brazil, which work together extensively and consistently. For simplicity, here are the details of the US regulations.

Within the USA, multiple sections of the Federal Aviation Regulations (FARs) deal with flight deck doors. Harmonization is greater and more consistent than in some other regions, with the regulations covered in section 25 of the FARs covering airworthiness standards for transport category aircraft. That compatibility is achieved from the US perspective through the work of the Aviation Rulemaking Advisory Committee (ARAC), a formal FAA standing committee mandated to “provide advice and recommendations to the FAA concerning rulemaking activity, such as aircraft operations, airman and air agency certification, airworthiness standards and certification, airports and noise”.

The ARAC generally meets four times a year, and is made up of organizations that are directly and indirectly affected by FAA regulations – specifically “aircraft owners and operators, airmen and flight crew members, organizations representing airports, maintenance providers, manufacturers, public citizen and passenger groups, and training providers”. Representatives of other national CAAs can apply for non-voting ARAC status in order to aid harmonization efforts, with the intention of meeting the standards in ICAO Annex 6 (aircraft operations, maintenance and general aviation) and 8 (type design or manufacture of aircraft) standards.

DOOR REGULATIONS ARE EXTENSIVE, SPECIFIC AND CONSISTENT

Standards in FAR section 25 include section 25.795(a) (security considerations), which requires that flight deck doors resist ballistic and main force threats. The door itself must withstand impacts of 300J (221ft lb), while handholds must resist a constant 250 lb (1,112N) tensile load.

In terms of small-arms fire and fragmentation devices such as grenades, doors must defend against threats to National Institute of Justice ballistic resistance level IIIA, equivalent to a high-velocity 9mm round or 44 Magnum round. The NIJ calls this standard “the highest level of protection available in concealable body armor”, requiring survival after 48 shots.

Section 25.772 requires that aircraft with lockable doors between the pilot and passenger compartments “must be designed so that neither crew members nor passengers require use of the flight deck door in order

to reach the emergency exits provided for them”.

Provision must also be made “to enable flight crew members to directly enter the passenger compartment from the pilot compartment if the cockpit door becomes jammed”, and “there must be an emergency means to enable a flight attendant to enter the pilot compartment in the event that the flight crew becomes incapacitated”.

Lastly, section 25.809(b) states that, “Each emergency exit must be openable from the inside and the outside, except that sliding window emergency exits in the flight crew area need not be openable from the outside if other approved exits are convenient and readily accessible to the flight crew area.”

US-SPECIFIC REGULATIONS ARE BEING REPLICATED INTERNATIONALLY

Some of the regulatory detail for which the framework is laid down within the US FARs are not yet global standards. For example, Part 121, which covers the operating requirements for domestic, flag and supplemental operations, is the most relevant to commercial airlines.

Section 121.313(f) (perhaps slightly disconcertingly the section on ‘miscellaneous equipment’) establishes the requirement to have a flight deck door, specifically: “A door between the passenger and pilot compartments (i.e. flight deck door), with a locking means to prevent passengers from opening it without the pilot’s permission, except that non-transport category airplanes certificated after December 31, 1964, are not required to comply with this paragraph. For airplanes equipped with a crew rest area having separate entries from the flight deck and the passenger compartment, a door with such a locking means must be provided between the crew rest area and the passenger compartment.”

Operational procedures for when that flight deck door may open during flight vary from airline to airline, although each carrier is required to submit their proposed procedures to the FAA and receive approval before a flight deck door is opened during flight.

“There must be an emergency means to enable an FA to enter the pilot compartment”

The FAA generally requires that two persons must be on the flight deck at all times, leading two-pilot operations to require a third person (generally a member of the cabin crew) to enter the flight deck in the event that one flight crew member needs to leave the cabin to, for example, visit the lavatory.

Airlines must also submit specific procedures around entry communication on the flight deck and between pilots and cabin crew. Following approval, the FAA monitors and checks airline procedures to ensure compliance.

If a carrier has not received FAA approval for their flight deck door procedures – or otherwise satisfied the agency that its procedures provide an equal or greater assurance of safety and security (through the use, among some airlines, of a closed-circuit television camera looking out from the flight deck to the door, for example) – the door must remain closed and locked during all phases of flight.

NO MAJOR CHANGES TO STANDARDS, DESPITE PROCEDURES SHAKE-UP

Despite the disappointing lack of transparency from the various companies and organizations in the field of flight deck doors, it appears that there are few or no regulator-

“Is the two-person cockpit rule as wise as it may seem on the surface?”



or manufacturer-driven initiatives currently working to increase or otherwise change flight deck door standards.

In terms of procedures, however, numerous non-US airlines have adopted the two-person flight deck requirements laid out in FAR Part 121 in the wake of Germanwings flight 9525. The alacrity with which airlines made those changes was surprising, with observers noting that such a fast move by so many carriers suggests that the two-person rule was likely to have been previously mooted and either postponed or rejected.

Yet is the two-person rule as wise as it might seem on the surface? Pilot suicide flight incidents have been blessedly rare in the history of commercial flight, and even more isolated in passenger flight operations. Does regulating, legislating and introducing the two-person rule meet cost-benefit requirements? Or are the dread risks (those with an infinitesimally low likelihood yet catastrophic impact, which humans have notorious difficulty in assessing) of pilot suicide too catastrophic in impact and in passenger confidence to do anything else, even in the context of flying being a very safe way to travel.

With a rising tide of disruptive passenger incidents, is it sensible to require a member of cabin crew to enter and leave the flight deck, drawing more attention to the moments when the door is open? Are safety and security indeed enhanced by a flight attendant (on a narrow-body jet, with as few as two to four cabin crew members) leaving the cabin, from where statistically more numerous and more consequential threats have previously arisen? And, given the limited resources of international regulators, airframers, interiors houses, door manufacturers, safety bodies and harmonization committees, is focusing on the flight deck door truly the activity that will make the most difference to the safety of commercial flights?

The aviation industry needs to engage with these questions in a transparent, productive and fact-driven way. Security via the obscurity of “no comment” is no security at all. ❖

FAA FOCUSES ON MENTAL HEALTH

The FAA is working with the commercial aviation and medical communities to study the emotional and mental health of US commercial pilots.

The joint FAA and industry group known as the Commercial Aviation Safety Team (CAST) recommended the study based on the recent Malaysia flight 370 and Germanwings flight 9525 incidents.

The Pilot Fitness Aviation Rulemaking Committee (ARC) will provide the FAA with recommendations within six months. The group will include US and international government and industry aviation experts, including a working

group of medical professionals who specialize in aerospace medicine.

US pilots undergo robust medical screening, but recent accidents in other parts of the world prompted the FAA to take a new look at the important issue of pilot fitness.

The ARC will examine issues including the awareness and reporting of emotional and mental health issues, the methods used to evaluate pilot emotional and mental health, and barriers to reporting such issues.

Based on the group's recommendations, the FAA may consider changes to medical methods, aircraft design, policies and procedures, pilot training and testing, training for aerospace medical examiners, or potential actions that may be taken by professional, airline, or union groups. The ARC's meetings will not be open to the public.

Federal Aviation Regulations outline the medical requirements for pilots. US airline pilots undergo a medical exam with an FAA-approved physician every six or twelve months, depending on the pilot's age.

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Written by Maryann Simson. Illustration by Anna Davie



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“An airline can be handsomely compensated for giving brands access to this captive demographic”

Airlines have, for the better part of the past two decades, left no stone unturned in the search for ways to turn cost centers into money-makers. This effort has resulted in fuel surcharges, checked baggage fees, paid seat selection and the sale of inflight food and beverage. Some airlines have gone so far as to place tariffs on in-flight entertainment, and most continue to charge for access to onboard wi-fi.

These endeavors have yielded fruit, but though marketing teams have done their best to disguise new fees for old services as personalized – or ‘à la carte’ – travel, most passengers are not fooled. They’ve grudgingly accepted being nicked and dimed at every turn.

THE AD EQUATION

Advertising in the air is beneficial to the bottom line, as an airline can be handsomely compensated for providing brands with access to this attractive and captive demographic.

Traditional advertising arrangements earn money, but that’s often where the benefit for the airline ends. On top of that, airlines must constantly balance pros and cons. Integrate too much cabin advertising and you end up with a host of sponsors shouting at once. Partnering with the wrong organization is also bad for business, as identity crises can arise from corporate tie-ups where brand image and value perception don’t mesh.

A PAGE FROM THE WEB

On the ground, the way people consume media is changing. Concepts like ‘native advertising,’ ‘sponsored content’ and ‘brand journalism’ are filtering increasingly into marketing campaigns. Brand messages are no longer simply pasted on real estate (real or digital) or produced into half-minute spots (called pre-roll) that a viewer must view before their chosen content begins. Product marketing is now blending better with content hosting platforms, is often actually selected by (and not forced upon) the user, and is increasingly designed to provide value in the form of useful information or entertainment.

BELOW: SHARETHROUGH HAS FOUND THAT MARKETING BLENDED WITH ENTERTAINMENT CONTENT IS PERCEIVED TO BE LESS INTRUSIVE THAN TRADITIONAL ADVERTISING OR POP-UPS



It’s happening everywhere: ads that are stories, documentaries that are ads, professional ‘amateur’ video, product placement, ‘crowd-sourced’ recommendations, suggested reading, embedded Facebook posts, YouTube tutorials, sponsored tweets, ‘listicles’ and quizzes are just a few examples of how lines are blurring.

To some, this is an abomination and a travesty. But for many advertisers and publishers (especially web-based), it is working like a dream.

Numbers published by Sharethrough, a rapidly growing tech firm that offers one of the world’s most sophisticated monetization software platforms, show that this type of promotion is perceived to be less intrusive than traditional advertising or pop-ups, and that native advertising garners positive brand associations and stronger intent to purchase.

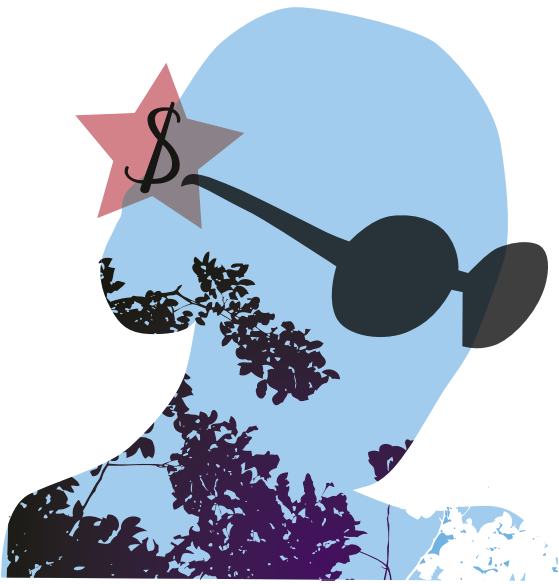
“It is clear that most advertisers and publishers aspire to deliver paid ads that are so cohesive with the page content, assimilated into the design, and consistent with the platform behavior that the viewer simply feels that they belong,” says page four of the *Digital Advertising Playbook*, available to all on Sharethrough’s comprehensive website.

DEFINING THE EXPERIENCE

Having witnessed the success of these alternative ad campaigns on the web, some airlines and content providers are also beginning to look at advertising and IFE through a different lens.

According to Robin Cole, vice president of global business development at Global Eagle Entertainment (GEE), there is no shortage of advertisers getting excited about creatively branded inflight environment.

“GEE has seen an amazing amount of interest from advertisers in learning how to work with airlines, and



“Product placement in video content is another way to generate extra cash”

a lot of interest from airlines around responsibly monetizing passengers,” she says. “Here is a recognition that IFE is one of the last bastions of monetization that passengers are fine with, because with IFE you’re adding value and giving [passengers] a fair exchange. We have been approached by a number of Fortune 50 brands that have realized that the inflight experience is something that can be really unique and owned by a brand that is looking to define that experience.”

SIGNING THEM SMALL

We’ve all seen the breathtaking wilderness travel and extreme sports videos sponsored by the likes of energy drink-maker Red Bull and compact adventure camera GoPro. The heavy sponsor branding in this content should make it free for airlines to obtain and show to passengers in flight. Right?

According to Cole, this is actually not always the case: “The content that [firms like Red Bull and GoPro] have is very much curated. It’s highly produced and they have started to understand the value of it. At this point, those guys are not saying ‘Here’s some content and I’m going to pay for advertising and sponsorship.’ They are now saying ‘You have to pay for my content and we are willing to work on broader relationship opportunities.’

“Our goal, our challenge and our opportunity is to find those companies



DMD PHANTOM'S ANIMATED WALKTHROUGH ON CONNECTING PEDS TO INFLIGHT CONNECTIVITY PROVED A HIT WITH THE CLIENT

before they get so huge that they can demand some kind of price. Then we are helping them establish the brand and the audience.”

HIDDEN TREASURES

Product placement in video content is another way to generate extra cash and it rarely affects the viewing experience negatively. Sadly, the product placement we regularly see in Hollywood films and TV shows is arranged too far upstream of the IFE world for any of that revenue to trickle down to airlines. However, there are other ways for carriers to benefit from this classic and non-disruptive means of IFE sponsorship.

DMD Phantom has helped more than 30 airline customers develop original content, such as safety and instructional videos, since 1999.

They recently assisted an advertiser in reaching its airline-specific product placement goal, while giving airlines a useful video. “We produced an animated segment for a major inflight connectivity provider,” says Stuart McGeachin, creative director at DMD. “It was a walk-through on how to use personal devices with their connectivity service. Branded variants were deployed on several airlines worldwide. The production was sponsored





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"Games are becoming difficult for airlines to justify"



in part by a mobile handset provider whose device featured prominently in the production."

Destination videos are another great opportunity to slip in mentions of a local product or business at the destination city. Some firms, like IMA in California (which calls itself the preeminent leader in connecting millions of airline passengers each month with travel, product and service messages) specialize in the creation of these videos, which firms like GEE then distribute. If the video is well produced, shown on the right routes, and the more overt advertiser-led aspects incorporated in a way that fits the experience, everybody wins.

GIVING GAMES

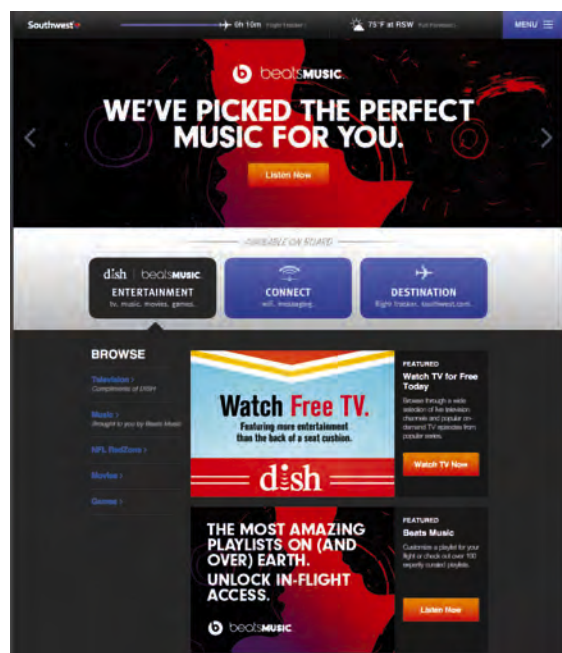
WOI is another of the industry's leading software and content providers and is particularly well known for its expertise in onboard gaming. Vinayakam Murugan, the firm's senior manager of OEM management and product planning, recognizes that games are becoming a difficult investment to justify for airlines, as passengers can easily play games on their own devices.

He believes that sponsorship could be the salvation of this content category. WOI's *Tour du Monde* (Tour the



ABOVE: THE POPULAR TOUR DU MONDE COULD WORK WELL WITH SPONSORED CONTENT

BELOW: SOUTHWEST OFFERS APPLE'S BEATS MUSIC STREAMING APP ON WI-FI ENABLED FLIGHTS



World) is a hidden object genre game where players examine a photograph of an iconic global locale to find hidden objects: very straightforward and very popular.

"There are two concepts we are working with currently and there is quite a lot of interest in them," he says. "We keep adding more destinations, and we give the airline the ability to add more as well. We recently spoke to an airline and it was going to introduce a new route, so we have proposed this as a novel way to promote it.

"The second concept is where [the airlines] have tie-ups with a corporate entity and place the product itself into the pictures, so some of the items the passengers need to look for are products or common emblems. That is again something interesting to them."

WOI has revealed to *Aircraft Interiors International* that at least one full-service carrier is currently setting up the *Tour du Monde* game as a partially sponsored hide-and-seek game.

"I am not able to share the name, but we do have an airline to which we have sold the concept and its game will go live sometime in September or October," Murugan says. "You see this in movies all the time. It's no surprise that product placement has come to games as well. I think it is a growing trend and will increase in the future. The caution that we have to exercise is that it doesn't overrun the basic game itself and it doesn't put off passengers." ❌



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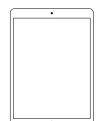
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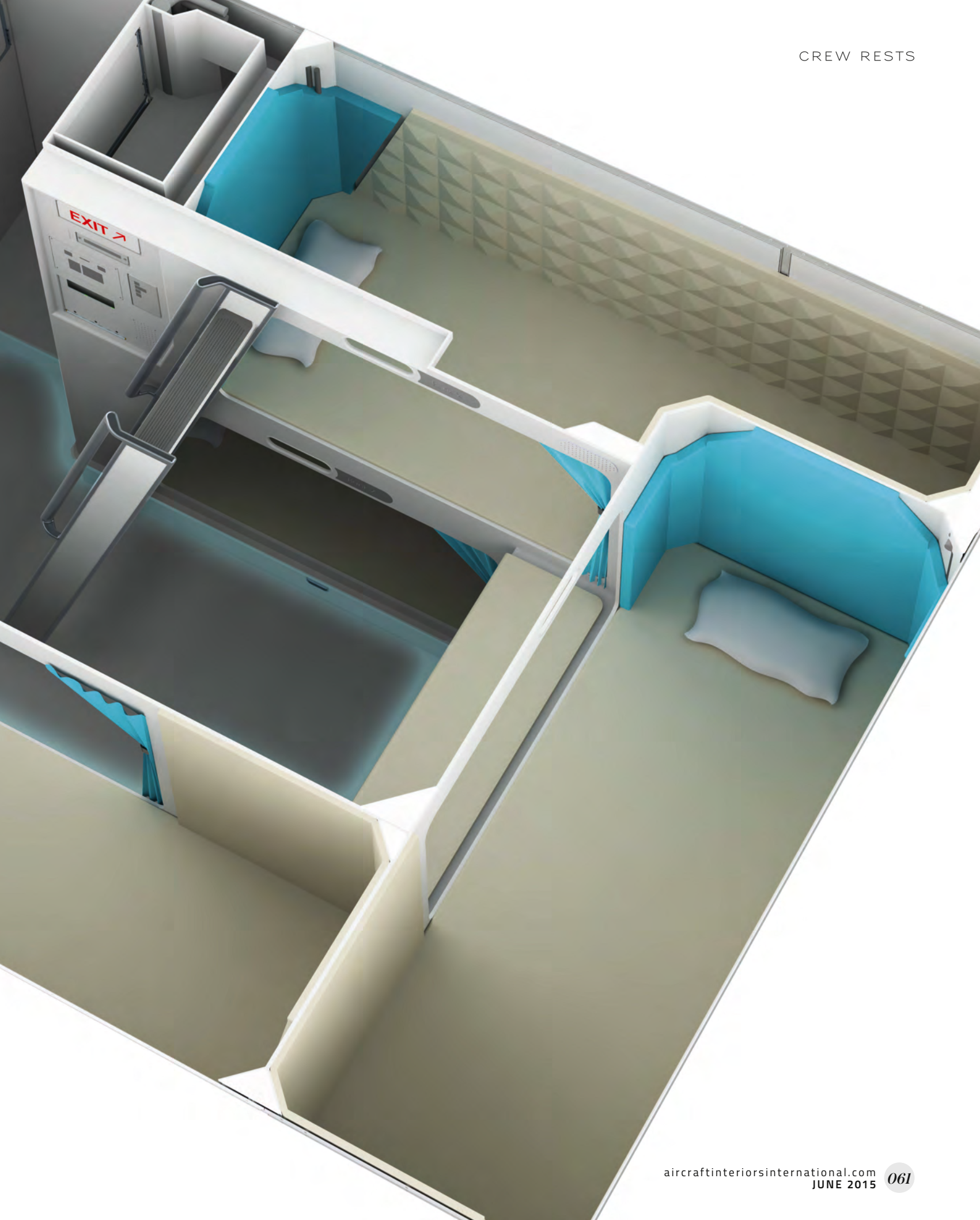


CREW RESTS

space race

DESIGNERS OF FLIGHT
CREW RESTS ARE SETTING
RECORDS FOR INGENUITY

Words by Selwyn Parker



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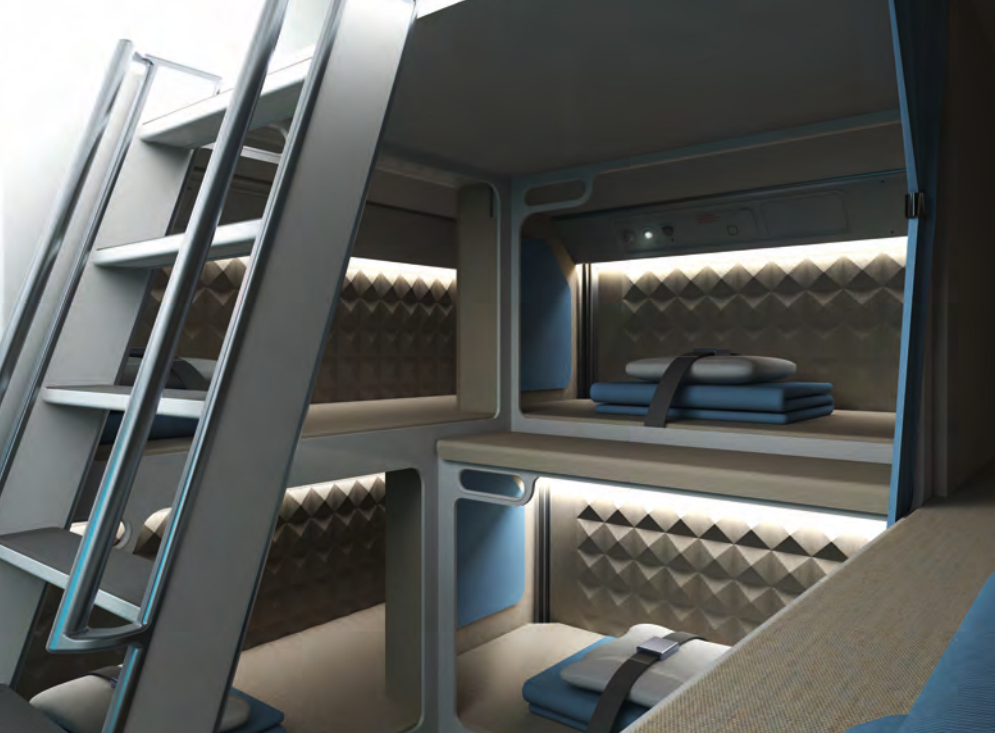
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“Flexibility has become a watchword in crew rest design”

what could be called five-star spaces for the next generation of long-range aircraft.

Before commencing work on its new rest unit, Zodiac sought pilots' and attendants' views on exactly what they wanted. In discussions and tests with 30 flight attendants from four continents, designers found they particularly needed two things: a sense of spaciousness, and comfort.

Out of this research came a series of prototypes that went through several iterations. As research and technology manager Tom Schreuder told *Aircraft Interiors International*, “the user testing helped us understand where we could make changes to further improve the rests”.

As Schreuder explains, the materials, color and lighting were modified to meet expectations in a number of practical ways. For instance, the centrally located light source was abandoned and replaced with more effective lighting along the outer walls of the rest,

eliminating dark spots and shadows. “This makes each bunk a more inviting and spacious area for the occupant,” says Schreuder.

Although they are only in the rests for a few snatched hours of sleep at a time, crews insisted on a measure of customization. So Zodiac gave each bunk a PSU and temperature control. And having learned that

In creative collaborations with crews and airlines, aerospace suppliers are devising crew rests that are relaxing and comfortable. Lighting is becoming subdued; privacy is enhanced, for instance by curtains suspended from ceiling-mounted tracks; extraneous noise is reduced; and entertainment systems may be personalized.

Even better, all this is being achieved with minimum interference to the revenue-producing areas of the aircraft. The designers of crew rests are configuring units that can be shoehorned into spaces that are little-used, and certainly not by paying passengers.

Ever aware of the value of cargo space, airlines have pushed suppliers to develop crew rests that can be installed at the top of the aircraft rather than in the lower lobe. For instance, pilots used to drop down into their rest areas, whereas now they climb into them.

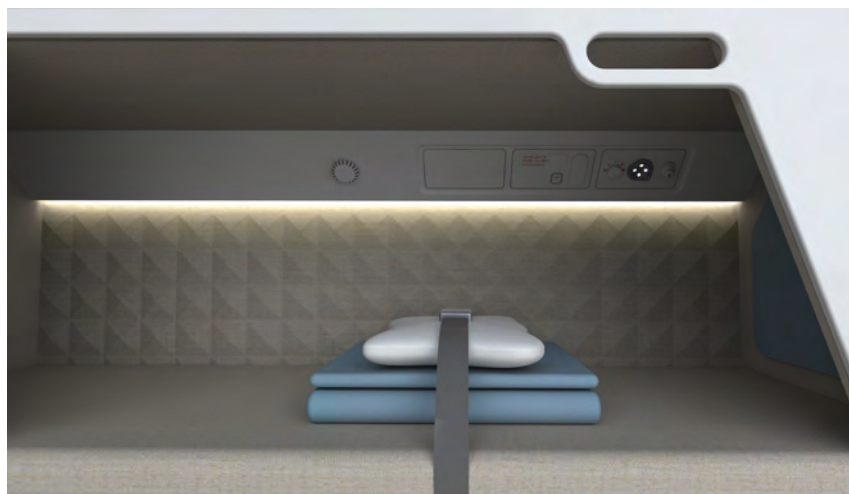
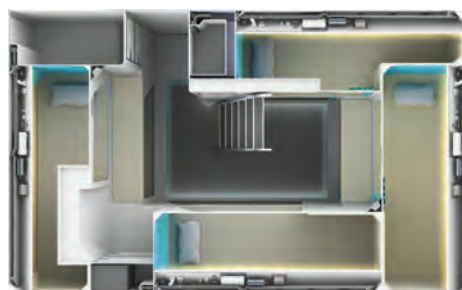
Flexibility has become a watchword in crew rest design. More units are mobile in that they can be removed on shorter flights to free up passenger areas when regulations do not mandate crew rests.

And in an industry rightly obsessed with lightness, the overall weight of crew rests is falling because of advances in composite materials and the more artful use of space that achieves more with less. At the same time, manufacturers are working on customized, foldaway crew seating that gives cabin attendants a similar degree of comfort and security as business class passengers, albeit with fewer kilograms.

FIVE-STAR ACCOMMODATION

The rate of development of crew rest facilities has never been faster, with the latest innovation coming from Zodiac Aerospace, which presented its new unit at Aircraft Interiors Expo in Hamburg in April. A specialist in mobile – or removable – units since the 1990s, when it designed a crew rest for the lower deck of the Airbus A330/340, Zodiac has lately concentrated on making

CABIN CREW HAVE A TOUGH JOB, AND THE QUALITY OF ZODIAC'S NEW CREW REST DESIGN COULD HELP MAKE THEM FEEL VALUED AS WELL AS REFRESHED





privacy is an important issue (after all, some people snore), Zodiac added sliders that allow occupants to fully close off their own space.

Along the way there were other incremental but user-friendly changes, such as a reshaped opening to each bunk and a more accessible foot step.

MORE REVENUE

B/E Aerospace has also focused on personalization. The supplier has devised an ingenious crew rest compartment that includes internal 16g-certified seats for take-off and landing that releases more cabin space for passengers. Featured in the Airbus A330/A340 catalog, the compartments come with a range of options and are suitable for both commercial and freighter aircraft. Single or double bunk, they can seat two crew members inside on the foldaway seats.

But in a winner for crews, B/E's units also offer a stowage compartment, folding table, interphone, shaver socket, individual air supply and extraction socket, and a control panel for temperature and air-conditioning. When not asleep, crew can entertain themselves with audio, video, PC power and an internet port. Reading lights are standard. An internal acoustic wall blocks out most of the outside sound.

B/E has also responded to the increasing need for airlines to maximize the revenue-earning sections of aircraft. After it identified the largely unused overhead volume in the crown section of the B777-200 as a prime opportunity, its engineers came up with an overhead crew rest. Located in the aft of the flight deck, it can accommodate up to four occupants in complete privacy.

WHY SHOULD PASSENGERS HAVE ALL THE FUN? THE OVERHEAD REST ON THE B777 IS A GREAT PLACE FOR CREW TO RELAX

“The design frees up the equivalent of 16 revenue seats”

The space includes two premium business class seats and two wide-berth beds for an unusual level of comfort. A closet sink or lavatory is optional.

B/E has done its sums. The company claims that moving the crew rests upstairs in this way creates enough main-deck seating area for passengers to generate between US\$4.9m and US\$11.24m in extra revenue over a 20-year period. And given today's slim profit margins, every million counts.

Similarly B/E's indefatigable space-hunters identified the midsection of the wide-body B777-200ER as a revenue-creating area. If crew rests were moved out of the midsection and into the area above it, they reasoned, there would be room for more passengers. And so the overhead attendant rest they designed now provides sleeping quarters for up to eight cabin crew – the biggest on the market – and two inflight seat positions.

Importantly the design frees up the equivalent of at least 16 revenue-producing seats, or one 96 x 125in cargo pallet, according to B/E. The company also claims that this upper-lobe solution achieves a 66% weight saving compared with a lower-lobe one. And the supplier reckons the overhead rest will earn its money back within 18 months.

FLEXIBILITY AND FUNCTIONALITY

Rather than focusing on one or two types of aircraft, Diehl Aircabin has opted for flexibility. A subsidiary of Germany-based Diehl Aerosystems, it produces a range of fixed units customized for the upper and lower lobes of a range of aircraft. Varying the size, geometry and location according to the type of aircraft, Diehl has developed 'bulk' compartments with up to three tiers of bunks stacked above each other, as well as units

CURTAINS UP

To illustrate the importance of crew rests to some cabin crew, a dispute over curtains late in 2014 led to 100 dismissals. Scandinavian Airlines (SAS) specified curtains to separate crew rests from the cabin on its refurbished A330s, rather than solid walls, which 100 Swedish crew stated was unacceptable and in breach of their contract.

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customized for attendants and crew. Plug-and-play modules are optional.

As the company's vice president of communications, David Voskuhl, explains, these comfier spaces have the happy result of helping crews do their jobs better.

Even more important than crew comfort are the increasingly stringent standards for flammability and robustness. Diehl tests its units rigorously. Before delivery, each one is mounted on a jig and subjected to a variety of shock treatments to ensure functionality.

MOBILE HOMES

When Timco Aerosystems released a crew rest unit in 2008 for the lower lobe of a B767, the North Carolina-based supplier set new standards for convenience of installation. Developed originally for Austrian Airlines, the unit was designed from the start to match the outer dimensions of an LD8 ULD and could be readily installed in the forward lower lobe cargo compartment. Indeed the company claimed the job could be done in 20-30 minutes.

Airlines immediately recognized the revenue-maximizing advantages of this quick-disconnect unit. It only had to be installed on routes where crew rests were mandated by regulation and could be removed for shorter flights. A useful, additional feature is that crew can discreetly access the unit through a corridor running off the main passenger cabin and climb into one of the six bunks via a lightweight ladder. In short, nobody need know that they have some of the most comfortable space on the aircraft. As airlines respond to new regulatory pressures, Diehl is entering the retrofit market.

LOWER LOBE CLUB

Timco has not rested on its laurels, as vice president of engineering Jose Pevida tells us. His engineers are always



“Single-aisle aircraft will service longer routes”

working on new or improved facilities for crew rests, especially in the lower lobe, which the supplier still sees as a fruitful area to pursue.

“We are constantly looking at new ideas”, he says. “We are working with airlines all the time to maximize the footprint for passengers. Uppermost in our minds are safety and quality. Crew rests must meet high regulatory standards, especially in case of emergencies.”

In this goal Timco has developed its own composite panels rather than buying off-the-shelf materials. Extremely light, these panels can be optimized in a number of ways to achieve regulated loads and space-saving geometry. And lately Timco has been working on crew seating. “We are aiming for a high degree of recline and maximum levels of comfort,” adds Pevida.

ABOVE AND BELOW: TIMCO/HAECO'S MOBILE CREW REST ACCOMMODATES SIX AND CAN BE INSTALLED IN THE CARGO AREA OF A WIDE-BODY AIRCRAFT IN LESS THAN 30 MINUTES



THE FUTURE

So far airlines have been under pressure to provide crew rests on longer flights, but this could change. Diehl, for instance, predicts that single-aisle aircraft, the workhorses of shorter flights, will be pressed into service on longer routes. And that will require crew rests. “This creates an extra challenge to find enough room for a crew rest and at the same time increase passenger numbers,” points out Voskuhl.

As for Timco's Pevida, he's looking ahead to the day when aircraft are configured from the outset for crew rests. This would enable engineers like him to develop optimal solutions rather than having to cram units into whatever leftover space is available. And he believes that regulations could already be pushing the aerospace industry in this direction.

If that happens and rests become even more comfortable than they are already, the airlines may have a problem keeping crew out of them. ☒

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Long-haul cabin upgrades are core to our future growth strategy

A SWEEPING OVERHAUL OF AIR FRANCE'S LONG-HAUL INTERIORS IS AT THE NUCLEUS OF ITS ALL-ENCOMPASSING 'BEST AND BEYOND' REBRANDING INITIATIVE. BRUNO DELILE, EVP OF LONG-HAUL PRODUCT, EXPLAINS

Words by Maryann Simson

Best & Beyond is seeing hundreds of millions of Euros invested in Air France's long-haul interiors

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Air France, Europe's second-largest full-service airline by fleet size as well as by number of passengers carried, has long been recognized as a leader when it comes to the quality of its inflight services. Yet in the years leading up to 2014, passengers participating in the SkyTrax airline awards voted Air France as low as 40th (2013), 48th (2012) and even 55th (2011) best airline worldwide – disappointing rankings and unbecoming a carrier with such a strong market position and legacy of service.

Keen to improve passenger perception and meet the new operational standards emerging in aviation, 2013 saw Air France launch the ambitious Best & Beyond strategy, positioning itself further upmarket and promising to upgrade products and services to the tune of around €500m (US\$550m) for the B777 fleet alone.

In September 2013 Air France revealed its new economy seat and IFE system at the International French Travel Market fair in Paris. Then in February 2014 the curtain was raised on its 'cocoon' business class concept. And just a few months after that, the new look of Air France's cabins came together with the presentation of the highly praised and sophisticated La Première first class cabin.

As the first revamped long-haul aircraft entered service late last year, it was abundantly clear that the upgrades were the right move for Air France, with one indication being the airline's jump to 25th in the 2014 SkyTrax survey, from 40th in 2013.

As Air France approaches the halfway mark in phase one of its twin-aisle fleet overhaul, we check on progress and results with Bruno Delile, Air France's executive vice president of long-haul product.

“We made a decision to keep this kind of investment a priority”



AIR FRANCE COLLABORATED WITH B/E AEROSPACE, PRIESTMANGOODE AND BRANDIMAGE TO CREATE THE ELEGANT LA PREMIÈRE SUITES

€500M IS NO SMALL INVESTMENT. HOW IS IT BEING BROKEN DOWN?

For the B777 fleet, we will invest close to €500m, and the rest of the long-haul fleet (A330s and A380s) should add several hundred million Euros more. These cabin upgrades are core to our future growth

strategy, which comprises enhancements to operational efficiencies, product and service upgrades everywhere (on the ground and on board, hard and soft product including amenities, enhanced IFE content, and food and beverage) and a special focus on personalized care and attitude from our cabin crews and ground staff. We feel there should be no compromise in any area of customer expectation.

Even during times of financial constraint, we made a decision within Air France/KLM to keep this kind of investment a priority.

ARE YOU ON TRACK TO MEET YOUR TARGETED COMPLETION DATES FOR THE B777 FLEET?

The retrofit work is split between the Air France Industries premises near Charles de Gaulle airport and the KLM premises in Amsterdam. By the end of June we will have modified 18 of our B777s – that's 11 -200ERs and seven -300ERs – out of a total of 44.

As far as the long-haul B777 fleet is concerned (phase one of the plan), we are on track. By mid-2017 we will have all 44 of these aircraft fully equipped with the new Best & Beyond configuration. We are currently completing between two and three aircraft per month. A full retrofit takes two to three weeks, depending on configuration and what resources we can allocate to the aircraft.

THE UPGRADED B777S HAVE FEWER SEATS IN BOTH FIRST AND BUSINESS CLASS. WHAT IS THE REASONING BEHIND THIS NEW CONFIGURATION?

It is simply the outcome of moving from seven abreast (the existing business class configuration) down to four abreast, with the seats in a reverse herringbone angle to



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the main axis of the aircraft. That is the compromise we made to offer the key characteristics passengers want today in a business class seat – direct aisle access, a 180° lie-flat bed, and a feeling of intimacy balanced with freedom of movement and personal space.

Though we were able to compensate a little, there is an overall decline in the total number of seats of around 15% per aircraft.

Likewise in La Première we moved from eight seats down to four, plus we removed first class from the B777-200ER, so we now have only 19 aircraft fully equipped with first class in the B777 fleet.

HOW IMPORTANT ARE IFE AND CONNECTIVITY AS PART OF THE 'BEST & BEYOND' UPGRADES?

IFE is an integral part of our product upgrade. In first class we have 24in IFE displays, business class features 16in, premium economy has 12in and in economy they are 9in, all from Panasonic.

The navigation experience is now similar to what you find on a tablet. People can steer easily using their fingers, or in business and first with the digital display handsets as well. We now have more than 1,000 IFE choices available to be selected by passengers, a strong improvement and one underscored as a priority by our customers.

Connectivity is something we are currently testing on two B777 aircraft. One test aircraft is in the Air France fleet and the other is KLM [both have been equipped with Panasonic's Ku-band solution for quite some time].

Let's just say that there are still expectations that are not fully met with the system we are currently testing and we need



ABOVE: AIR FRANCE CLAIMS ITS PREMIUM ECONOMY PRODUCT OFFERS 40% MORE SEAT SPACE THAN ECONOMY
BELOW: THE AIRLINE WORKED WITH DESIGN INVESTMENT AND BRANDIMAGE TO CUSTOMIZE THE CIRBUS SEAT IN BUSINESS CLASS



to work with the suppliers. We are ready, but deployment will only happen when the solution is capable of functioning smoothly without frustrating the passengers, whether due to limited speed or poor reactivity.

THE COLOR PALETTE IN THE NEW PREMIUM CABINS IS ELEGANT, BUT PALE. DO YOU ANTICIPATE MAINTENANCE DIFFICULTIES?

From the beginning of the project, we worked closely with our MRO people to ensure they can react quickly in the event of damage. They were involved in the design phase with the seat manufacturer and the designer, Mark Collins [co-founder of Geneva-based Design Investment].

On top of that, we implemented processes in daily operations. We have a certain boarding process for first class and we try to avoid having everyone board through Door One. Premium passengers prefer this method, and it reduces foot traffic through the whiter cabins.

DO THE 'BEST & BEYOND' CABINS FAVOR PRIVACY OVER THE PROMOTION OF SOCIAL INTERACTION IN THE AIRCRAFT?

Social or communal areas are something we discussed at length with our top passengers in the early stages of research and development. The feedback we received indicated that our customers appreciate having a bar where they can socialize a little, but they don't want it to be too much of a disturbance. As a result of this knowledge, we have been quite cautious.

We still have bars on the modified B777s, but they are very close to the galley so that passengers aren't disturbed by the sounds of glasses clinking or people chattering. Also for this reason we do not aim to develop large onboard bars in the future.

On some A380s we do currently have a social area – without a bar – where people can gather, but the customer

We asked Caroline Fontaine, brand and advertising manager at Air France, what she views as the essence of Air France's design philosophy.

"I would say that the definition of French elegance is what drives us. In our country, it is important not to say everything at once. We do not show everything in an obvious way, but pay attention to small details. This was a key point when we imagined our new interiors and it means that our customers

get to discover small details during their journey. We wanted to simplify the lines and the appearance of a congested space, allowing little touches of flair to surface and affect the perception of the whole.

"It is like having the classic little black dress, and then according to your mood, you can add jewelry or a beautiful handbag or interesting shoes. Anything can change the entire look. That is the concept of French elegance. We want people experiencing Best & Beyond to perceive this feeling of sophistication, then the little details."

DESIGN DNA

BEST & BEYOND, BY THE NUMBERS

La Première (first class)

Seat model: Inline Oasis/
Open Concept
Supplier: B/E Aerospace
Seat width: 22.4in (57cm)
between armrests, 30.3in
(77cm) including armrests
Bed length: 79.1in (2.01m)
IFE monitor: 24in

Business class

Seat model: Cirrus
Supplier: Zodiac Aerospace
Seat width: 20in (50.8cm)
between armrests,
28.3in (72cm)
including armrests
Bed length: 77.1in (1.96m)
IFE monitor: 16in

Premium economy

Seat model: C38
Supplier: B/E Aerospace
Seat width: 18.9in (48cm)
between armrests
Seat pitch: 38in (96.5cm)
IFE monitor: 12in

Economy

Seat model: Z300
Supplier: Zodiac Aerospace
Seat width: 17in (43cm)
between armrests
Seat pitch: 31in (78.7cm)
IFE monitor: 9in

feedback on it is not so great, so in the new B777 configuration we haven't gone for it.

CAN WE ASSUME THIS SOCIAL AREA WILL ALSO NOT APPEAR ON THE A380S WHEN THEY RECEIVE THE 'BEST & BEYOND' UPGRADE?

You could assume that, yes, although no final decision has been made.

HOW ARE YOUR CUSTOMERS REACTING TO THE UPGRADED INTERIORS?

We track that every month via NPS (Net Promoter Scores) – a positioning that is calculated by subtracting the number of people who vote against the product from those who rate it positively. This score has improved by 23 points [since the start of Best & Beyond] and we see that on routes where we operate the outgoing configuration

BELOW: IN 2013 AIR FRANCE UNVEILED THE FIRST MAJOR CHANGE IN ITS LONG-HAUL ECONOMY CABINS FOR A DECADE: A NEW, CUSTOMIZED SEAT



as well as Best & Beyond. Many people clearly prefer Best & Beyond.

In the business class market we've taken a big step toward having the best ranking among our direct competitors. In fact we are now ahead on the North Atlantic routes and are catching up with the best of our competitors on the Asian routes with Best & Beyond.

We are especially proud to have observed that La Première has attracted new customers. Some of them are even coming over from private aviation and joining us for the overall product and services offered – like our first class lounge, which was last year named by SkyTrax as the best gastronomic offer in a first class lounge.

SO WHAT'S NEXT?

After the B777 fleet is complete, our 10 A380s and 15 A330s will be next. The existing configuration for the A330 is 200 seats with 40 in business class. The A380s have just over 500 seats with a mix of first class, business class, premium economy and coach. The Best & Beyond configuration plans for the A380s and A330s are not finalized yet. It is all part of an ongoing study.

We also look forward to – as far as incoming deliveries are concerned – an order of B787s, which is a split between ourselves and KLM. Air France will receive the first one at the end of next year or the beginning of 2017. That aircraft and those that follow will be equipped with a Best & Beyond configuration comparable to what we have implemented on the newly retrofitted B777s. ✕

PARTNERSHIP MAKES PARFAIT

Air France has a long tradition of working with leading designers, brands and culinary experts to infuse French style and culture into the passenger experience. True to form, an impressive list of collaborations lends taste and elegance to the Best & Beyond initiative:

- Jean-Marie Massaud has designed tableware for La Première and business class
- Eugeni Quitlet has designed tableware for premium economy and economy
- Interior designer Noé Duchaufour Lawrence has collaborated with Air France on the new

business class lounge in Hall M at Paris CDG

- French architect Didier Lefort has collaborated with Air France on the new La Première lounge in Terminal 2E at Paris CDG
- Chef Alain Ducasse has designed menu selections for the La Première lounge restaurant in Paris CDG
- Chef Guy Martin designs new signature dishes for the La Première inflight service
- Chef Anne-Sophie Pic has developed new signature dishes for the business class inflight service

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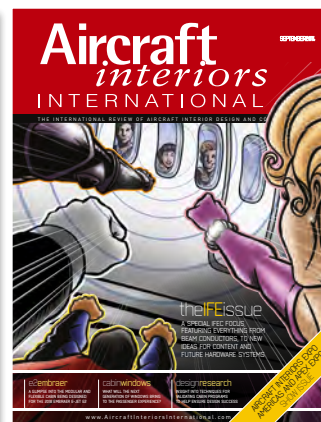
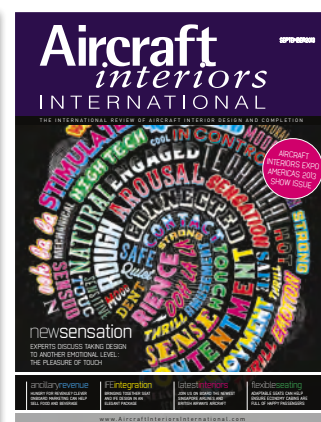
AER LINGUS

emerald

ONE CABIN, ONE AIRCRAFT TYPE:
THE NEW AER LINGUS BUSINESS
CLASS SOUNDS SIMPLE ON
PAPER, BUT IT PRESENTED
MAJOR DESIGN CHALLENGES

Words by Adam Gavine

d aisle



Aircraft interiors INTERNATIONAL

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SHOULD THE
INDUSTRY BREAK
THE FLIGHT DECK
DOOR CODE
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THIS PRELIMINARY SKETCH
BY FACTORYDESIGN SHOWS
THE COVETED THRONE SEAT

When Aer Lingus was looking to create a new long-haul business class with today's essential fully flat beds, it decided to take the opportunity to freshen up the cabins with a modern twist on Ireland's rich history and cultural heritage, and to include some authentic Irish innovation in the project.

At the heart of the cabins is a customized version of the Vantage seat by Thompson Aero Seating, manufactured just 70 miles from the Aer Lingus headquarters in Dublin. Vantage was selected because its forward-facing staggered dovetail layout affords great cabin density, with a 79.3in (2m) bed length at a 45in pitch.

Thompson's brief from Aer Lingus was to deliver a product that would enable business and leisure travelers to "transform their seat into whatever they want it to be, a place to sleep, work, eat, or simply chill". We'll return later to the features that answered this part of the brief, and begin by looking at the real challenge of the project:

Keep an eye on
our website for a
review of the new
business class, and
an interview with
Aer Lingus

"We tried to create a modular platform as much as possible, and that was a success"

GREEN SCHEME

Four different trim and finish schemes were proposed to Aer Lingus, all based on Irish heritage, including some landscape and architecture-inspired options. The airline opted for a scheme based on its current trims and finishes, but with some extra flourishes and extra accent color, described as "Irish with a modern twist".

Continuing the Irish theme, Dublin-based Botany Weaving was selected

as the supplier, which created seat fabrics, carpets and curtains based on traditional green Irish tweed, but in new, subtle shades that reflect the new, up-to-date Aer Lingus brand language.

The vivid green used in the airline's shamrock branding is used as a highlight color in the stowages, and also as a contrast bead line just below the headrest cushion.

The bulkhead tedlars were also updated, and a satin silver aluminum shamrock brand panel added that conveys the modern Irish feel.

The whole scheme is complemented by new blankets, cushions and amenity kits.

with different galley and monument configurations across its A330 fleet (four A330-300s and three -200s), these varying aircraft had to be optimized in terms of seat count, bed length and creating the maximum number of seats (more than 90%) with direct access to the aisle.

This was not a case of 'one size fits all'. That aim to achieve as much direct aisle access as possible, as well as maximum cabin density, led to having single seats portside, doubles in the center, and doubles and large single 'thrones' flanked by large consoles starboard. This arrangement created a challenge of perception in ensuring that whichever seat a passenger might book, they feel they are having an equal experience to everyone else in the cabin.

Aviation and product design agency Factorydesign was brought in to help with the LOPA and the seat and cabin customization, and associate Matthew Fiddimore was a key member of the Aer Lingus project. He recalls the biggest challenge: "To maintain visual order and to try to make every seat look like an equal passenger offer, while in reality there were around 34 different seat units that make up the cabins, and about 20 of them are unique. We tried to create a modular platform as much as possible, and that was one of the successes, but also the toughest challenge."

A consistent design language was essential, but that required giving some seats a little more attention than others. For example, the personal space in the outboard doubles has been visually maximized to bring passengers' perception of them closer to the single thrones, and the privacy dividers in the center seats have been extended to create more of a feeling of private space.

This egalitarian sentiment was also carried through to the customization of the center doubles. With the Vantage layout, some seats are aisle-side with their console inboard, alternating with inboard seats with aisle-side consoles. Those inboard seats are viewed as more desirable as passengers feel protected from aisle traffic and disturbance, and they have an extra 1.7in seat width (22.3in versus 20.6in). Thus to even things out, aisle passengers benefit from extended consoles that are exclusively for their use and give them additional shoe stowage, a cubby, a literature pocket and a larger cocktail table surface. Those inboard passengers enjoy the same seat width as the thrones, further equalizing the offer throughout the cabin.

“Every time one passenger appeared to get a benefit, we tried to offer the other passengers another benefit,” states Fiddimore.

The effect is that any initial neighborly jealousy is minimized, and the actual experience in the seat is broadly similar, whatever the seat. Clearly the single thrones will be prized by solo frequent flyers (there are only two in each cabin), but nobody should feel they are having an inferior experience to any other passenger.

WHEN IRISH EYES ARE STYLING

Factorydesign and Thompson worked to make the seat appear as wide as possible. For example, the soft panel added to enhance comfort in the bed position is color-matched with the surrounding plastics so the space feels continuous. They also did a little decluttering, by concealing the IFE handset in the armrest, concealing the IFE monitor ventilation, cleaning up the junctions where moldings come together, and redesigning the fronts of the consoles to maximize surface space. A new, softer armrest profile maximizes the seat width for all.

A major change is the introduction of a secondary seat controller. The original position of the controller limited the size of the cocktail table and wasn't always easy to operate from bed, so now that main controller, which includes less frequently used functions such as lumbar support and massage, has been moved to the center divider, and a slimmer, secondary controller added further forward and lower on the center console,

Seat pitch is 45-49in across the A330 fleet, and everyone gets a minimum 79.3in bed

THE SEAT OFFERS MAY VARY, BUT REGULAR AER LINGUS FLYERS WILL APPRECIATE THE NEW FLAT BEDS, WHICH ARE ALL GENEROUS, RANGING FROM 79.3IN TO 83.3IN

THAT'S ENTERTAINMENT

Passengers can enjoy 50% more movie content and 100% more TV content in the new business class, including a new Ireland Channel. All this content can be viewed gate-to-gate on the 16in Panasonic eX2 IFE monitors – the largest available for the Vantage. The large monitors presented a challenge for the front row, as the bulkhead wall is in a tapering section of the A330. The monitors and shrouds wouldn't fit on properly if mounted

straight ahead, so some clever massaging of surface models was required to move them within the allowable mounting envelope while still appearing to be perfectly in line with the seats.

A Panasonic connectivity package has also been selected, giving business passengers complimentary wi-fi, while services from AeroMobile and Deutsche Telecom give mobile connectivity for text messaging or data.

where the main position functions can be easily accessed in the upright and bed positions. The capacitive controllers, designed with Dornier, feature bespoke graphics in the Aer Lingus brand colors.

TIME TRIAL

It wasn't just the LOPA and customization that presented a challenge: the teams only had 11 months to design and deliver the cabin, with work beginning in February 2014 and CDR following in May.

As Andy Morris, VP of sales and marketing at Thompson Aero Seating, recalls, “We had a number of different LOPAs across the fleet with over 30 unique seat part numbers. These were all designed, certified and delivered within a 12-month period.”



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PITCH PERFECT

2015 IS ANOTHER BIG YEAR FOR AIRCRAFT SEAT LAUNCHES, WITH NEW PRODUCTS OFFERING MORE TO AIRLINES AND PASSENGERS. THEY ALL HAVE SOMETHING IN COMMON THOUGH – THEY OFFER MORE WHILE USING LESS...





Economy class

LIFT BY ENCORE

Lift is a new entrant to the seating market, with a solid background as a division of EnCore, the California-based aircraft interiors manufacturer co-founded by Jim Downey, who was a co-founder of C&D Aerospace in 1972. The goal of Lift and its seat design is to "change the way the industry thinks about tourist class seating". A bold goal, and not one it intends to achieve through headline-grabbers like ultra-lightweight designs or a titanium structure, but instead through a simple, elegant design that meets the passenger and airline needs of "a seat that you want to sit in, a seat that is comfortable, a seat that is easy to maintain, a seat that lasts".

Make no mistake though: Lift's seat is lightweight, incorporating aerospace grade metals and composites including aluminum and carbon fiber, and it has embraced these materials in the design. Working with the London-based PearsonLloyd design consultancy, many of the structural components have been left exposed in a minimal, simple design that is elegant and functional without resembling the inside of a racing car. As well as having an honesty in its design

EnCore
may be new in
seating, but it
has strong
manufacturing
experience

language, this approach also yields benefits including increased living space, reduced part count and simplified maintainability.

This approach also results in a claimed 10kg baseline weight, fully featured and flight-ready with seatbelts, cushions and covers. "There is no tricky math here. This is a complete seat at 10kg," states Elijah Dobrusin, VP of development and strategy at Lift by EnCore.

Comfort is the primary focus of the seat design, with a sculpted seat pan and ergonomic seatback, which provide comfort with minimal padding, as well as an elegant appearance. The deep bottom pan has a contoured waterfall front edge to minimize leg fatigue and allow freedom of movement. Even if the headrest option is not selected, the sculpted padding at the top of the seat provides comfort.

The seatback reclines 3in and is made of a rigid composite, which is shaped for ergonomic comfort, and also ensures the occupant won't feel a knee in their back when reclined.

Some unique features are also included, such as an elegant PED holder that pulls out with a pleasing haptic (though an IFE display up to 11in can be incorporated) and a simple water bottle holder under the seat that is easy to access and out of the way.

For the convenience of airline maintenance crews, there is a quick-release access system for removing the back and bottom cushions, whether for replacement or for providing quick access to the single actuator.

LIFT FAQs

- **Suitable for:** focused on Airbus and Boeing narrow-body aircraft, but adaptable to wide-body platforms
- **Pitch:** 27-35in
- **Standard options:** PED holder, water bottle holder, sliding meal table, bifold meal table, attendant step, upper literature pocket, moveable headrest, life vest stowage box or flotation cushion, USB port, coat hook, proximity light
- **Customization options:** upholstery and stitch patterns, back and bottom customization, PC power outlet, in-arm PCU, headphone jack, IFE

The company has already completed preliminary developmental dynamic, reliability and FMEA tests, and is currently working on detailed engineering and certification, with TSO C127B expected to be passed by Q1 2016.

Lift by EnCore has reported "significant interest" in the seat since its April reveal, and is currently in discussions for the first order. The company anticipates a lead time for orders of 6 to 12 months, depending on the configuration.



ACRO SERIES 6

UK-based Acro Aircraft Seating has revealed two products: a prototype economy seat (Series 6) and a premium economy seat concept in the early stages of development (Series 7 – see p96). Both seats have been designed together with Factorydesign, a London design consultancy, with a little inspiration from the best of 20th century furniture design.

The Series 6 is offered in both single and twin aisle variants and represents a new type of fixed-back economy seat design, which is set at 24°, and which does away with the conventional aluminum tube frame and replaces it with a fully composite construction for increased passenger comfort, lighter weight and greater durability.

Both seat models have been designed to maintain values of spaciousness and comfort, but with what the company describes as “a more sophisticated and elegant aesthetic”, complemented by a great variety of trim and finish options. Further options for Series 6 include a large single-leaf table, provision for IFE up to 9in and easily accessible in-seat power outlets.

The effective schedule for entry into service will depend on the market response. However, following positive feedback at the Hamburg show, Acro hopes to have both seat models completely developed by the end of 2016.



- Weight: circa 9kg/pax
- Minimum pitch: 28in



- Launch date: within 12-16 months
- Suitable for: A318, A319, A320, A321, B737, B757



GEVEN ESSENZA

The Essenza model has been designed with minimal parts count and maximum comfort in mind, with two variants available: a pre-reclined version (105°) for high-density configurations with minimal options, and a reclinable version (up to 120°).

Both versions are intended as 3-3 in single-aisle aircraft at a pitch of 27-33in, with a high shin clearance to make the tightest pitch as comfortable as possible.

The low parts count is combined with the use of lightweight composites and metals, but Geven is not yet ready to disclose the final weight figures.

Other standard options include a flush armrest for easy access and an upper net literature pocket. Customers can also opt to customize the upper seatback with a rigid literature pocket or tablet holder, or an IFE display up to 12in.

Economy class



HAECO VECTOR-Y

The Vector-Y economy seat is the first model to be launched on Haeco Cabin Solution's new seat platform, designed to meet narrow-body operator requirements including low weight, low acquisition cost, and low cost of maintenance.

Industrial design support was provided by James Lee of Paperclip Design (see our website to read an interview). The team selected lightweight materials including carbon fiber, extruded aluminum, a proprietary fabric for the seat pan, injection-molded plastics and thermoformed plastics. All line-removable units can be replaced in five minutes or less, including an easily removable bumper insert.

In terms of comfort, Vector-Y can recline up to 6in depending on seat pitch, with the backrest pivot positioned to create maximum shin clearance and the forward baggage bar placed to maximize leg-stretch space. Seat width (17in on a B737, 18in on an A320) is enhanced by the tapered armrests.

Further comforts are available on the options list, including an eye-level tablet holder, seatback power/USB outlets, a four-way adjustable headrest, a full plastic backshell with upper literature pocket and either a flat plastic kick panel or lower literature pocket, audio IFE provisions and installation, electrical DPCU and audio jack installation.

Integrated seatback IFE is not an option, but the company views its 10 x 7in PED holder as sufficient for narrow-body IFE requirements. The wide-body Vector-Y+ variant being launched later

Y FACTOR

- **Pitch: 28-34in**
- **Weight: 30kg (68 lb) for a standard triple including seatbelts, cushions, padded backrest dress cover and life vest stowage**
- **Suitable for: B737NG and B737MAX families; A320 and A320neo families (Vector-Y+ to be launched later this year will be for B777, A330, B787 and A350)**

this year will have full IFE provision, as will the following Vector-PY premium economy model.

Vector-Y is currently completing certification, with test results already submitted to Boeing for the B737 offerability process. Testing on Vector-Y for a potential TSO weight of 140 lb for a standard triple and 180 lb for a front-row triple has been completed, as follows: 16g dynamic forward; 14g dynamic down; 9g static forward; 6.5g static down; 3.5g static up; 4.0g static side; 2.0g static aft. Haeco is also in the process of abuse and cycle testing per SAE AS8049, ARP5526, D6-36230 and 2521 M1F 1000 00.

The company is quoting a six-month lead time for orders for any catalog Vector-Y seat with electrical options (plug receptacle with USB, USB only or receptacle only). Audio and DPCU will be a quoted lead time per order. Haeco predicts the first deliveries for the first quarter of 2016.



B/E AEROSPACE JAZZ

Panasonic Avionics has been working to bring the IFE innovations found in premium class seats to economy class. With the Jazz long-haul economy seat concept, Panasonic has worked with its design partners – B/E Aerospace, Teague and Formation Design Group – to create a seat that seamlessly integrates IFE from the outset, to bring more efficient design, lighter weight and shorter lead times.

B/E's anthropomorphic research informed the shape of the seat, which uses a slimline mandrel-free composite seatback construction to free up more space for the passenger by improving knee clearance, while the innovative armrest geometry increases hip clearance. The geometry has been made possible through the use of additive manufacturing.

A 13.3in 1080p LCD touchscreen is integrated into a seamless edge-to-edge glass structure for a clean look, and the wide viewing angle means that a tilt mechanism is not required. For quick and simple maintenance, the clever monitor mount means that the display can be removed with just one screw.

As well as enjoying widescreen IFE in comfort, Jazz passengers can also enjoy other in-seat technologies, including mood light control, built-in reading lights, and integrated attendant call lights. AC power, inductive charging, USB ports, Bluetooth 4.0 and NFC payment features can also seamlessly integrate with PEDs for a fully personalized passenger experience.



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Economy class

RECARO'S UPGRADED CL3710

Recaro's CL3710 long-haul economy seat has enjoyed success since its launch in 2013, with KLM being the first airline to enter the seat into service, and sales now exceeding €100m. The reasons for the success include its light weight (less than 12kg), its ergonomic comfort, and its features – including a high literature pocket – that help make even a 29in pitch acceptable for long-haul travel, aided by mounting the IFE boxes below the seat pan. The ergonomically optimized six-way headrest offers great neck support and the armrests can be raised and still remain flush with the backrest – even at the maximum 7in recline.

New features for 2015 include a fold-out footrest with integrated footnet that enhances comfort in the sleeping position, a cup holder so that drinks can be enjoyed without folding out the complete tray table, and a one-piece table option.

CL3710 is suitable for all Airbus and Boeing aircraft



The 13in Panasonic IFE monitor is stylishly integrated

RECARO CL3710 WITH 13IN IFE MONITOR

The CL3710 is a fine seat, but Recaro felt the flying experience could be enhanced further by integrating the latest IFE technology to create a movie theater viewing experience. Thus Recaro partnered with Panasonic Avionics to seamlessly integrate a slimline 13in monitor into the CL3710 seatback – the largest IFE monitor in a Recaro economy class seat to date.

The screen is large, but the key benefit is that it is installed framelessly across the entire upper part of the backrest. The monitor, which the passenger can tilt for optimal viewing angle, fits perfectly into the architecture of the seat so that it looks like part of the seat design and not an afterthought. Audio and USB ports and a reading light are integrated under the monitor in a peripheral bar, with further options for the bar including an additional reading light, HDMI, handset or NFC technology.

What is unique is the combination of such a large monitor, including a handset, with the literature pocket, which has been located above the tray table.

Depending on customer wishes, the project partners say they can quickly bring this solution to market and adapt it to individual customer requirements.

The design made it to the finals of the Passenger Comfort Systems category of the Crystal Cabin Awards – see p119 for more details.

- Pitch: 30-36in
- Certification status: not certified
- Details of orders: undisclosed

FLYING SERVICE Y SEAT

Flying Service has found that some lightweight seats have been breaking during service and so is bucking the trend with a new economy seat that weighs a little more than some seats on the market, but is more robust.

The design is still under wraps, but the company has stated that it can offer real comfort at the minimum 28in pitch, and the seat pan and backrest are contoured to the passenger so that the seat foams serve only to provide softness. The seat can either recline or there is a fixed-back option, with the angle of the back designed to be comfortable in the upright position.

Flying Service says the seat will be suitable for any aircraft, certified to 16g and released on an EASA Form 1 certificate. The seat will be for sale within six months, with a 12- to 14-week lead time.

TOYOTA BOSHOKU/ANA

Japan's All Nippon Airways (ANA) has introduced a new entrant to the aircraft seating market, following a collaboration between the airline and Toyota Boshoku, which develops and manufactures seats for a variety of Toyota's automobile lines.

The first development program for the two companies is an economy seat for ANA's domestic B767-300s. Support was identified as being critical to passenger comfort, so the seat is structured to limit muscle fatigue around the hips, and to maintain a relaxing posture by firmly supporting the pelvis. Also, the height, length and angle of the seat and backrest were designed to evenly distribute pressure on the body and to accommodate a wide range of body sizes and types.

Toyota Boshoku conducted a range of tests involving multiple angles in order to determine the optimal height and natural contours of the tray tables and armrests so they can accommodate a variety of body types.

The seats will appear on ANA's domestic service beginning June 2015, and by FY2016, ANA plans to have installed a total of 1,560 seats across six B767-300 aircraft. The seats will be configured 2-3-2 on the B767-300s, with a seat width of 17.5in and a seat pitch of 31in.



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ZODIAC L³

The short-to-medium haul L³ is claimed to offer 'three Ls': living space, light weight and short lead times – as well as high cabin density. The seat's sub-4kg per pax weight is due to its all-carbon fiber composite construction, the result of a cooperation with composites giant Hexcel.

The L³'s structure is manufactured using Hexcel's HexPly carbon fiber prepreps, which as well as being light in weight, also provide good mechanical resistance and an ergonomically sound seat geometry, while the armrests and tray tables are manufactured from Hexcel's HexMC compression molding process, providing a unique look and strong resistance. Zodiac and Hexcel say that their manufacturing process is quick and ideal for short delivery times.

A prototype of the seat was demonstrated at Aircraft Interiors Expo in April 2014, but it officially launched in September 2014.



- Suitable for: A320, B737
- Intended layout: 3-3
- Seat width: up to 18in
- Pitch: 28-34in



ZODIAC Z60

The Z60 is Zodiac's response to airlines' desire to pack more passengers into narrow-bodies on short-haul routes. Modern in style, the fixed-back and slimline Z60 is intended to optimize living space and comfort – even at the seat's operating minimums of a 27in pitch and 16.5in seat width – while its minimal parts count (30% fewer than the previous generation) reduces operational costs and weight. In particular the one-piece backshell is easy to install and to clean and replace, and there is a system for fast switching of cushions and covers.

Passengers may be losing seat pitch, but they don't lose the features they expect, which include a tablet holder, audio IFE provision, and USB and PC power.

- Width between armrests: 16.5-18in
- Intended layout: 3-3, 2-2
- Suitable for: A320, B737, ATR

The L³ benefits from Hexcel's composites expertise

REBEL.AERO

A composite monocoque seat with a folding mechanism and a three-point harness, which is truly comfortable at a 28in pitch? It may sound like just another seating concept, but Rebel.Aero's short-haul economy seat is very real and ready to order.

The folding mechanism is simple – raise the seat pan, and because the contours of the seatback and seat pan cushion match, it folds flat. This means that occupants can stand up in their own footwell, which has clear benefits for ingress and egress, and a passenger can even sit on the folded part during flight, creating a second seating position around 4.5in higher, which enables them to straighten their legs and stretch their lower back.

The seatbacks have been sculpted to maximize knee room, meaning that a 28in pitch feels more like a 30-31in pitch. And even with the flip mechanism and three-point belt, the company says it has achieved a sub-10kg per pax seat weight, aided by a low parts count.

There are some customization options, and Rebel.Aero is looking at incorporating features including simple

phone and tablet holders and some creative storage spaces. While the launch seat – designed for short-haul A320s and B737s – doesn't have IFE, with a quick tooling change it could be incorporated. Indeed the company has indicated that it intends to offer IFE options for future medium- and long-haul versions.

Rebel.Aero has conducted a full feasibility study with a certification company, to plot the quickest route to full certification. The seat has already been static 9g tested, with full FEA analysis, a finalized bill of materials and a full supply chain in place, ready for order, with certification for a particular airline's configuration billed as a relatively swift process.





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Part 145 (maintenance)
Part 148 (manufacture)
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Economy class

Airbus has also been working on a 3-5-3 seating configuration for the A380



- Minimum pitch: 28in
- Recline angle: up to 4in

RECARO/AIRBUS 3530SWIFT

This short- and mid-haul seat is a joint supplier-furnished equipment (SFE) project between Recaro Aircraft Seating and Airbus. Based on Recaro's successful BL3530 economy class seat, the 3530Swift is a new seat for the A320 family and will be available in predefined, pre-qualified and pre-certified Airbus layouts and catalog configurations in order to save the time normally required for individual product approval.

The seat takes full advantage of the A320's cabin width to offer an 18in width between the armrests, while its pitch efficiency (28in minimum) will also enable airlines to install more rows in an aircraft while maintaining legroom, helped by the lean, space-saving backrest combined with a high literature pocket.

Airlines will be able to customize the 3530Swift with combinable catalog package options, which include leather dress covers, comfort cushions, more stowage space and a six-way adjustable headrest. Customers will also be able to select all-important PED options, including a tablet holder and tablet stowage, as well as a power socket for USB and PC.

The 3530Swift will become available as an A320 SFE line-fit and retrofit option later this year.

TSI COMFYSKY

This short-haul economy seat from TSI Aviation Seats in Turkey will be flying in Q1 2016, with Turkish Airlines' order of 13 shipsets. To keep price competitive, no exotic materials are used in the seat, which instead comprises aluminum, stainless steel and plastic, but still weighs in at a competitive 14.5kg/pax (32 lb) complete with IFE but without BFE.

Passenger comfort is catered to with an 8.5° recline, an articulated bottom, four-way adjustable headrest, and by squeezing the B737 seat width to 17.39in between the armrests. A 10.6in IFE display can also be integrated into the seatback, though the optional tablet holder may prove more popular given current trends. Better still, the lower literature pocket does not have any metal parts or hard edges to dig into knees.



- Suitable for: A320 family, B737 family
- Lead time: ITCM + 8 to 12 months
- Pitch: 29-40in

TSI SKYSOFA

The long-range relative of Comfysky will launch in Q3 2015, again with Turkish Airlines, which has ordered 14 shipsets. Skysofa offers a few

more comforts than the short-range Comfysky, including a 13.6° recline, an 18.18in seat width between the armrests, an extendable footrest, provision for an 11.1in IFE display, and cushions with foams developed for long-haul comfort.



SOFA STATS

- Suitable for: A330, A340, B777, B767, B787
- Lead time for orders: ITCM + 8 to 12 months
- Pitch: 30-40in

TSI MILLIGRAM

With its ergonomic design and lighter components, Milligram is pitched as a good alternative for low-cost carriers looking for fuel savings without compromising passenger comfort. Launching in Q2 2016, Milligram has a lightweight modular construction that incorporates an energy-absorbing function to minimize in-seat disturbance, a 17.39in seat width between the armrests, a 5° recline, and a high-mounted tablet or literature pocket.

- Weight: 9.8 kg/pax (21.6 lb/pax) without BFE
- Suitable for: A320 family, B737 family
- Pitch: 28-40in



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Economy class beds

WITH THESE NEW ENTRANTS TO THE CONVERTIBLE SOFA MARKET, AIR NEW ZEALAND'S SKYCOUCH HAS SOME COMPETITION



GEVEN PIUMA SOFÀ

Who says you can't sleep in economy? The Piuma Sofà is Geven's proposal for creating ancillary revenue by allowing airlines to offer full lie-down sleeping accommodation in the economy cabin.

When in seat mode it looks like a typical economy triple or quad, but in less than 30 seconds it can be converted into a 'sleeper sofa' asset that can be sold to monetize empty seats. The headrests are on a 'push and click' mechanism and can be removed and plugged into the front of the seat pan to create the bed surface. Fold up the armrests and add a mattress, and you're ready to relax.

Geven says the design has a simple mechanism and is easy to install, with no reduction in seated comfort, legroom, footroom or under-seat stowage, and only a minor addition to seat weight.

AVIOINTERIORS Y-BED

The Y-bed is a new option for Aviointeriors' Columbus range of seats, which can be also retrofitted on existing Columbus seats. On Y-bed seats, simply extend the seat bottom surface of each seat on a triple or quadruple seat, and a row can be transformed into a couch able to accommodate one or two sleeping passengers. A special cushion is provided by the crew to complete the transformation.

A partial conversion is also possible, by extending only one or two seats, to accommodate a sitting parent with one or two children sleeping. Also, a single seat can be converted to act as a wider bassinet for toddlers.

To prevent sneaky sleepers, the crew will unlock the feature and provide the special cushion only for those who have booked or purchased the Y-bed option.



■ Minimum pitch: 28in

ESP could even be used as a crew rest or to help a passenger who is taken ill during a flight

CHAMELEON/FLYING SERVICE ESP

Aircraft interior supplier Chameleon Products, and Flying Service, the UK-based seating manufacturer, have collaborated to create ESP (Extendable Seat Product), a standard economy triple that can be converted into a lounge seat. Having booked a triple, the passenger simply unlocks and deploys a pad stowed under each seat and unfolds the foam sections over them, and in under 24 seconds, a flat surface is created, enabling one or two passengers to lie down to relax. Alternatively just two seats in a triple can be converted so that an adult can sit next to resting children.

The seats work equally well as standard seats, with passengers charged extra to unlock the extendable function, or access to the bed can be offered as an upgrade or loyalty reward.

According to the two companies, ESP can be produced for any aircraft type and certification takes approximately 12 weeks.

Following airline interest at Aircraft Interiors Expo, with the demonstrator seat trimmed in fabric created by British designer Sir Paul Smith, Chameleon and Flying Service are also working on a new version of the seat, which will feature some new features and combinations to build on the theme of families traveling together in comfort. The seat – named ESP2 – will be launched later this year and will again feature fabrics from a top designer.

■ Minimum pitch: 29in



CHAMELEON/FLYING SERVICE ESP XTRA

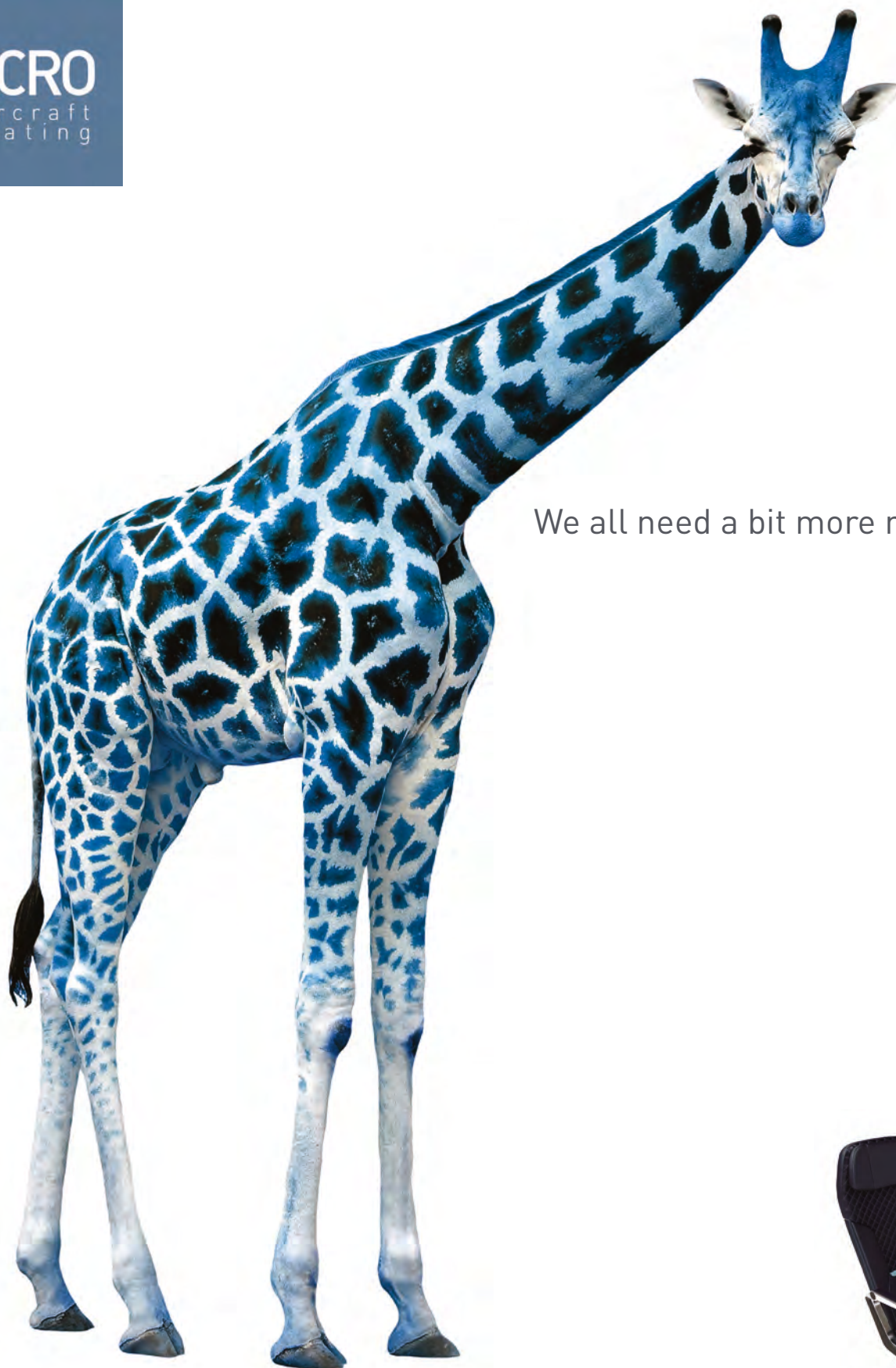
Chameleon Products and Flying Service have also developed the ESP Xtra family seat, which sees two ESP triples installed facing each other, giving a traveling family effectively a 60in double bed area where they can sleep, rest and play.

Airlines, depending on their pricing structure, could carry three fewer passengers and their bags per seat area, but still receive the equivalent revenue for all six seats.

Indeed large families may choose to book the facing seats purely to keep an eye on and entertain their children, and can deploy seats to tailor the area as they wish.

ESP Xtra is expected to be rolled out over the next 12 months.

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Premium economy

STEP UP

Acro's Series 7 is also envisioned for service in narrow-body business or even first class cabins, where the seat would retain the maximum number of shared components and also benefit from a console unit, offering each passenger more side furniture with extra functionality.

The console unit provides personal in-seat stowage and surface space as well as increasing the separation between passengers. According to Acro, all these features improve the passenger experience more than simply adding additional seat width. Side furniture is a feature associated with premium flat bed business products and Acro sees the console as a powerful advantage in this market.

The narrow-body variant would have a seat width of 54in for business or 60in for first class, with a living space width of 27in and 30in, respectively.



ACRO SERIES 7

The quilted beauty that is Acro's Series 7 is designed to offer passengers a premium experience and airlines a cost-effective choice. The seat, still in the early stages of development, has been distilled down to the essentials for passenger comfort, including good legroom and ergonomics, and features that make a real difference. Anything unnecessary has been removed so that the seat structure is what you see – elegantly detailed rather than covered up with plastic cladding, to keep weight down to 18kg per pax.

Series 7 was co-designed with Factorydesign, with its styling intended to resemble a lounge chair where comfort is the result of careful ergonomic design rather than the addition of thick foam padding, inspired by the furniture design of Charles and Ray Eames. The slim,

curved seatback means pitches of 34in are possible with generous legroom, while still meeting Airbus's minimum 9in egress requirements.

The concept is optimized to be 48in wide on a wide-body, with a living space width of 24in, while the 2.5in width of the armrest provides sufficient space to house an in-arm table or front row monitors without modifying the rest of the seat.

Series 7 also offers elegant and practical stowage areas, an 8in recline, a fully articulated seat pan, a leg rest, a large single-piece console table, and a variety of trim and finish options.

As with Series 6 (see p85), the effective schedule for entry into service will depend on the market response. However, Acro hopes to have both seat models completely developed by the end of 2016.

By carefully considering and minimizing padding, extra legroom is created



- Suitable for: B767, B747, B777, B787, A330, A340, A350, A380 (premium economy); A320, B737 (business/first class)
- Maximum IFE size: 17in

Geven's Comoda is flying in South African Airways' A320s: more info on our website

ZODIAC Z500

According to Zodiac, the Z500 "maximizes spatial and motion mechanics, elegantly creating room for legs to stretch and for passengers to take a relaxing breath". A bold claim, but going on looks alone, one that appears feasible.

Key to the Z500's design is a clever ergonomic pitch motion that enhances knee, shin and foot space, with the knee room at the minimum 38in pitch feeling more like 40in according to Zodiac, aided by the ultra-thin backrest. While reclining and resting, passengers can also rest a cocktail on the 5in-wide center console or enjoy a meal on the large one-piece table.

Seatback IFE displays of up to 15.4in may be accommodated, with the power module and electronics box hidden in the console behind maintenance-friendly covers. No IFE system? No problem – a tablet holder may also be selected, and newly designed pockets in the armrests can also accommodate tablets or small laptops, as can the large literature pocket on the seatback. For a good old-fashioned read, a headrest-mounted reading light can also be selected.

Z500 FAQs

- Intended layout: 2-3-2, 2-4-2
- Suitable for: A330, A350, A380, B787, B777
- Minimum pitch: 38in
- Width between armrests: 18-20.5in
- Maximum IFE size: 15.4in
- Table size: 18.75 x 10.7in



GEVEN COMODA AQ

The wide-body Comoda AQ is conceived for comfort and cabin density, as well as to have great flexibility of installation in various possible cabin configurations, whether six, seven or eight abreast. Comfort features include a 135° recline and a central console with single-leaf table, with options including a massage function, lumbar support and amenity pockets. Further options include a customizable literature pocket, cup holder, cocktail table, coat hook and integrated crew step. Expect Comoda AQ to be launched within the next eight months.

- Suitable for: A330, A340, A380, B747, B777, B787
- Maximum IFE display size: 15in
- Pitch: 38-42in

Premium economy

ZODIAC Z535

With a second premium economy seat launch in 12 months, Zodiac Seats clearly sees growth in this class. The Z535 is specifically designed for the A350 – it is now in the catalog – and is targeted at a 38in pitch with a thin backrest for high cabin density.

The Z535 cradles the traveler in an articulating seat that provides comfort while preserving valuable living space by limiting recline intrusion. Comfort is enhanced even further with calf rest and footrest options. For dining or working, a 10.5 x 18.5in two-piece table can be folded out of the center console, complemented by a wide cocktail table.

The literature pocket, amenity storage and separate tablet holder offer generous storage space for personal devices and sundry items. An optional water bottle holder is also available on the aft face of the center console.

Z535 FACTS

- Suitable for: A350
- Intended layout: 2-4-2
- Maximum IFE display size: 13.3in
- Width between armrests: 19in
- Minimum pitch: 38in



The 5810 model from Zodiac Seats US is also in the A350 XWB catalog



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Business class

RECARO CL6710

You may recall seeing Recaro's CL6710 long-haul staggered seat in last year's review, but the reason it qualified this year is that it has been further developed over the past 12 months for enhanced comfort. As a recap, key aspects of the CL6710 included a full-flat bed, a 21in-wide seat, direct aisle access, and generous stowage space in a high-density 1-2-1 configuration. Key to the design is a ratio of 1:1.8, which reflects the ratio of pitch to bed length for space optimization. This means that at a seat pitch of 42in, the bed length is up to 78in (82in at a 46in pitch).

To ensure a good flight's sleep the bed is widest in the shoulder (30in) and waist areas and the footwell space is generous, while the seat shell protects the occupant from the aisle.

But these details were all revealed in 2014. For 2015 the comfort features of the seat have been further developed. Moveable armrests offer additional options for adjusting the seating environment so that occupants can enjoy more shoulder space in the sleeping position when the armrests are down, or feel shielded from the aisle or cold cabin wall when the armrests are up. Additionally an optional retractable divider allows passengers in the center seats to individually adjust the level of privacy. Further comfort

options include a pneumatic lumbar support system, proximity light integration and mood light options. Thanks to the flexibility of the seat design, airlines can even decide where sockets for PC power, headphones or USB should be located – and inductive charging can be integrated into the side table.

The visual layout of the seat control unit has also been refined for intuitive handling, and several variants are currently being evaluated. For tech-savvy travelers, the seat can also be controlled using a cell phone app, which airlines can also use to retrieve maintenance data, such as actuator health. In other technology news, the IFE monitor (up to 18in) is certifiable in the deployed position for gate-to-gate IFE.

Recaro Aircraft Seating is also offering a package of front row monument solutions with the CL6710. By working together with partner companies that offer intelligent cabin integration, Recaro can help customers to optimize their layout and stowage efficiency as well as introducing creative additional signature features into the cabin.

Starting at the end of 2016, a European launch customer will be flying the CL6710 and the certification process is currently underway.

- Suitable for: all Airbus and Boeing wide-body aircraft
- Minimum pitch: 42in; maximum pitch: 46in
- Intended layout: 1-2-1, staggered

CL6710 TRIVIA

- The styling of the 6710 long-haul staggered seat is inspired by contemporary interior design in hotels, clubs and lounges
- Making the most of the direct aisle access, even during mealtime egress, is easy as the large one-piece table can be moved out of the way



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Business class



JAMCO DOVETAIL

DoveTail, Jamco's dramatic entry into the upper-business class seating segment, represents the company's second aircraft seat model, following its March 2012 entry into the aircraft seating market with the Journey forward-facing business class seat, as found in the A350 catalog.

That same year, Jamco's seating team began work with JPA Design to create DoveTail, a seat designed along the principles of the reverse herringbone layout, while also offering something a little different by adding a stagger to the configuration.

The staggered configuration meant that the footwell angle could be expanded from a typical sub-30° angle to 55-60°, creating a square, usable foot space 21in deep and 20in wide, with sufficient space to stow a carry-on underneath the ottoman. The staggered layout is also naturally beneficial for privacy.

The single-actuator kinematic minimizes weight and cost, and is shared with the Journey seat, which is nearing certification and will be flying later this year. The design teams predict DoveTail following Journey through the certification process without any difficulties.

For airlines keen to give a companion as well as a private self-contained customer option, sliding panels can be specified between the center seats, giving privacy control, as they can be slid back in order to have

a conversation with, or dine with, the neighboring passenger.

Regarding customer options, perhaps the most interesting is made possible by Jamco's other activities in lav and galley manufacturing. If end-row monuments are incorporated into the seating layout, new potential cabin customization opportunities open up, including the fitting of extra seats, a changing room, or an integrated baby bassinet.

The staggered arrangement of the seats also creates large, accessible storage spaces at the fore and aft ends of the center rows, which are ideal for crew to stow items such as blankets, safety equipment and magazines – and which also free-up space in the areas where they are

DOVETAIL DATA

- Intended for: wide-body application in a 1-2-1 configuration
- Pitch: 43-46in pitch, depending on aircraft type
- Seat width: 21.5in, with a 1.5in taper to the foot of the ottoman
- Bed area: 1,700in² (78in long)



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ZODIAC SEATS

AURA HD



**ZODIAC
AEROSPACE** 

Business class

RECARO CL5710

Recaro has rounded off its product range with a short- to medium-haul business seat for narrow-body aircraft: the CL5710. The electrically actuated seat is claimed to offer "unmatched passenger comfort" at a minimum pitch of 45in through the engineering of various predefined seating positions, up to 14in of recline, and an optional lumbar support and integrated massage feature.

Further options include the latest IFE systems and an integrated in-arm monitor of up to 13in, additional stowage spaces for electronic devices and personal belongings, power plugs and ports in the center console, a pull-out cocktail table, a bifold console table with swivel function, a six-way adjustable headrest, a large upper stowage area, a privacy divider and a coat hook.

The seat is not certified yet, but you can expect agreeable lead times as the company has been expanding its production capacity around the world, and has also received extended signature rights from Airbus, with the airframer transferring responsibility and rights in the development phase to Recaro, which reduces coordination efforts and lead times.

The CL5710's combination of features has already convinced an Asian customer and the seat will be integrated into the airline's A320neos in 2016.

- Suitable for: single-aisle aircraft
- Intended layout: 2-2



- Configuration: 1-2-1 (honeymoon or full privacy)
- Pitch: 44-47in
- Seat width: 23in
- Bed width: 27in
- Maximum IFE display: 18in
- Weight: 80kg



STELIA SOLSTYS III

In case you missed April's announcement in Hamburg, EADS Sogerma is now known as Stelia Aerospace, following its merger with Aerolia. The latest development from the company is Solstys III, an enhanced version of this popular and proven seat (more than 7,000 units sold). The aesthetic is almost identical to Solstys, save for a few tweaks to the upper stowage areas, but the work goes much deeper.

Stelia worked with Mormedi, a product and service innovation consultancy based in Spain, to evaluate seat quality by applying a comprehensive framework of criteria that covered not only passenger comfort factors such as seat comfort, privacy, IFE and easy access, but also the needs of other important stakeholders such as airlines' need for easy installation, maintenance and certification; the seat manufacturer's need for easy manufacturing assembly and differentiated product; and aircraft manufacturers' need for plug-and-play solutions, capacity management and fast reconfiguration. Mormedi worked closely with Sogerma's engineering team on several cycles of design iterations, including full-size, high-fidelity prototyping.

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Business class

- Suitable for: A330, A340, A350, A380, B747, B777, B777X, B787



ZODIAC CIRRUS NG

Cirrus is a well-received product in the industry, so news of a new-generation version has created some excitement. You will be familiar with Cirrus, as found on Air France and Cathay Pacific, among others, but the NG version brings more: more footwell space, more travel positions and more bed surface, 15% more ottoman space and more privacy.

The biggest development in the NG version is a new reversed angle position that opens up new companion travel opportunities to give airlines more configuration options, while the optional full-length moveable central divider gives occupants privacy options. There are also two new seating positions: the 'body-neutral' relaxing position and the 'meridian sofa' position. Zodiac's designers have also been busy making the seat feel more homey, applying a residential furniture feel to the seat, so it now includes features including a secretary desk, a one-piece desk-like meal table that is up to 35% larger than in the existing Cirrus, and front-facing shelves modeled on bookshelves.

NEW GENERATION

- Intended layout: 1-2-1, 1-1
- Pitch: 42-47in (A330); 44in is the comfort Cirrus NG version
- Bed length: 78in minimum (with wide foot space)
- Width between armrests: 21in (upright)
- Meal table: monofold up to 19 x 14in (on A350)
- IFE: new 18.5in pivoting screen pivot system suitable for gate-to-gate IFE



ZODIAC Z600

Zodiac's latest domestic business class model, the Z600, is elegant, innovative, ergonomic and efficiently built to optimize space in the service of premium comfort. The seat is 18-25in wide between the armrests, and occupants can leave a drink on the 8.5in-wide center console while watching a movie on the IFE (15in maximum display size).

- Suitable for: A320, B737
- Intended layout: 2-2
- Table size: 18.75 x 10.7in
- Minimum pitch: 38in



- Suitable for: A330, A350, A380, B777, B787
- Intended layout: 1-2-1

ZODIAC FUSIO

It's tough to decide if Fusio is super business class or first class lite, but one thing is for sure: it is super luxurious. As airlines continue to reconsider their first class cabins, the living room environment afforded by Fusio at even the minimum 53.5in pitch (107in per double module) provides the efficiency airlines seek and the comfort top-tier flyers demand.

The stylish and modern forward/aft design includes a 30- to 34.5in-wide seat, an 81.5in-long fully flat bed that is 39in wide at the head and shoulder level, direct aisle access, provision for an IFE display of up to 27in, and a 20 x 15in table. The shell offers the privacy demanded at this level and includes a wardrobe.

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Business class

- Suitable for: A320, A321, A330, A340, A380, B737, B747, B757, B777, B787
- Intended layout: 4, 6 or 7 abreast forward facing; 4 or 6 abreast 15° longitudinally angled

GEVEN BACIO

Geven showed a concept demonstrator angled lie-flat seat at last year's Aircraft Interiors Expo; it has since been refined and enhanced following feedback from suppliers and customers. The concept's name has remained – Bacio (Italian for 'kiss') – as have its key features of simplicity and light weight, but the big news is that its two electric actuators now extend the seat into a fully flat bed setting.

Weight in this long-haul design has been minimized through the use of lightweight composites and metals. Meanwhile comfort has been maximized through carefully selected preset positions of upright, relaxed and bed, and the inclusion of a four-way adjustable headrest (an optional six-way headrest is available). Depending on pitch (60-80in), the recline is between 169° and 180° and the bed length up to 79in. In line with demand for large IFE displays, anything up to 21in can be mounted.

Other options include lumbar support, ottoman, moveable lateral armrest, additional amenity stowage, customized shell design, extra stowages, open or covered shoe stowages, decorative shell films, glass touchscreen PCU and self-extinguishing cushions with an extra layer of memory foam. Geven indicates that a customer announcement for Bacio is expected very soon.



ZODIAC AURA HD

Another enhanced product in the Zodiac Seats stable is the Aura HD seat, which has received improvements over the Aura model in almost every aspect, including IFE display size, bed dimensions and stowage options, to create a more adaptable product tailored to customers' brands.

A key design aim for the seat was to achieve a feel of an open cabin with spaciousness within the seat, while still maintaining a sense of privacy, which is achieved through carefully selected seating angles and privacy dividers.

AURA HD IN NUMBERS

- Aircraft and intended layout: 2-2 for A320/B737 families; 2-2-2 for A330, A350, A380, B787, B777
- Overall bed length 81in
- Bed length: 75in
- Bed width: 14-21.5in
- Seat width between armrests: 19in
- Minimum pitch: 60in
- Maximum IFE size: 22in

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Business class

- Configuration: 1-2-1
- Seat width: 20.5-22.2in
- Intended for: Airbus and Boeing wide-body aircraft



STELIA COMET

Another development from Stelia Aerospace is Comet, a herringbone design aimed at premium long-haul business class. The format may be familiar, but it is popular with passengers and airlines alike due to its blend of direct aisle access, fully flat beds and 42in pitch. Stelia has a long list of customization options available for Comet, including gate-to-gate IFE provision with a display of up to 18in.



AVIOINTERIORS SOPHIA

The new Aviointeriors Sophia is a business class seat tailored to the regional market, with a weight and size that will fit most narrow and extra-narrow-body airliners. It is also suitable for service as a premium economy seat on any aircraft – even long-range wide-bodies.

The backrest is shaped so as not to interfere with the small radius of narrow fuselage sections, and weight is kept low by adopting the latest alloy technology without using exotic materials that might be difficult for smaller operators to service. For the same reason the part count is kept low.

Sophia is fully customizable, meaning anything from a simple change in upholstery stitching can be made, to a full redesign of the plastic fairings and the shape of the foams. Various accessories can also be installed, including any IFE system with a screen size up to 16in, front and rear footrests, a seatback meal table, cup holders, reading lights, amenity pockets and literature pockets, among others.

WHERE'S FIRST CLASS?

There is no first class entry for this year's review, but that doesn't mean nobody is working on this sector. There is already a fantastic range of luxurious, customizable seats and suites on the market, which receive regular refinements, and we know of a couple of brand-new models that will be launched soon – just not in time to be included in this review.

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ON THE RAILS

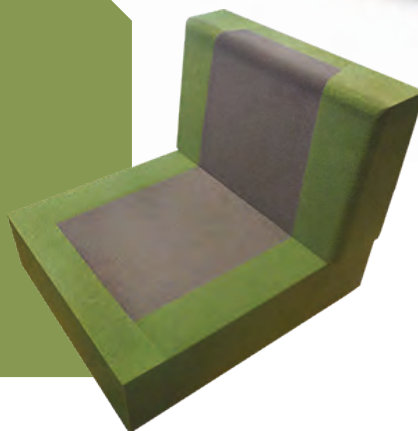
Linear motion systems specialist Rollon Group has developed a telescopic guide rail, which the company says is 30% lighter than standard rails. Named the DE Series, the rails are suitable for the movement of first and business class seats, and the movement of tracking, headrests, armrests and pull-out tables.

The hardened tracks of the rails have been tested to run for over 100,000 cycles, even under high loads (around 130kg applied to the end with the rail in fully extracted position), and to maintain their ability to self-align with the mounting surfaces.



PRE-APPROVED FOAM

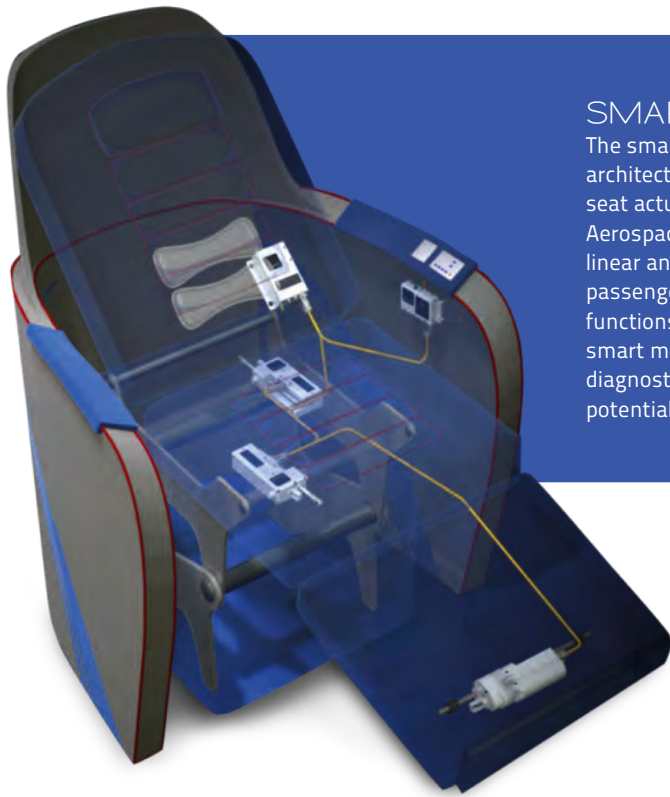
Skandia has simplified seat foam replacement and refurbishment for operators of aircraft manufactured under the previous 9g dynamic certification requirements. The 9G EC (engineered comfort) seat foam cushion block is pre-engineered and certified under current FAA flammability requirements, thus saving the time and expense of meeting flammability requirements for replacement foam, and removing the need to re-dynamically certify an entire seat.



THERMOPLASTIC FANTASTIC

Thermoplastic surfaces with bespoke patterns and design are great for branding and customizing seats. Patterns are typically achieved by applying a cap layer to a polymer sheet either during production or after thermoforming, but problems in the process can include deformed designs, cap delamination, or burn test failure because of multilayer construction. Sekisui SPI has developed an Infused Imaging process that can integrate designs into the polymer. In short, designs aren't applied to polymers – the design is the polymer.





SMART ACTUATION

The smart module system architecture of the mcX premium seat actuation system from Crane Aerospace & Electronics includes linear and rotary actuation, lumbar, passenger control, and auxiliary functions. According to Crane, each smart module is capable of enhanced diagnostics and prognostics to identify potential problems before they start.

SPRING INTO ACTION

AWP-Präzisionsteile has developed electric and mechanical cable systems for gas spring-operated backrest recline systems. With just one touch, crew can recline the backrest of a single seat, an entire seat row, or even every passenger seat in an aircraft. Both systems can be combined with common standard aircraft gas springs, with the electric release system weighing 95-120g (depending on the force of the gas spring), and the mechanical release system weighing 71g.



NEW ELEMENT

There is increasing interest in the use of magnesium in aircraft interiors, particularly in seating. According to Magnesium Elektron, there is now a certification route for seats containing its Elektron 43 magnesium alloy, and the latest revision to SAE standard AS8049 is being reworded which, when published (expected this year), will effectively remove the magnesium ban, opening up use of a new lightweight material. Magnesium Elektron is working with Geven to integrate magnesium in the Piuma EVO economy seat as part of a research program aiming to develop a low-cost manufacturing route for major 16g-compatible structural parts in Elektron 43 magnesium alloy, as well as establishing a UK supply chain.

MAGNIFICENT SEVEN

THERE IS NO DOUBT THAT THE CRYSTAL CABIN AWARDS ARE GROWING IN STATURE, AND THIS YEAR'S COMPETITION WAS THE MOST HOTLY CONTESTED IN THE AWARDS' NINE-YEAR HISTORY. THIS UNIQUE INITIATIVE HAS RECOGNIZED THE BEST CABIN INNOVATIONS OF THE PAST 12 MONTHS, FROM THE ULTIMATE LUXURY EXPERIENCE IN COMMERCIAL AVIATION, TO SUPER-FAST INFLIGHT INTERNET. IN NO PARTICULAR ORDER, LET'S LOOK AT THE WINNERS...





CRYSTAL CABIN AWARD

HOW IT WORKS

The competition was launched by Hamburg Aviation and is organized by the Crystal Cabin Award Association. A pre-selection committee assists the judging panel in the early decision-making process, deciding upon a shortlist for each category, including only the best entries that meet with the Awards criteria. The independent, high-profile panel of international aviation experts then debates the relative merits of each shortlisted entry, and the three entries of the highest standard in each category make their way to the next stage, when the winners are chosen during an intense judging session held in Hamburg. Throughout the whole process all evaluation bodies of the Awards remain neutral.

Industrial Design and Visionary Concepts

WINNER: EMBRAER E-JET E2

Seeking to maintain and strengthen its strong position in the 70-130 seat narrow-body market, Embraer decided that for its next-generation E-Jet E2, a completely clean-sheet approach was required. From the moment you step into the cabin – co-created with PriestmanGoode – you are immersed in an environment that is uniquely Embraer. The cabin design is now entering its third year of development, and everything from the sidewall panels, ceiling panels, overhead bins, PSUs, lighting, IFE, seating, galley and lavatory have all been conceived to enhance the passenger experience and make the E2 an efficient aircraft to maintain. Key to this second factor is that the entire cabin is modular, allowing for quick and low-cost reconfiguration – attractive qualities to the critical customer demographic of banks and leasing companies.

For an in-depth study of the E2 cabin, visit the case studies section of our website.



RUNNERS-UP: B/E AEROSPACE

The Jazz economy seat concept, created by Panasonic Avionics, B/E Aerospace, Teague and Formation Design, was designed from the ground-up by the three partners. Benefits include the 13.3in IFE display being truly integrated with the seat design, rather than being added when the seat design is complete (see p87).

BOEING

Boeing's 777 Premium Arch provides a striking, architectural entrance to the aircraft. Co-developed with Teague, the arch also offers beautiful new lighting effects. To see a fantastic application of the Premium Arch, read the China Airlines B777 feature on our website.



Premium Class and VIP

WINNER: ETIHAD AIRWAYS

The winner of this category needs little introduction, with its A380 interiors having commanded headlines around the world since the reveal of the mock-up cabins in May 2014. The award goes to the incredibly luxurious upper deck, which brings a boutique hotel feel into commercial aviation with opulence that could upstage many a private jet. From that three-room Residence, to the nine first class Apartments, to the business suites, to the Lobby lounge, everything is bespoke and represents a labor of love – and a not inconsiderable risk, which according to Etihad has paid off.

We appreciate the opulence, but are even more impressed by the surprisingly efficient use of space. Even the Residence, with its living room, shower room and bedroom, is no halo product, having been fitted in a space that would not have generated any more revenue than one of the lower-priced Apartments.

And according to Calum Laming, VP of guest experience at Etihad, who accepted the award, the Residence – even with its one-way fare of US\$18,000 from London to Abu Dhabi (sold as a double occupancy room, rather than two seats) – is proving very popular.

Special mention must also go to the Etihad Design Consortium, which worked with the airline to create its new interiors, comprising Honour Branding, Acumen Design Associates and Factorydesign.

Everything you might want to know about the Etihad A380 upper deck, including the Residence, the Apartments, the fore-aft business studios, and how the upper-deck floor had to be re-engineered to accommodate the gorgeous main galley, is available in the articles and case studies section of our website.

RUNNERS-UP: QATAR AIRWAYS

Etihad had strong competition from Qatar Airways' A380 first class cabin and premium lounge, another truly luxurious flying experience. To finish ahead of Qatar's flagship product, designed by PriestmanGoode, really says something about the quality of Etihad's offering.

LUFTHANSA TECHNIK

The Hamburg-based company made the finals with Chair, an innovative modular VIP seat concept that sees one basic seat available in options including a reclining lounge or dining chair. The family of seats, designed by Pierrejean Design Studio, has now passed all 9g ETSO maximum payload tests and 16g dynamic tests are currently ongoing, with certifications for both expected by late summer.

And the winner is: E2.

News from inside! The E-Jets E2 interior has received the prestigious Crystal Cabin Award in the "Industrial Design and Visionary Concepts" category. And for good reasons: An emphasis on individual territory and abundant natural light. Thirty percent larger overhead bins. Modularity for easier, less costly cabin reconfiguration. A staggered first-class seating option. And more. All along, we thought the E2 concept was outstanding. And now that's crystal clear.



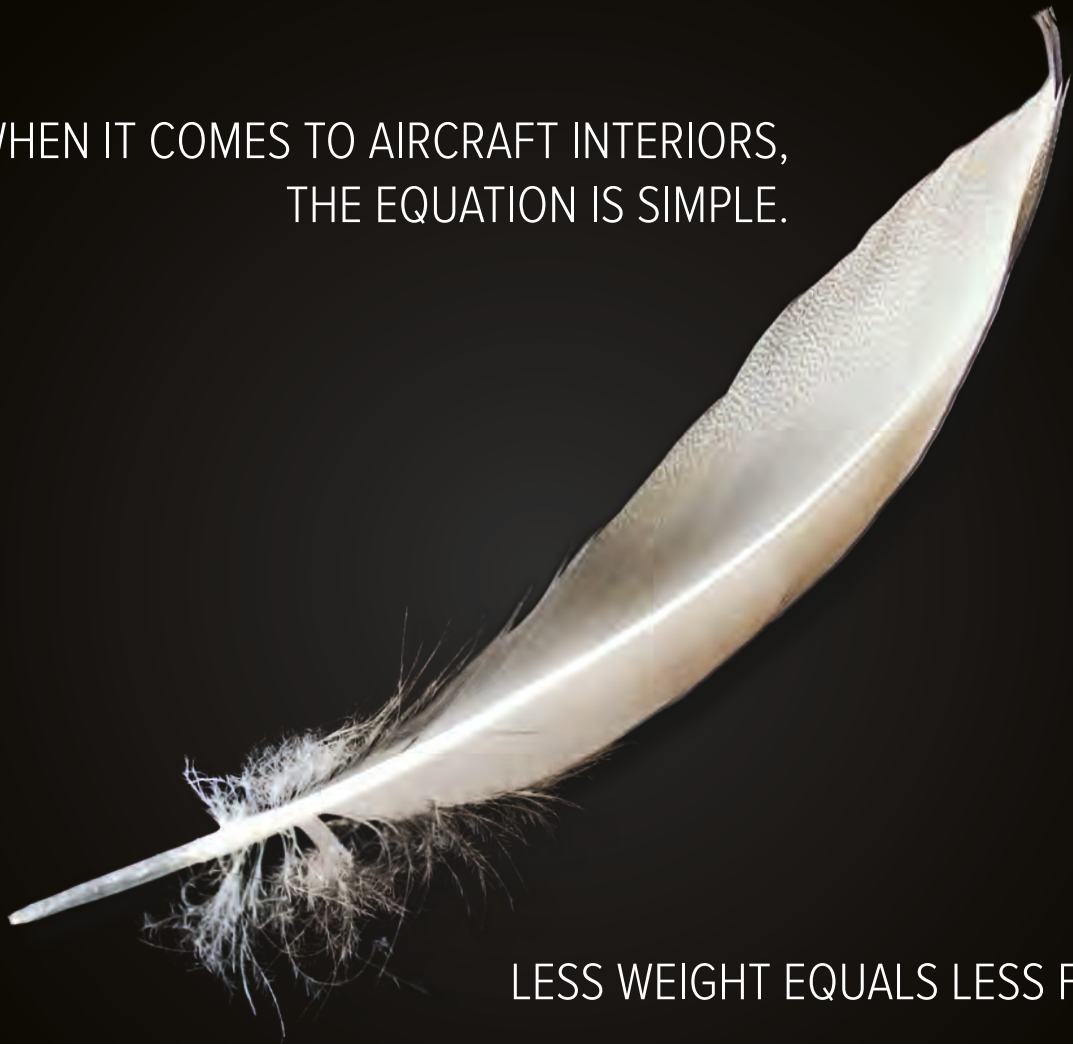
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Passenger Comfort Systems

WINNER: VIASAT

Together with Thales, ViaSat launched the Exede In The Air inflight internet service on December 12, 2013, on JetBlue. Since then, ViaSat says the service has achieved several milestones, including attracting more than four times the average number of passengers using the service on each flight compared with the nearest competitor (although the service is free to use), with take rates on flights of more than three hours approaching 40%; over 2.5 million personal electronic devices connected in the first year; data use per passenger doubling since the first flights; and 20% of all data consumed being used for streaming applications, a number that the company says is increasing each month.

The reason for the success? The service provides similar speeds to those that passengers enjoy at home (12Mbps per passenger), and this speed doesn't degrade when more passengers log on. The satellite-based system can also operate on the ground, enabling airlines to take advantage of gate-to-gate wi-fi connections.

The service is also fitted to United aircraft, and is coming soon to El Al Airlines, with the first certification flights planned for mid-2015. The only downside of the system is that it is not currently available worldwide, but in mid-2016 the ViaSat-2 satellite is expected to launch, which will further expand capacity and extend service to transatlantic, Central American, Caribbean and European routes.

RUNNERS-UP: LUFTHANSA SYSTEMS

Lufthansa Systems' BoardConnect InSeat system is the latest iteration of the technology. The system provides a seatback IFE system without requiring cables and monitors to be installed. Operators can simply latch a tablet into each backrest and connect them with the onboard entertainment system via wi-fi.

RECARO

Like B/E's Jazz seat (see p87), Recaro's Ultimate Passenger Experience seat features a 13.3in IFE display. Co-developed with Panasonic Avionics and Teague, this design shows how an existing seat model (the CL3710) can be further enhanced in a cohesive way to create long-haul comfort. For more details, see p88.



Materials and Components

WINNER: SABIC

Aircraft interior designers have long been seeking clear materials for the cabin, but have been restricted by the clarity and compliance limitations of the 'transparent' materials currently available to them. The winner of this category – SABIC's clear Lexan XHR2000 OSU-compliant sheet – is the closest thing to clear available today, with 80% light transmission.

The sheets meet OSU 65/65 heat release and typical industry FST requirements (FAR25.853, BSS7239, ABD0031) and are ideal for application in anything from security partitions and windows, to trolleys and mirrors. The

sheets are currently being used by Delta, and by China Eastern in its first class window panels, and are currently being evaluated by Qantas.

RUNNERS-UP: RELIANT WORLDWIDE PLASTICS

Reliant Worldwide Plastics from the USA reached the finals with a lightweight thermoplastic composite integrated seatback. Reliant molecularly bonds thermoplastics and carbon fiber impregnated composites, to create products the company says can replace traditional aluminum structural, semi-structural and cosmetic components, saving on average 40% in weight.

FRAUNHOFER INSTITUT

Fraunhofer Institut's Smart-Fluox oxygen mask deployment system is claimed to achieve an across-the-board increase in efficiency of 80% to 90% compared with conventional electromagnetic deployment mechanisms.



Greener Cabin, Health, Safety and Environment

WINNER: B/E AEROSPACE

If you're looking to offer PED power on aircraft without installing in-seat power, Solar Eclipse could be a simple and cost-effective option. A thin solar cell foil is inserted into each window blind, which provides power to two USB ports in the window surrounds, enabling passengers to recharge electronic devices during the flight – even tablets. The system is still under development, including ideas for routing power to center seats, but the manufacturer is confident about gaining FAA approval. There is just one downside: the shade needs to be lowered to expose the cells on the reverse to light and enable charging.

RUNNERS-UP: CTT SYSTEMS

CTT's Humidity in Balance technology features a drying system that stops condensation forming as cabin air encounters the cold fuselage structure. Benefits include more moisture in the cabin, and weight and stress benefits on the fuselage structure due to the prevention of condensation accumulation.

PHITEK

Headphones are one of the most stressed inflight products, so New Zealand-based Phitek has developed reusable economy headphones that have a product life 10 times that of conventional models.



Passenger Comfort Hardware

WINNER: SII DEUTSCHLAND

Where the fuselage narrows at the rear of a narrow-body aircraft, requiring the LOPA to go from three to two seats on each side, the SANTO concept sees a special seat installed, which is one-and-a-half times the normal seat width, making use of the normally wasted space. This larger seat can then be assigned to passengers of size, or divided and assigned to passengers with small children. SANTO stands for 'Special Accommodation Needs for Toddlers and Overweight Passengers'.

RUNNERS-UP: BOEING

According to Boeing, its Space Bins for the B737 increase locker space for cabin baggage by around 50% while using the same amount of space. A modification to the overhead lockers makes it possible for cabin baggage to be stowed vertically. The Space Bins are already flying, with the launch customer being Alaska Airlines.

SMART TRAY

Smart Tray can add a simple personal electronic device holder into tray tables, creating a cost-effective way for airlines to meet passengers' love of bringing and viewing their own devices on board.



University

WINNER: HAW HAMBURG

This is the second award for the mobile vacuum trash container – co-developed with Airbus – as Marc Spille from the Hamburg University of Applied Sciences (HAW Hamburg) also collected the Hamburg Aviation Young Talent Award for the design at the end of 2014. The design uses existing onboard vacuum power to contract trash bags in the galley in seconds. There are of course issues with sharp objects and liquids, but Spille says that suitable bags are available to prevent tearing or spillage.

RUNNERS-UP: COLLEGE FOR CREATIVE STUDIES

Alexandra Mocerri from the College for Creative Studies in Detroit created the Escape economy seat IFE visor concept, which sees a 'visor' slide up and over the occupant's head for an immersive IFE experience.

TU DELFT

A team from TU Delft in the Netherlands submitted the Enable concept, which uses the surface of the folding tray table as an interactive display. ●

SEEING STARS

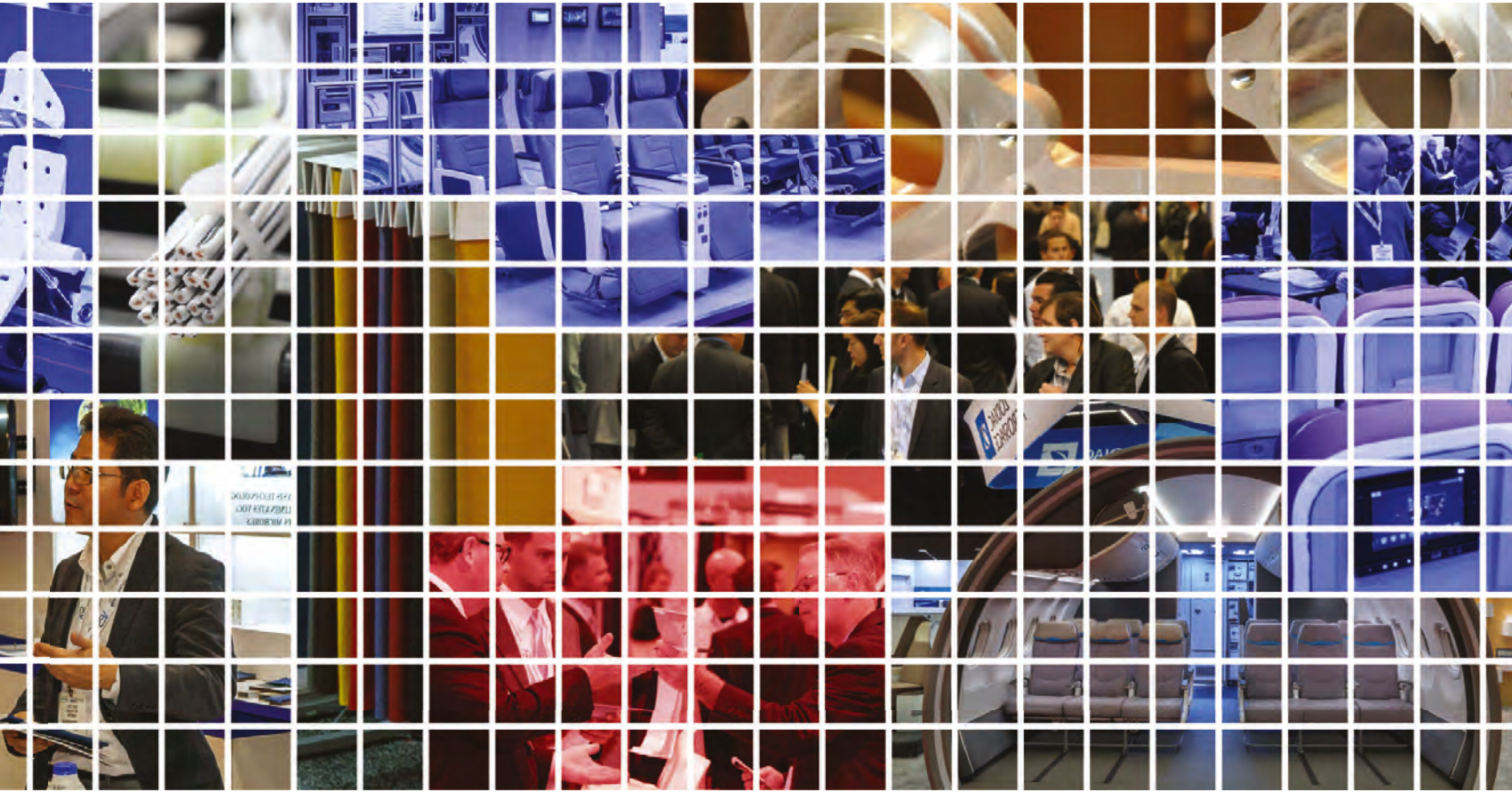
So what do those pretty stars on the Crystal Cabin Award logo mean? The logo was created by the Hamburg-based design agency Bell Etage, intended to sparkle like a precious stone, tracing the character 'C', a cipher for Crystal and Cabin. The slight squareness of the 'C' shape embodies both the linearity of technology and the emotional curve of creativity.

At second glance, the logo appears not to be crystalline but a stellar constellation. Each star denotes one of the five categories in which the Crystal Cabin Award had been conferred initially, before a further two categories were added. The logo slants aspirationally skyward, heading for a sphere in which aircraft – with their innovative cabins on board – circle and soar.

The silver in the logo conveys high quality and innovation, while the red and blue are the colors of Hamburg, the city that hosts the Awards. The logo therefore embraces both the content and the geographical heritage of the competition.



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CLEAR THINKING

The use of advanced materials and resins can expand cabin interior design options

Cabin interior design is all about the passenger experience, as it greatly influences traveler choices about which airlines to fly. So many factors can add to or detract from a cabin's ambience, which is why carriers and tier suppliers put such care into virtually every aspect of design.

And while good design – whether it's a seat, the look and feel of interior elements such as cabin dividers, cabin environments for each class of traveler, or lighting – plays a strong role in comfort, experience and repeat business, other factors also come into play: weight reduction, ease of maintenance and updating, overall cost containment and, of course, compliance with safety regulations and OEM requirements.

Understanding what resources – particularly new materials – are available to help achieve these objectives is a challenge. While some materials may help in one arena, few are capable of achieving multiple wins. Let's look at two that stand apart.

With the increasing prevalence of LED lighting comes the need for materials that are LED-compatible while still meeting weight and safety considerations. A specialty material from SABIC – Lexan CFR5630D resin – is a material of choice for LED lighting. The product offers wide-angle light scattering for excellent aesthetics combined with optimal light diffusion and transmission. The resin is also ultraviolet-stabilized for improved color stability over the lifetime of the lighting part. To support design freedom, SABIC offers this material in five diffusion colors. The material can be used in very thin and lightweight walls (down to 1.0mm) while meeting the requirements of the FAR 25.853 vertical burn test – a milestone for polycarbonate materials. From an ease-of-

SABIC's Lexan XHR transparent sheet won a 2015 Crystal Cabin Award



manufacturing perspective, Lexan CFR5630D resin is capable of being used in either extrusion or injection molding processes, and is 'lot-to-lot' certified from a compliance perspective.

The second material that stands apart is Lexan XHR sheet, a Crystal Cabin Award-winner in the Materials and Components category (see p119), which enables virtually unlimited choices for distinctive cabin designs and solves the long-standing industry problem of the lack of a transparent material that also meets safety standards.

The forecast growth in new aircraft, as well as the healthy demand for retrofits, presents ample opportunities for creative designs that have the power to underscore a brand while surprising and delighting flyers. As aircraft interior designers seek to achieve modern, light-filled cabin environments, they require

a range of transparent materials that meet the industry's vertical burn standards and are amenable to different processing technologies.

Lexan XHR sheet offers the highest level of light transmission available in an OSU-compliant sheet material today, meeting OSU 65/65 heat release and typical industry FST requirements. But its versatility expands well beyond transparency. With lamination, it is possible to specify a wide range of colors or textures including brushed, matte, moire, stucco, gloss and more. Add-ins such as foils or organic material such as coffee beans or bamboo can be used to create a custom effect. Lexan XHR sheet can also be mirrored. ☒

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LIGHT REST

TTF Aerospace has just delivered its first A330 lower-deck modular crew rest to Delta Airlines. The crew rest is the first on the market to be classified as a Class 1 rest facility in accordance with 14 CFR Part 117. The unique design and use of lightweight materials in the module also mean it is 450kg (1,000 lb) lighter than the current option, which confers a tremendous benefit in terms of fuel savings.

TTF crew rests are temperature controlled; provide isolation from intrusive noise, odors, vibrations and disturbances; and have bunks that allow a flat sleeping position during cruising. Besides large fuel cost savings, the lighter weight of the crew rests also helps airlines to maximize flight range in order to make sure every seat counts.

As a reliable partner in the aerospace industry, TTF has been providing crew rests to various airline customers for the past 15 years. As well as its new lightweight lower-deck crew rest, TTF has also designed and manufactured main deck crew rests in various configurations.

Over the next 12 months TTF will deliver 31 crew rests for Delta's A330 fleet. ☒



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FLEXY THING

Premium aircraft cabins are becoming more complex, with compound angles and organic curves in seating areas, lavatories and other interior surfaces. This design complexity is stretching the performance of existing laminate products. That is why Schneller debuted its new AerFilm flex product earlier this year at Aircraft Interiors Expo in Hamburg, Germany.

The company recognized a growing market need. Some interior cabin manufacturers were having difficulty wrapping existing interior laminates around increasingly complex three-dimensional parts while maintaining the product's texture. They needed a product with greater stretching capacity and texture retention.

The result, AerFilm flex, is a lightweight decorative laminate with superior formability, engineered to cover three-dimensional parts with compound curves. AerFilm flex is claimed to offer 150% more stretch than established laminates.

"It's not called flex for nothing," says Schneller's product line manager, Michael Miler. "Premium cabins in

first and business class are getting more and more complex, with compound curves. Sometimes, that means that established materials cannot form and stretch as needed, occasionally leaving customers and designers with no options other than thermoplastics or other designs and materials to meet their requirements."

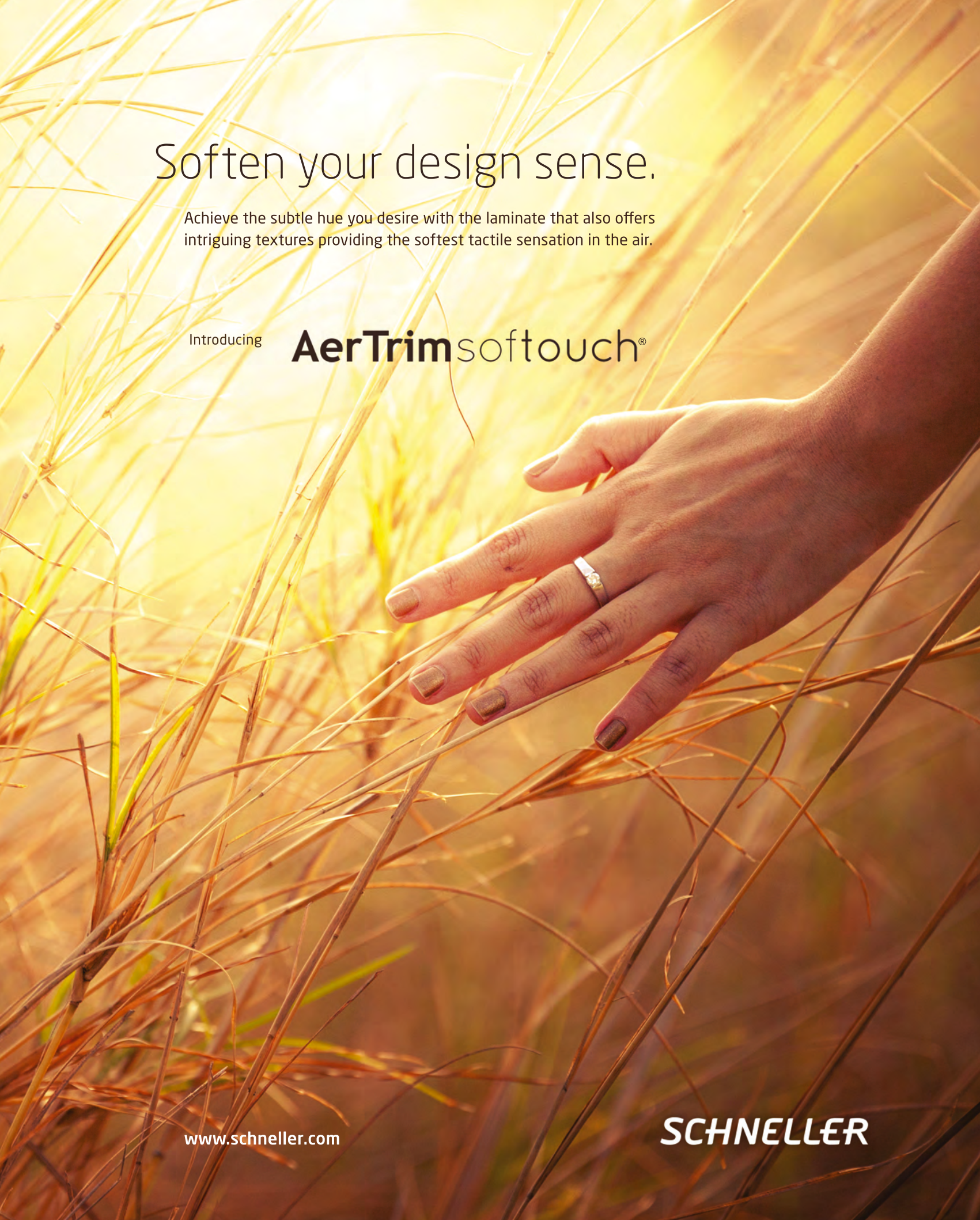
"By taking our established laminates and re-engineering them, we were able to achieve a far more flexible and formable product," Miler explains. "It gives designers a greater degree of flexibility to create comfortable and inviting interior environments. And because all Schneller products are created in a single manufacturing facility, Miler notes, "It can achieve greater color consistency across all its product lines, offering customers a one-stop shop for their decorative needs."

Schneller has a reputation for innovation in aircraft interior decorative solutions. Since its founding in 1964, it has been a global leader in engineered decorative laminates used in transforming aircraft interiors. ☒



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A close-up photograph of a person's hand with a ring on the ring finger, gently touching tall, golden-brown grass. The background is a soft, warm glow from a setting or rising sun, creating a hazy, golden atmosphere. The hand is positioned on the right side of the frame, with fingers slightly spread as it touches the grass.

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SOFT APPROACH

Airlines are moving toward more luxurious, premium class cabins. They want quality interiors that feel natural and offer a special tactile quality that adds to a comfortable environment without limiting their design choices. Of course, the challenge in aircraft interiors is to deliver all these attributes while reliably passing the stringent FAA requirements.

At April's Aircraft Interiors Expo in Hamburg, Germany, Schneller debuted a product that does just that. AerTrim sofTouch is a lightweight, reinforced, decorative laminate with a uniquely soft feel that enhances the passenger experience, without any compromise in flammability, smoke and toxicity compliance.

The new technology draws on Schneller's half century of steady innovation in airline interiors. The company was among the first in the early 1980s to introduce decorative laminates for aircraft interiors that met the new heat release and smoke density standards.

"The product grew out of customers' requests," says Schneller's Michael Miler, the company's product line manager for decorative laminates. "Customers said 'Wouldn't it be great to have a unique soft-touch surface in our first class or business class cabins and seats?' You want something that has a premium feel – not something that is rubbery or like plastic." The product also had to meet FST standards from regulatory agencies and OEMs, which was a tricky balancing act.

Schneller explored a number of potential solutions before settling on a unique laminate. The product, available in a range of colors and textures, offers a soft,

comfortable feel and exceptional durability. It resists stains, scuffing and fading better than other soft aircraft materials and is 20-30% lighter than premium leather.

As premium airline cabins and seats grow ever more luxurious, AerTrim sofTouch offers designers a new sensation that will speak to the passenger experience and brings an overall aesthetic consistency to customers in premium cabins. ✕

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The AerTrim sofTouch laminate can add a soft, high-quality touchpoint



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Big Orange

The 100th Boeing 747 to come off the production line is already a special, historic aircraft, but aircraft N601BN was destined to become something even greater: '747 Braniff Place', the most exclusive address in the sky. The year was 1971 and in January the wonderfully unconventional Braniff International Airways received its flagship B747-127 with typical exuberance, with fashion royalty Emilio Pucci himself presenting a vividly colored new 'pant dress' collection for the air hostesses (a term the airline had started using instead of 'stewardesses') at the launch party at the Dallas Hilton.

What really excited people was the look of the aircraft, with its bright orange bulk meaning its official monicker was soon forgotten by the public, who instead affectionately referred to her as the 'Great Pumpkin' or 'Big Orange' for obvious reasons, and 'Fat Albert' after a cartoon character who wore a large orange sweater.

Big Orange might have looked a little off the wall, especially since her interiors were also a riot of color (a joy to passengers but a nightmare for engineering and maintenance), but the onboard passenger experience was outstanding, and indeed many would agree has yet to be bettered.

The 54-seat Blue Suite (first class) featured velvet 'wingback' chairs, and a further 18 chairs and couches split between its three – yes, three – lounges, including a 12-seat Blue Suite lounge upstairs in the bubble.

The remaining 268 seats were coach class (these were pre-business class days), but what a coach class!

Split into three sections – the Red, Green and Yellow Rooms – coach was designed for fun and comfort, and even had three lounges. That's right, lounges in coach, and proper ones with lounge chairs. Further destination spaces were provided by the 10 'conversation foyers' between cabins. The many cabins in the aircraft also allowed the airline to make 20% of first class into a 'no smoking' zone, and 15% of coach.

Even the food and beverage was remarkable in coach, with a rum punch to welcome you on board, a choice of entrées served on china plates, and complimentary South American wine. Of course, coach passengers got a little less seat for their fare, and had to do without table linen and crystal, but they still got to enjoy the full Braniff experience and hospitality.

Braniff's famous 'end of the plain plane' advertising campaign couldn't have had a better figurehead than Big Orange, but sadly Braniff went bust in 1982, marking the end of this fabulous moment in air travel. ✕

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