

BusinessJet *interiors* INTERNATIONAL

JULY 2014

THE INTERNATIONAL REVIEW OF BUSINESS JET INTERIOR DESIGN AND COMPLETION

supergroup

CAN AN ALLIANCE OF MAJOR SUPPLIERS BRING SWEET HARMONY TO THE OEM CABIN DEVELOPMENT PROCESS?

 ALSO IN THIS ISSUE: PANORAMIC WINDOW SOUND ATTENUATION ACJ319 ELEGANCE 3D PRINTING SR TECHNICS LIGHTING DESIGN

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brightideas

Recently I have noticed a lot of cabin designers highlighting the work they have done to improve aircraft windows. For example, Airbus Corporate Jet Centre's modular design for the ACJ319, the Elegance (page 60), includes new window surrounds designed to diffuse light in a softer way and give a porthole look. Meanwhile, SR Technics launched a narrow-body cabin product (page 20), which includes a system to filter light entering the cabin. Then there is Fokker Services' panoramic window for the BBJ 737 (featured on page 38) – a show-stopping product that fills the width of three standard windows. And the desire to make bigger and better windows is not limited to big iron aircraft. Recognizing that light is important to passengers, business jet OEMs have long been engaged in this tricky business. A recent innovation in this sector is the skylight on Dassault's Falcon 5X.

What I like most about these solutions is that they attempt to make the most of some of an aircraft's exclusive advantages – the beautiful view and light at that altitude. "I want to go back to an aircraft being an aircraft again, to enjoying the uniqueness of this environment," says Eric Jan, head of VIP interior design at SR Technics.

Of course, natural light also has to be complemented by cabin lighting systems. Passenger expectations of lighting, the installation challenges involved, and future technologies to look out for are detailed in this issue's *Design Panel* (page 16). Lighting innovations also feature heavily in Inairvation's mock-up (cover and page 44). The new company combines the talents of Lufthansa Technik, LIST components & furniture, Schott and DesignQ. Its plan is to work with OEMs on new cabins, taking responsibility for most of the interior development. This means the project's key suppliers would work together from day one. The company believes one of the benefits of this integrated approach is that it can create features that it otherwise could not. Many of these involve integrating lighting with other components – for example, because the lighting supplier is working from the outset with the furniture and CMS suppliers, it can integrate illuminated capacitive switches directly into wood veneer. One OEM at least has clearly been impressed, as it has signed up Inairvation for one of its cabin designs. It will be exciting to see what they come up with.

Izzy Kington, editor



Cover image:
Inairvation's mock-up

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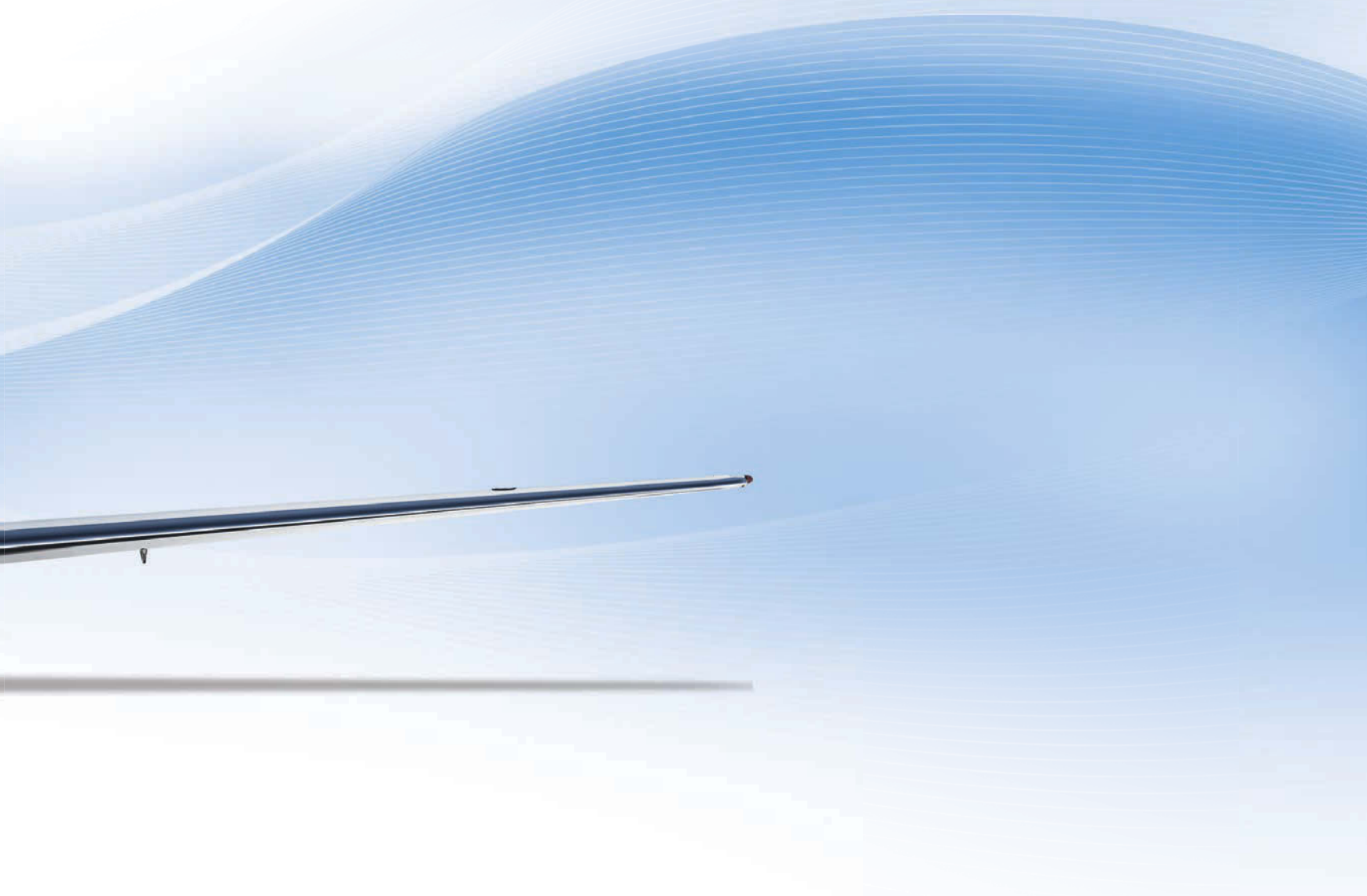
REDESIGNED INTERIOR

TEXTRON AVIATION



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ALL-NEW COCKPIT



EXTERIOR PAINT SCHEMES

“From day one, we will work together so we can offer furniture, lighting, CMS and IFE that is integrated in terms of design and technical aspects. By doing so, we avoid all the extra loops that we usually have in a cabin project – where companies are fighting each other and the OEM is trying to manage it all”

Inairvation

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THE FIRST FRUIT OF THE ALLIANCE OF
LUFTHANSA TECHNIK, LIST, SCHOTT AND DESIGN Q
SHOWCASES THE MERITS OF INTEGRATION
Izzy Kington, Business Jet Interiors International



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A BBJ 787-9 WITH A BUBBLE WALL, DESIGNED BY VIP COMPLETIONS

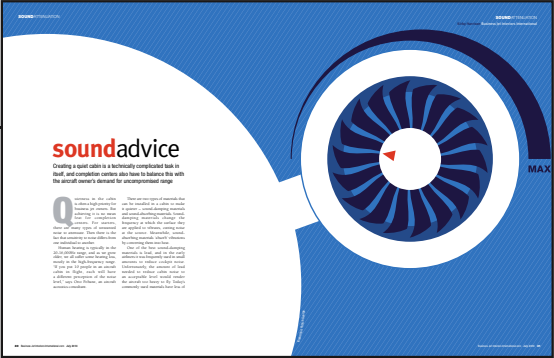
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FEELING THAT CURRENT VIP NARROW-BODIES DON'T FEATURE ENOUGH SPACE FOR THE AIRCRAFT OWNER, SR TECHNICS SET ABOUT A SOLUTION THAT IT SAYS WILL ALSO SAVE TIME AND MONEY
Izzy Kingston, Business Jet Interiors International

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CREATING A QUIET CABIN IS A TECHNICALLY COMPLICATED TASK IN ITSELF, AND COMPLETION CENTERS ALSO HAVE TO BALANCE THIS WITH THE AIRCRAFT OWNER'S CONFLICTING DEMAND FOR UNCOMPROMISED RANGE
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Izzy Kingston, Business Jet Interiors International



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ALTHOUGH 3D PRINTING ISN'T YET ESTABLISHED AS A WAY OF MAKING FINAL PARTS FOR VIP INTERIORS, SOME WITHIN THE INDUSTRY ARE ALREADY FINDING IT USEFUL FOR RAPID PROTOTYPING AND CABIN VISUALIZATION

Paul Eden, Business Jet Interiors International



60 ACJ319 Elegance

BY OFFERING A MODULAR VERSION OF ITS MOST POPULAR AIRCRAFT, THE ACJ319, AIRBUS CORPORATE JETS BELIEVES IT CAN SAVE ITS CUSTOMERS TIME, EFFORT AND MONEY

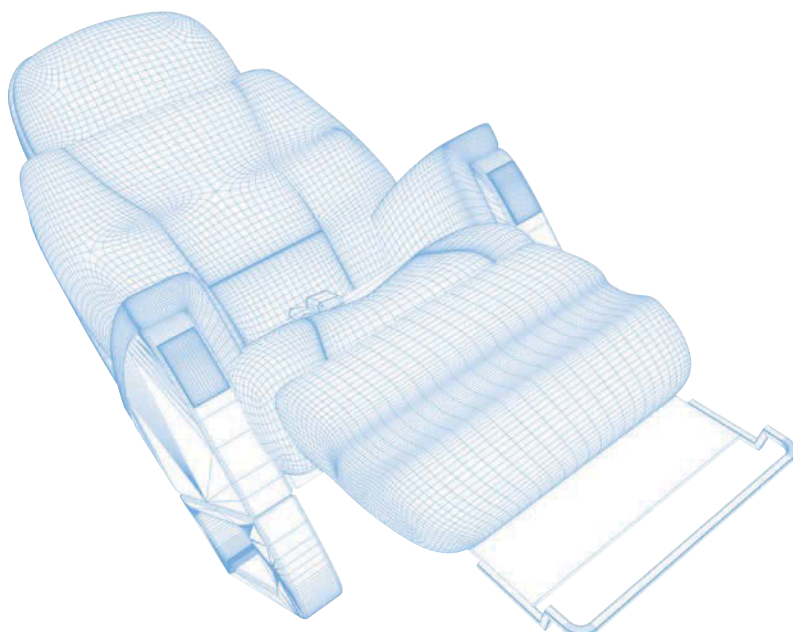
Guy Bird, Business Jet Interiors International



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A ROUNDUP OF SOME OF THE BEST SOLUTIONS FOR CATERING SERVICE ON BUSINESS JETS

Izzy Kington, Business Jet Interiors International



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REMODELED BBJ RESUMES SERVICE FOR PRIVAJET

A BBJ 1 has resumed charter service with Privajet following a six-month interior refurbishment by Jet Aviation Basel in Switzerland. The aircraft features a master bedroom, a lounge area with divans, a private office that can convert into a second bedroom, a dining area with seating for six, club seating and two bathrooms, each with a shower. The aircraft's capacity has been increased from 18 to 19, by replacing a three-place divan with a club-four grouping.

One feature that Privajet is particularly proud of is its new Flying Chef service. In partnership with Yves Mattagne – a two-Michelin-starred chef and owner of Sea Grill in Brussels, Belgium – Privajet's new dining concept involves providing a private chef on board every flight to prepare and serve meals. "We have spent the last six months with Yves Mattagne and his team to develop something unique," commented Jérôme Franier, commercial director at Privajet. "Our cuisine needs to be exceptional and this partnership demonstrates the level of excellence we are aiming for."



Jet Aviation Basel replaced the carpet, re-covered all of the ceiling panels with new materials and refreshed the bathrooms by repainting the showers and replacing the countertops.



The aircraft is equipped with Rockwell Collins' high-definition Venue IFE/CMS system, broadband wi-fi, iPads and HD monitors.



The aircraft's original seats, manufactured by BF Goodrich, were re-upholstered – some in full leather and others with a combination of leather and fabric.

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There are two bedrooms, both equipped with queen-size beds.



The aircraft has a range of 6,000 nautical miles, and is capable of flights of 12 hours.



Q&A: ESTELLE THORIN

DIRECTOR OF MAINTENANCE OPERATIONS FOR LARGE AIRCRAFT AT JET AVIATION BASEL

WHAT WAS PRIVAJET'S BRIEF FOR THIS BBJ 1?

The brief focused heavily on providing comfort for the passengers. IFE and CMS technologies were paramount, and particular attention was paid to the galley equipment, to accommodate the chef employed on board. Privajet's Flying Chef service was developed with a two-Michelin-starred chef.

HOW DID THE AIRCRAFT'S MISSION INFLUENCE WHAT HAS BEEN INSTALLED IN THE CABIN?

The cabin was refreshed for operation in the upmarket charter business. Privajet's mission to provide an exceptional food service, including an onboard chef, required a high-end, exceptionally equipped galley. The final galley we created is unique. Exceptional connectivity and IFE equipment was also crucial.

WHAT WAS THE MOST CHALLENGING ASPECT OF THE REFURBISHMENT?

Combining this extensive refurbishment project with a heavy maintenance 12-year check was extremely challenging. As a renowned MRO and authorized Boeing service center, we offer a complete BBJ Next Generation 12-year service package to our BBJ customers. The 12-year tip-to-tail service inspection requires extensive overhauls of all major aircraft systems and structures, which must be removed and reinstalled. To help reduce aircraft downtime, we offer the 12-year BBJ service inspection in combination with other maintenance or refurbishment work, such as exterior painting and avionics or CMS upgrades. Still, coupling the 12-year check with a refurbishment of this magnitude was a considerable challenge.

DO YOU HAVE ANY MORE PROJECTS LINED UP THAT YOU CAN DISCLOSE?

We are currently preparing for another 12-year check that will involve the replacement of IFE equipment and a cabin refurbishment. That project will be on a smaller scale than this one, as the seats will not be refurbished and the carpets and panels will not be replaced. There are also a couple of other projects in the pipeline, but it's still too early to discuss those.

PINBOARD



A recent BBJ project by Edese Doret



An Art Deco-influenced BBJ concept by Lufthansa Technik, with seats inspired by those found in classic English cars



A G5 refurbishment concept designed by Unique Aircraft, visualized by ACA-3D



A private office concept for an ACJ330, designed by Associated Air Center



The New York refurbishment design by OHS Aviation Services and Callies Design, rendered by ACA



A BBJ completed by Greenpoint Technologies



The latest narrow-body concept produced by the designers at TAECO



A BBJ bedroom concept by Associated Air Center

LAUNCHES

The new chair platform developed by Lufthansa Technik and Pierrejean Design Studio



TrueNorth Avionics' latest wi-fi platform, Optelity

LUXURY LIVING



Midipy magazine holder, £210 (US\$356) from MPD Shop



Midipy 100% wool throw, £120 (US\$204) from MPD Shop

Large Porsche Design CosmoBag in June Bug, €1,890 (US\$2,557)



Bond No. 9 Shelter Island fragrance, US\$260 (100ml), US\$195 (50ml)



Pure + Solid Platinum MasterCard, made from pure platinum, €28,690 (US\$39,094)



BEST OF THE WEB

Jennifer Coutts Clay's *Jetliner Cabins* is now available as an e-book app: www.jetlinercabins.com

Daher-Socata has released a new app for customizing the TBM 900's cabin: www.tbm.aero/index.php/tbm-900/media/mobile-apps

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COMPLETIONS ROUNDUP

THIS QUARTER'S ANNOUNCEMENTS FROM COMPLETION CENTERS AROUND THE WORLD

TORONTO, ONTARIO, CANADA:

Field Aviation received an FAA STC for its proprietary long-range fuel modification for the Bombardier Dash 8 series 100/200/300. The company was also awarded a contract by Bombardier to modify the airframe and interior of a CRJ700 NextGen special-mission aircraft.

PETERBOROUGH, ONTARIO, CANADA:

Flying Colours Corp completed the first phase of its three-phase expansion plan, a 1,858m² extension to an existing hangar. The space is equipped for refurbishments, avionics installations and upgrades, heavy maintenance and completions.

KIRKLAND, WASHINGTON, USA:

Greenpoint Technologies was acquired by Zodiac Aerospace.

ARDMORE, OKLAHOMA, USA:

King Aerospace Commercial Corporation was contracted to perform maintenance and interior modifications on a BBJ 737-322. The downtime is expected to be two-and-a-half months.

DENTON, TEXAS, USA:

Odyssey Aerospace Components won a cabinetry and interiors contract for two BBJ 787s. The program includes monument engineering, systems integration, manufacturing and installation.

BIRMINGHAM, UK:

Monarch Aircraft Engineering Limited (MAEL) was contracted by TAG Aviation to fit seats, a galley, overhead storage and a wi-fi system on a Boeing 757-200ER.

NORWICH, UK:

KLM UK Engineering has transformed a Boeing 737-400 into a business jet with 68 seats for GainJet.

ST. LOUIS, ILLINOIS, USA:

Jet Aviation St. Louis installed Aircell's UCS 5000 cabin media server on a Bombardier Global. The contract was signed immediately after Aircell announced the release of the router and media server in October 2013.

INDIANAPOLIS, INDIANA, USA:

Comlux America was awarded the maintenance and refurbishment contract for a BBJ based in Asia. The aircraft should spend four months on-site. The work includes a 12-year check, painting and a major cabin refurbishment. This will include re-upholstering seats, laying new custom-made carpet, and reworking valence panels and bulkheads.

ZURICH, SWITZERLAND:

SR Technics unveiled a cabin for narrow-body ACJ and BBJ aircraft. See page 20 for more.

SINGAPORE:

Jet Aviation Singapore is now operating from a new 7,500m² facility, which includes a 420m² interior shop providing refurbishments.

TOULOUSE, FRANCE:

Airbus Corporate Jet Centre (ACJC) delivered two ACJ319s with similar layouts but different decor. The outfitting of both was managed by Aviation Link of Saudi Arabia. ACJC also recently signed three outfitting contracts in Asia, including the design and completion of an ACJ319. ACJC's modular design for the ACJ319 Elegance was also unveiled – see page 60 for more details.

BASEL, SWITZERLAND:

Jet Aviation Basel is to employ upholstery and polymechanic apprentices to undertake three- and four-year apprenticeships respectively. In other news, Embraer has extended the company's service center authorization to include interior and repair services for Legacy 600 and 650 aircraft.

GENEVA, SWITZERLAND:

TAG Aviation's maintenance center has been granted EASA Part-21 Subject J Design Organisation Approval, entitling it to design, certify and approve modifications and repairs encompassing interiors, galleys, avionics and secondary structures.

MUNICH, GERMANY:

Ruag Aviation, Satcom1 and Emtec are providing an EASA-approved add-on connectivity solution for Dassault Falcon 7Xs. Based on Inmarsat's SwiftBroadband High Gain Antenna service, it can stream data services of up to 432kbps.

DUBAI, UAE:

Jet Aviation Dubai has been appointed an authorized service station and dealer for Satcom Direct.

BROUGHTON, UK:

Marshall Aviation Services installed a Garmin G1000 full glass cockpit on a Beechcraft King Air 300.

HAMBURG, GERMANY:

Lufthansa Technik has unveiled a pre-customized VIP cabin that will be offered for narrow-body ACJs and BBJs. The modular concept enables customers to combine different cabin elements. For the ACJ319, Lufthansa Technik can offer 96 variations, for a longer aircraft like the BBJ 2 even more combinations are possible. Lufthansa Technik also recently unveiled a new family of chairs dedicated to VIP and business jet aircraft, in cooperation with Pierrejean Design Studio.

ERFURT, GERMANY:

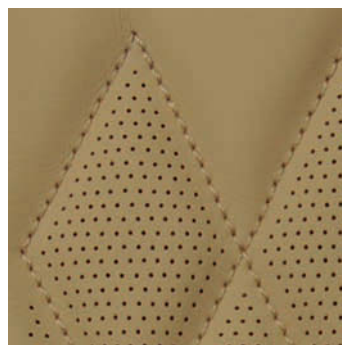
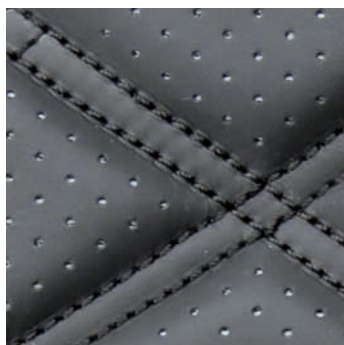
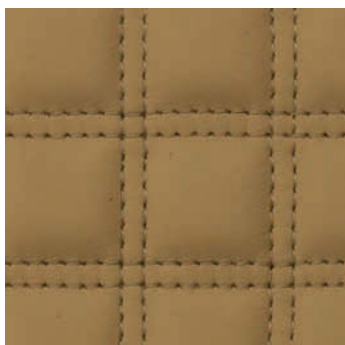
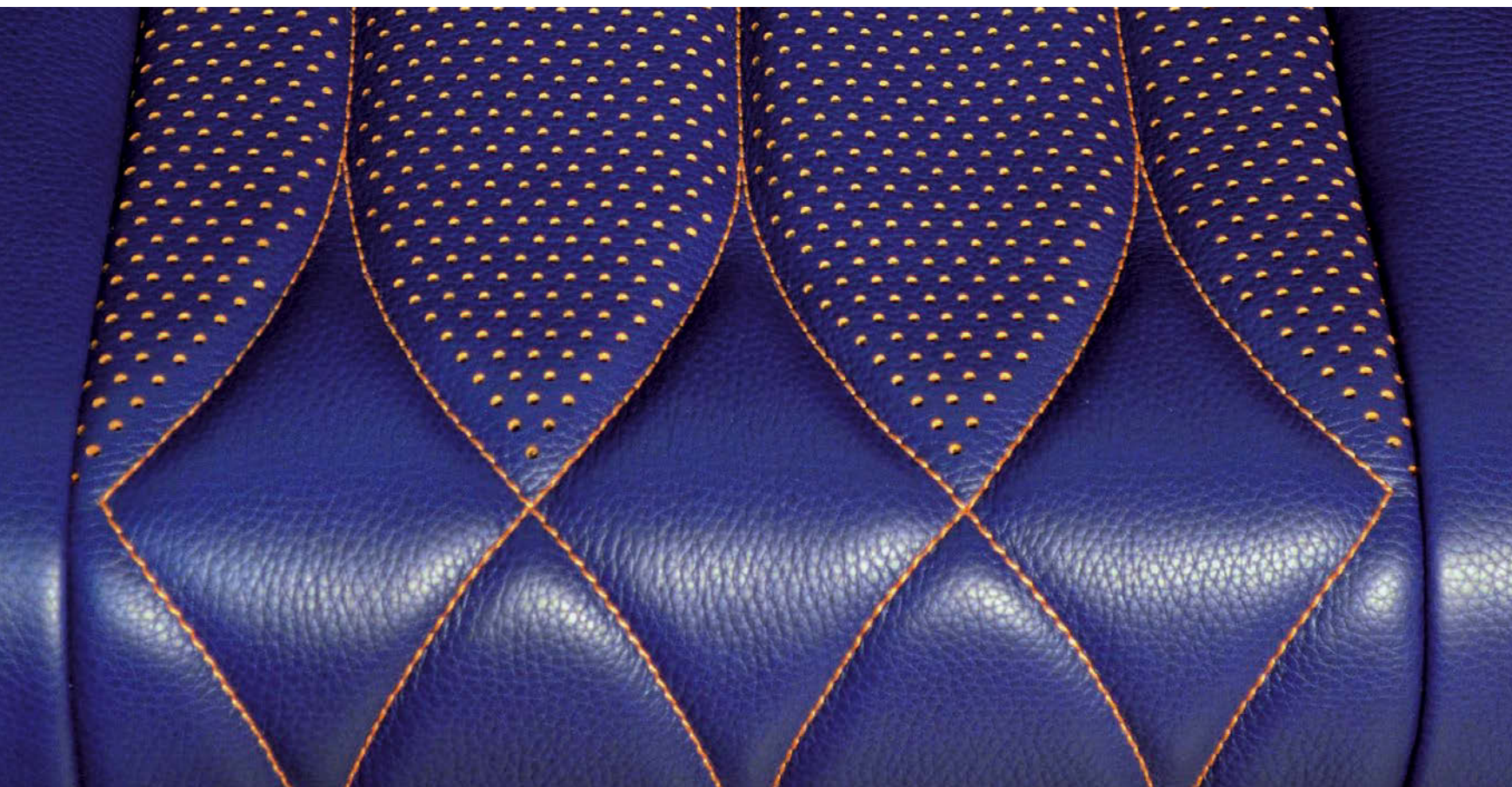
HAITEC Aircraft Maintenance has launched a VIP maintenance subsidiary. It has approvals for G550 and nearly all types of Boeing and Airbus aircraft. Besides line and base maintenance, it will offer refurbishment and interior design.

ISTANBUL, TURKEY:

AMAC Aerospace's facility in Istanbul has become a Dassault-authorized service center.

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A stylized graphic of a hand holding a pen, positioned below the word "AERISTOCRAFT". The hand is depicted in a simple, elegant line style, with the pen tip pointing towards the bottom right.

LIQUID ASSET

VIP Completions of London created this design for a private client's BBJ 787-9. The cabin accommodates 16, with large areas set aside for the owner's private use. The modern interior is notable for its flowing design, inspired by running water. This influence is evident both in the layout and in the curves of individual items. The lounge even features a bubble liquid wall, which Michael Wilson, client representative at VIP Completions, believes will be the most challenging aspect to implement. "The bubble wall is a first," he says. "We sought specialist input regarding the technology – taking care with the materials and techniques used to minimize the volume of liquid."

The bubble wall will actually be very shallow, with a mirror finish on the back to create the illusion of depth. It will contain a very low quantity of liquid and will be up- and back-lit with LEDs. "The design was undertaken with care, as we had to ensure it was achieved in accordance with regulations," says Wilson. "The installation will be non-structural. The positioning in the aircraft is important, both for visual effect and to minimize stress from the airframe."

The interior also makes great use of lighting and reflective surfaces. The color scheme – white, black, silver and gray – provides a neutral backdrop for mood-lighting. As well as being able to change the color of LEDs in the bubble wall and behind the bar, the owner will be able to change the color and intensity of a backlighting strip that runs the length of the lounge, where the ceiling meets the wall panels. They can also easily refresh the cabin through the linen and cushion covers, as replacements in various colors will be stowed on board.

Wilson says the aircraft is likely to be completed in 2017/2018, depending on final contract signatures and availability of the green aircraft.

BLACK LEATHER

As well as surrounding the bubble wall, this textured black leather is used on bulkheads in the bedroom (including behind the bedhead) and the en-suite.

TEXTURE

The design utilizes many reflective and textured material surfaces. The detail around the window shades is a good example of the latter, providing a feeling of depth.



GUIDED TOUR

BUBBLE WALL

The moving liquid is up- and back-lit with LED lights to provide a relaxing feel. Multiple color changes are possible, controlled by an app on the client's smartphone.

LOUNGE

The lounge, with its lateral split and lack of straight lines, is a good example of the flowing design philosophy of this aircraft. The curved shape of the seating was also influenced by flowing water, designed to offer a relaxing ambience. The open-plan seating arrangement is designed to enable the client to use the area for formal and informal discussions, post-dinner relaxation, watching films and entertaining guests. A clustered lighting arrangement – also a feature of the owner's suite – provides a star-like display. It is created by suspending backlights and Swarovski crystals from the ceiling.



BEDROOM

Instead of business- or second-class seating, the client decided to use the aft third of the aircraft for personal use. This section features a full-width bedroom, a private study with make-up area and a large en-suite bathroom with shower.



EN-SUITE BATHROOM

The en-suite features a walk-in shower, a large personal area and a make-up table. Reflective finishes have been used on the shower and bathroom doors, in contrast with the wood-look finish used on the cabin doors. Flat mono colors were used on other surfaces, such as the flooring and leather.

CONTACT:

contact@vipcompletions.com
www.vipcompletions.com



DESIGN PANEL: LIGHTING

SPECIALISTS SHED LIGHT ON THE INTRICACIES OF CABIN LIGHTING AND POINT TO TECHNOLOGIES AND TRENDS THAT INDICATE AN EVEN MORE EXCITING FUTURE

RACHEL BAHR: The challenge lies in developing certified custom lighting for every aircraft project. Interior designers are incorporating lighting as part of the unique element of the cabin design.

RAFAEL TAPIA: The challenges vary according to the installation. For example, with ceiling lights the light is contending for space with other components, such as oxygen boxes, PA speakers and air gaspers. With e-path lights, we want them to look discreet while maintaining the FAA's line-of-sight requirements. With backlit panels, the challenge is to determine the spacing required for the lights and to create the glow effect. With mood lighting strips, which usually come in set lengths, the engineer has to find the correct length to prevent shadowing effects and maintain a constant light wash, even around corners. More general challenges involve ensuring there is enough power available, and that there is color consistency between the various light sources.

WHAT ARE THE MAIN CHALLENGES
IN ILLUMINATING A CABIN?

JACQUES PIERREJEAN: For each project, we have to be innovative and propose a decorative lighting concept offering a nice design, good technical lighting for the whole cabin, easy maintenance and that can support take-off and landing. There are now a lot of certified LED sources on the market – offering good quality, easy integration and a choice of lots of sizes and thicknesses. There are also a lot of reading and spotlights available, although we design custom products most of the time. However, creating decorative lamps, wall sconces and chandeliers can be quite challenging, because there are not so many companies making these products.

ANTOINE MERGOT: The main challenge is to enable the customer to create different luminous ambiances inside the cabin. With mood lighting, for example, the customer wishes to replicate the light experienced at each point of the day on the ground. The final installation must look high end, so the products have to be integrated with high-end plating, leather and other materials.

THE PANEL

JACQUES PIERREJEAN:

We use indirect lighting to provide a daylight effect, target lighting for specific functions such as working and reading, and decorative lighting to provide a soft ambience.

ANTOINE MERGOT: Our latest lighting system, Be-Bop'tic, is designed to enable bright decorative effects, to highlight elements such as monuments, doors, windows and seats, and create dynamic color scenarios. PGA develops tailor-made products as required by each client. We also study new materials to meet customers' needs.

HOW HAVE YOU RESPONDED TO THESE CHALLENGES?

RAFAEL TAPIA: For the backlit panels, we use mock-ups and work with the vendor to determine the correct light installation spacing and the distance from the lens needed to create the glow effect. We install the e-path lights in line with sideedge panels to keep them visible yet under the toe-kick, and under seat arms – outside the walking area.

RACHEL BAHR: Emteq has built modular products that can be customized for multiple applications. We have also built flexibility into our business model so we can support unique applications, supplying custom lights for a single aircraft.

RACHEL BAHR: People now expect connectivity in every aspect of their lives – this will be a key influence on aircraft lighting. We believe that lighting will be connected, intuitive and able to provide a unique experience based on preferences learned for each passenger. This is not far from reality today.

JACQUES PIERREJEAN: We are working closely with some companies to produce decorative striped inlay lighting, inspired by the automotive industry, and are also researching a fabric lighting concept. In addition, we are looking for solutions to integrate information signs with general cabin lighting so we can minimize the number of holes in the ceiling.

WHAT DOES THE FUTURE HOLD FOR LIGHTING?

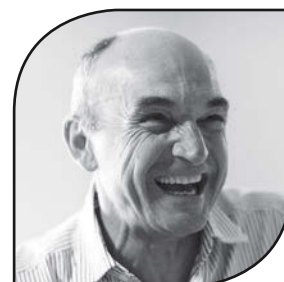
RAFAEL TAPIA: Aircraft lighting will take more inspiration from treatments used in the hospitality and residential markets. One trend we are seeing is to light the floor in unexpected places. It could also be possible to integrate can lights with other components, such as air gaspers.

ANTOINE MERGOT:

The trend for the future will be OLED. PGA must develop with a constant focus on innovation.



RACHEL BAHR
director of business
development and
marketing at Emteq



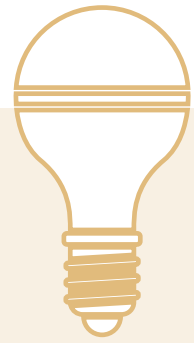
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RAFAEL TAPIA
lead designer at
Associated Air Center



RACHEL BAHR: Currently, lighting is designed around the rooms and zones of the aircraft. As passenger expectations increase, we believe that hyper-personalization will become the trend. The ability to interact with the lighting in one's personal space within a larger room will be a differentiator.

JACQUES PIERREJEAN: The internal part of the fuselage could be covered with light foils to reproduce daylight. We have tried to realize this idea using LEDs, but the supplier felt certification was an issue. You could also illuminate the floor to give the feeling of floating in the sky. My feeling is that nothing seems impossible at this time; the only problem is the cost of such products. It's always difficult to start a new development without an idea of how many will be sold.

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ANTOINE MERGOT:

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RAFAEL TAPIA: I would like to introduce motion-activated lights. Imagine walking down the corridor, with lights activating automatically to guide your way. It would also be fun to use holograms to create temporary walls to separate larger spaces. I'd also like to see thinner paper backlight sources that can be used in various settings and medias. One special installation that we already achieved was a unique suspended translucent ceiling fixture using mood backlighting, mood wash lighting and fiber optics to complement the organic and translucent elements.



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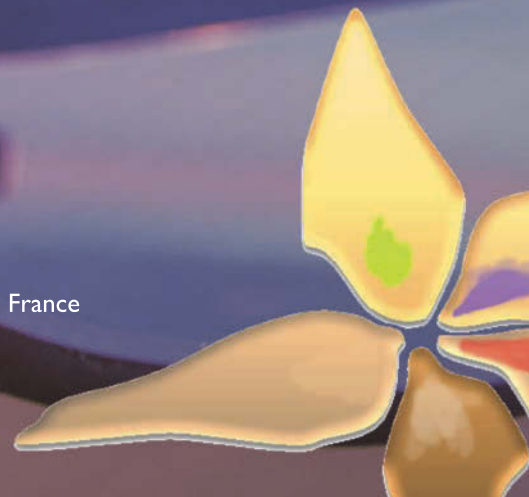
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Feeling that current VIP narrow-bodies don't feature enough space for the aircraft owner, SR Technics set about a solution that it says will also save time and money

Eric Jan, head of VIP interior design at SR Technics, makes some attention-grabbing claims of the interior the company has developed for VIP narrow-bodies. "We cut a third off of the average completion time, we give 100% of the space to the customer, and it costs 20% less than a normal VIP aircraft," he says.

The product is the culmination of 18 months of in-house research and development, including thorough analysis of customer needs and current offerings on the market. The company came to the conclusion that these were not in alignment.

Part of the research was to ascertain how much of the cabin was available for the VIP to actually use in current narrow-body offerings. Jan concluded

that roughly 30% of the space is dedicated to staff and flight crew, 40% to guests and 30% to the VIP. "Of course, the VIP can use the guest area as well, but it's not so private," he adds. "Offering only 30% for the VIP on such an expensive product is incredible."

Jan says that private VIP areas such as bedrooms and bathrooms, which he calculated to cost US\$10m on average, are used on only 20% of flights. "This



is because 80% of flights are only three to four hours long, and these bedrooms are 100% dedicated to sleeping. So US\$10m is not properly invested.”

Space crusader Jan set out to create a cabin that the VIP could use in its entirety. “Believe it or not, this has never been done on an aircraft of this size,” says Jan. “There is always space that is not accessible to the VIP.”

To start, he created a large entrance area. Unless curtains are drawn, from here passengers can see straight down the cabin to the bathroom at the very aft, because nothing is installed down the middle, and there is a wide space between dividers. Finding current layouts complex to navigate, Jan was adamant that his would offer a crystal-clear circulation. “You know where you’re standing, you know where you

1. Widely spaced dividers mean items are easy to bring down the cabin during installation



can go up to,” he explains. “Somehow this all helps the passenger to feel safe and good, subconsciously.”

The entrance area has a couple of seats where passengers can take off their shoes or put on overshoes. Although this is common practice on VIP aircraft, Jan says designers very rarely plan for it.

On long flights, he envisages the area being used as a crew rest, but for shorter trips he has designed in another functionality. When the seats are swivelled to face aft, a desk is deployed from a cabinet and dividing curtains are closed, the space becomes a secluded office.

Leaving the entrance, passengers pass down a split galley that is wet on one side and dry on the other. It is designed as an integral part of the cabin, although it can be closed off with soundproofed curtains if required. Jan says customers nowadays want an open galley. “People want to help themselves,” he says. “Even VIPs use their kitchens at home by themselves.”

Next is the lounge area, which is designed to be flexible and informal. “Today too many places in the aircraft are locked to only one function,” says Jan. “This is a more informal area; you can sit, sleep, eat and work.”

There are two hi-lo tables, which, when raised, can slide together to form

**TODAY TOO MANY
PLACES IN THE
AIRCRAFT ARE
LOCKED TO ONLY
ONE FUNCTION**

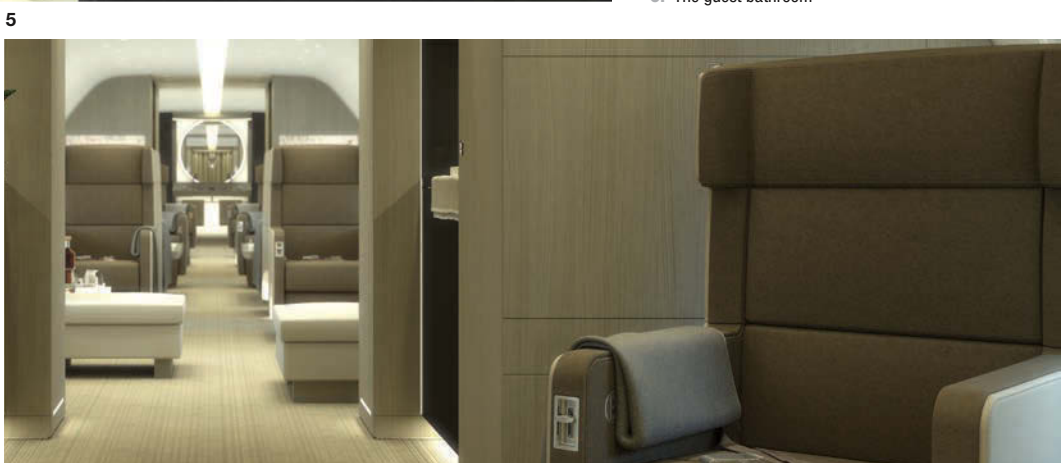
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2. The standard of finish will be consistent throughout the aircraft
3. The new shell system integrates lighting, ventilation, decompression and electrical systems
4. The open galley and entrance area
5. There are two seats in the entrance area
6. The guest bathroom



PEOPLE WANT TO HELP THEMSELVES; EVEN VIPs USE THEIR KITCHENS AT HOME



a working surface, and they can also be unfolded to create a larger table for meetings or dining. There are also ottomans, which Jan envisages being used as footstools or low tables, the latter a trend he has noticed in hotels.

After the lounge is a lavatory and a storage area, which can be closed off by a curtain. Beyond a set of sliding doors is the private lounge and en-suite. Jan chose to position this area at the aft for privacy, and also so space wasn't wasted on having to have a corridor. Rather than fill it with a double bed (although one can be fitted if requested), Jan has included two daybeds that convert to a bed for two people when needed. "We have implemented a layout that we believe is more functional," he explains. "A sleeping area is only used 20% of the time. Here there are daybeds, so you can sit or even have meetings without feeling like you are on a bed, but you can also sleep if you want."

The bathroom is intended to feel like part of the lounge, another trend picked up from the hotel industry.

Natural beauty

For this product, a new window system was developed with an outside partner. One shade comes down from the top and another comes up from the bottom. The passenger can adjust these shades, leaving a gap or overlapping them. A third shade can also be deployed to block light completely.

“Natural light at this altitude is so beautiful,” says Eric Jan, head of interior design at SR Technics. “Most of the time it is not filtered properly on a private aircraft – it is either blocked or left fully open, so there is too much light. An aircraft has the uniqueness of being up in the sky and having a distinctive light. You can play with this once you filter it properly, and this is what we wanted to enable.”



“We wanted to make it a bathroom that you would be happy to leave open,” says Jan. Obviously the bathroom can also be closed off.

Reducing clutter The entrance area, galley and bathrooms are fixed areas that will be the same on every project (apart from the materials used). In the lounge and the VIP lounge, customers can specify their ideal configuration from four categories of pre-engineered furniture items – a seat; a storage unit; a table; and a bed, daybed and three- and two-place divans.

Rather than installing bulkheads, SR Technics’ product uses full-height multifunctional cabinets to divide the interior – integrating items such as monitors, desks, cupboards, dividing systems like curtains and doors, and more. SR Technics says bulkheads are unnecessary and these cabinets entail the same amount of certification work while offering more functions.

Jan has also specified what type of material each element needs to be

7. The cabin has a new light filtering system
8. The VIP bathroom
9. The solution can be installed on narrow-body ACJ and BBJ aircraft

finished with. For example, cabinets should be veneered in wood, seats should be covered in leather, and galley countertops should be faux stone. However, the client is free to choose anything they like within those material categories.

“Normally in a VIP interior you would have 30-40 materials, which is difficult for the customer, because you may have this one special material that becomes unavailable and then you need to change everything,” says Jan. “Our cabin has 10 materials, which the customer can stock more easily.”

Essential viewing SR Technics has also minimized cabin electronics – there are no in-seat monitors or call buttons for example. “VIPs don’t have call buttons at home, so why would they need them in the aircraft?” asks Jan. He believes the habit of installing these items is inherited from smaller jets. “On business jets those things are needed, but on a narrow-body they’re not needed and they just add weight, cost and complexity. Plus when these things fail, changing them is costly.”

He also blames some customer representatives. “They try to protect

OUR CABIN HAS 10 MATERIALS, WHICH THE CUSTOMER CAN STOCK MORE EASILY



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themselves by listing everything possible, just in case,” says Jan. “So you have a DVD player, in-arm monitors, plenty of plugs, but the reality is you don’t need them. A Blu-ray player could cost up to US\$100,000, because you have to connect it, modify your AV system software, run extra power runs, make a rack to hold it, adjust fuses, and the unit itself is not cheap. We’re challenging the industry, saying, ‘Give the owner what they need but no more, because they don’t want to pay more’. Why would they want to fly around with a very expensive DVD player that they only use once? Why don’t you install an HDMI or a VGA point somewhere instead, and they can plug their own DVD player in – saving US\$99,500!”

On SR Technics’ product, IFEC is provided through iPads and wi-fi, a few big screens and a couple of LAN ports. “We thought about what the customer needs and what they use at home. You get more flexibility by using iPads and maybe a laptop pre-loaded with movies from the iTunes store. The old system was to pre-load an installed DVD player – this is not flexibility. There’s no point in using this technology anymore. The screen quality is not as good, it becomes obsolescent and it’s very costly to maintain. An iPad costs nothing compared with an in-arm monitor and you have a lot more functionality. The world has changed, there are plenty



of new tools, and it’s important to move away from old ways of thinking.”

Ready to go SR Technics launched the product at EBACE 2014, showing customers a design package complete with contractual drawings and precise details of everything from how many sockets there are to the direction of the wood grain. “It’s not a concept, it’s

10. SR Technics’ in-house design team
11. Divans and seats will be built around products supplied by other companies

a solution,” says Jan. “It has been studied to a very high level. If the customer wants to sign tomorrow, we can go ahead with it. Everything has been defined – all the materials, the quantities, everything.”

Jan believes this means a cabin could be defined in days rather than months if the customer has only minor amendments. For the completion itself,

3

material packages have been developed as an inspirational starting point

4

categories of pre-engineered furniture items are available

10

materials can be specified

18

months of research and development went into the product



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Not a modular cabin

SR Technics' Eric Jan is keen to stress that this is not a modular product – cabins are created through combining the four furniture elements in the lounges rather than by mixing and matching pre-engineered cabin sections.

He believes modular products don't offer particular advantages. "They will take the same amount of time as a normal completion because you have to outfit in the traditional way," says Jan. "If you want to change a kit, you have to remove certain parts again, because they are in the way."

SR Technics also avoided the modular approach because it didn't want to spend a lot of time and money pre-engineering modules that might not be used. "I wonder if these companies invest in the engineering for all these modules up-front without having a customer and have to assume that maybe 70% or 50% of this engineering will be wasted," says Jan. "Engineers are expensive manpower. You could invest 3,000 hours per module or more because you need to do the seat build-up and everything; it's a huge investment."

SR Technics estimates nine months for the first green aircraft, reducing to eight months and possibly six months after the third aircraft.

The main time saving should result from the wide spacing between the dividers. Fixed areas will be installed first, then SR Technics is free to install everything else in any order; they don't have to work from the aft to the front, because they don't have to dismantle dividers and other elements to get items down the aisle.

12. SR Technics has a policy of taking on one VIP project at a time, at its hangar in Zurich, Switzerland

13. The company is showcasing the product in three styles – this is called Modern

14. The Elegant scheme

15. The Classic design



12

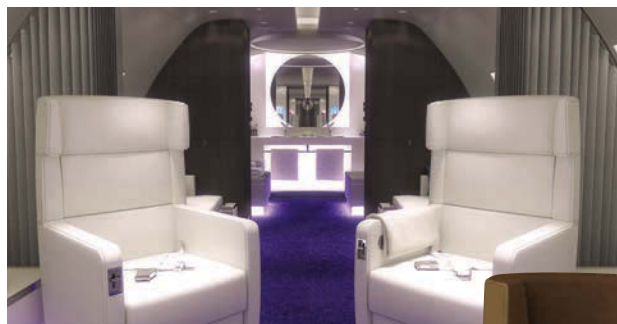
"This will allow us to bring elements into the cabin in record time," says Jan. "This is very important for us when we install the cabin, but also for the customer in the long term, when they want to sell the aircraft or when their own needs have changed. When they want to reconfigure the cabin we can make changes in nearly no time. It is a simple, effortless, upgradable product – a very good investment."

The product is not intended for clients who want a one-off, completely customized cabin, which SR Technics also offers. With this product, the company is targeting customers who see their aircraft as investments that have to be easy to resell; heads of state who need a private aircraft but are under political pressure not to be seen as opulent; charter and time-share operators; and an upcoming generation more interested in a simplified style.

"Today, our customers don't have the same lifestyle; they are less formal and more independent, they travel with fewer staff and they invest a lot in modern interior functionalities," says Jan. "There is a big discrepancy between these needs and what the market offers."

Jan believes other cabins do have a high level of finish, but often reflect "some old cliché of what is luxurious". He points to the Armani Hotel in Dubai as an example of changing tastes in the Middle East and Asia. "This is what the new generation likes," says Jan. "It's not all gold, marble and chi-chi."

With its toned-down but elegant luxury, multifunctional spaces and opportunities for time and cost savings in completion and refurbishment, SR Technics is confident that its new product is exactly what the market is now looking for. **END**



13



14



15

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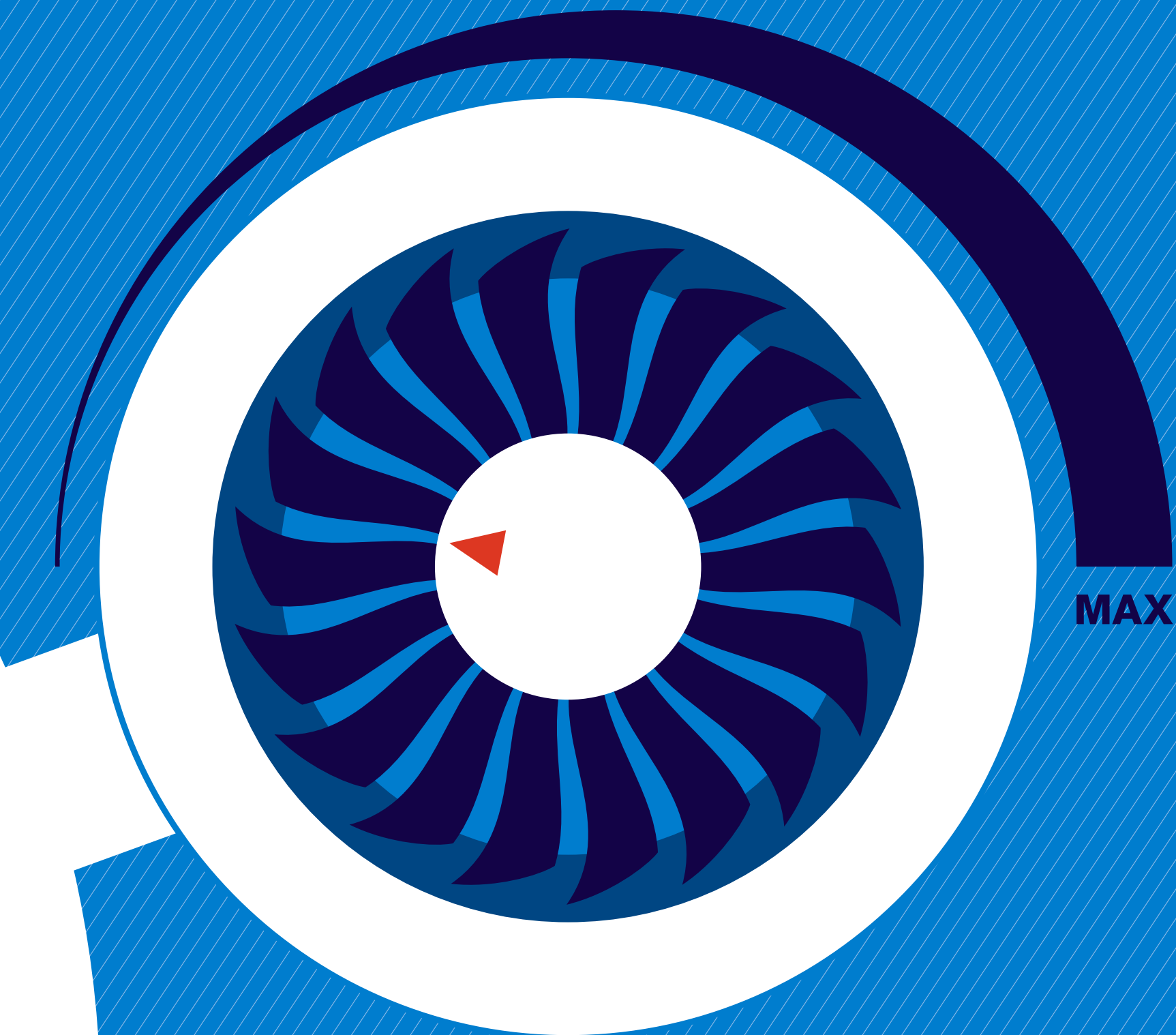
Creating a quiet cabin is a technically complicated task in itself, and completion centers also have to balance this with the aircraft owner's demand for uncompromised range

Quietness in the cabin is often a high priority for business jet owners. But achieving it is no mean feat for completion centers. For starters, there are many types of unwanted noise to attenuate. Then there is the fact that sensitivity to noise differs from one individual to another.

Human hearing is typically in the 20-16,000Hz range, and as we grow older, we all suffer some hearing loss, mostly in the high-frequency range. "If you put 10 people in an aircraft cabin in flight, each will have a different perception of the noise level," says Otto Pobanz, an aircraft acoustics consultant.

There are two types of materials that can be installed in a cabin to make it quieter – sound-damping materials and sound-absorbing materials. Sound-damping materials change the frequency at which the surface they are applied to vibrates, cutting noise at the source. Meanwhile, sound-absorbing materials 'absorb' vibrations by converting them into heat.

One of the best sound-damping materials is lead, and in the early airliners it was frequently used in small amounts to reduce cockpit noise. Unfortunately, the amount of lead needed to reduce cabin noise to an acceptable level would render the aircraft too heavy to fly. Today's commonly used materials have less of





THE MORE MATERIALS YOU ADD, THE MORE WEIGHT YOU ADD, AND THE PENALTY IS RANGE AND PERFORMANCE

a weight penalty than lead, but they still leave aircraft owners and completion centers with a balancing act to do. “The more sound-attenuating materials you add, the more weight you add, and the penalty is range and performance,” explains Daron Dryer, director of engineering for Comlux Aviation in Indianapolis, Indiana, USA.

Targeted approach These days the focus is on finding the right combination of damping and absorbing materials, and applying those that are best suited for a particular noise source. Common sources of noise affecting the aircraft cabin include the engines, air passing over the skin of the aircraft, pumps, gears, fans, the fresh-air circulation system and even cabin

pressurization. Each of these sources of noise produces a different frequency, so each necessitates a different mix of noise-damping and -absorbing materials, typically assembled in layers of varying thicknesses.

Sound levels In addition, the different nature of these noise sources presents a further complication, points out Mike Weisner, chief customer engineer for Greenpoint Technologies of Kirkland, Washington, USA. “When the overall or background cabin noise is reduced, other noise sources, such as pumps, become more noticeable,” he says. “They haven’t become louder, it’s just that it’s easier for the human ear to detect them.”

The cabin design also affects noise. “When you install a bulkhead or wall, the noise signature of the cabin changes, not merely by virtue of its presence, but by the fact that it can either amplify or absorb noise in varying frequencies,” says Pobanz.

Pobanz further notes that the high amount of customization on today’s business jets, in particular the narrow- and wide-body aircraft, makes noise

L-3 seeks the quieter cabin

Ken McAlpin, vice president of VIP and head-of-state programs at L-3 Platform Integration in Waco, Texas, USA, says the demand for a quiet cabin is now a default expectation. “Rather than being a feature with elastic demand, VIP customers expect a quiet aircraft cabin as a consistent requirement,” he says.

This usually translates into a maximum average sound level of 50dB SIL. The final evaluation is done at normal cruise altitude, speed and engine thrust, under normal interior airflow and pressurization conditions.

L-3 has the ability to create its own cabin noise-reduction packages, but typically performs a make/buy analysis on each program to determine the best approach. Many of its cabins require a cooperative effort by L-3 and its suppliers. “We have used several acoustics solutions suppliers and find that having a competitive supplier base yields ingenuity and competitiveness,” comments McAlpin. “Like the rest of the supplier base in the VIP industry, capacity is a major consideration.”

One new technical challenge McAlpin has noticed is today’s decompression venting requirements, which drive larger vent areas, providing pathways for noise to migrate to the cabin.

The company is currently working on two head-of-state BBJ 747-8s, on which sound elimination/damping technologies will be employed.



1. A circumferential array of microphones from PCB Piezotronics, used to measure acoustic pressure to determine noise source location
2. A technician at L-3 preparing a green BBJ 747-8 for completion
3. Greenpoint engineers working on a BBJ 3

reduction more difficult because each cabin presents its own particular acoustic challenges.

And another factor, pointed out by Eamon Halpin, founder and CEO of Flight Environments, is that different parts of the cabin feature different harmonics and resonance frequencies. The company, which provides thermal and acoustic insulation systems, is currently involved in developing an acoustics package for one of the first BBJ 787s. It has developed some “new and less conventional materials” and is conducting acoustic chamber testing for the project.



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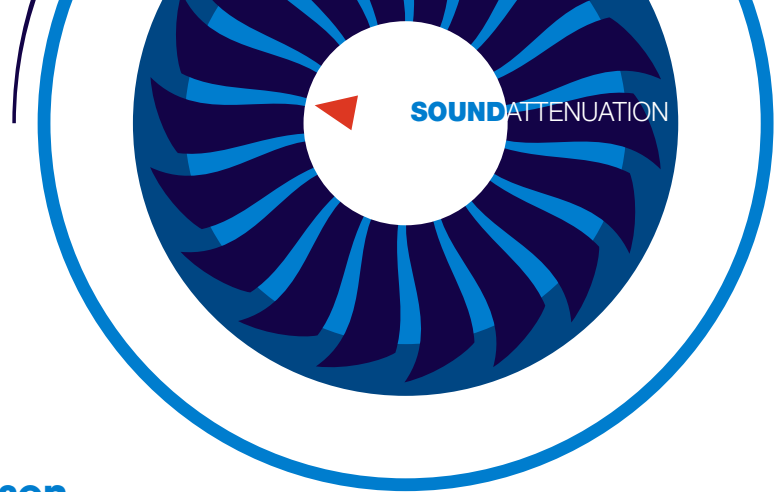
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So with the increasing demand for quietness, how far has the technology progressed? In the early 1960s, a JetStar would typically have a cabin noise level of about 72dB speech interference level (SIL). By the late 1970s, the first of the Challenger 600 series from Bombardier rang in at slightly less than 50dB SIL. Today, ACJ and BBJ narrow- and wide-body jet cabins often average well under 50dB.

To provide a comparison, highway traffic has an average noise level in the 75dB SIL range at a distance of 75ft, a business office is typically about 50dB SIL, and a whisper in a library would register approximately 40dB SIL from 6ft away.

Lower expectations “Many customers would like their entire BBJ cabin to be around 48-50dB SIL,” says Sue Hart, business development manager at Altitude Aerospace Interiors of New Zealand. “Their levels of noise acceptance will vary. Their preference for the master stateroom and VIP lounge will most likely be a lower sound level than in the galley, lavatories and crew rest area.”

“The best I’ve ever achieved was in a Global Express, which was 43dB SIL in the back and 45dB SIL in the front,” claims Pobanz.

Comlux, says Dryer, has got interior noise down to 47.5dB SIL on a BBJ 3. “The typical ACJ cabin noise level allows interactive speech at a distance of 1-2ft; we have now reduced the



Q&A: Derrick Jansen

manager of engineering integration at Jet Aviation St. Louis

What is the most challenging aspect of producing a quiet cabin?

Mostly, noise attenuation efforts affect the weight of the aircraft. Customers can choose many soundproofing options that do not drastically affect the weight, but the most effective applications involve adding soundproofing material, which does add weight. Some options add no weight, some add a couple of pounds, and some add hundreds of pounds. We have developed a highly customizable package that can be mixed and matched to suit the customer’s needs. Our contract sound levels are typically 72dBA. On average, a typical aircraft without special soundproofing comes in at 69-70dBA. Our quietest cabin came in at 64.7dBA and 46.6dB SIL – 10% quieter than our typical contracted sound level.

Do noise considerations affect your choice of materials and fixtures?

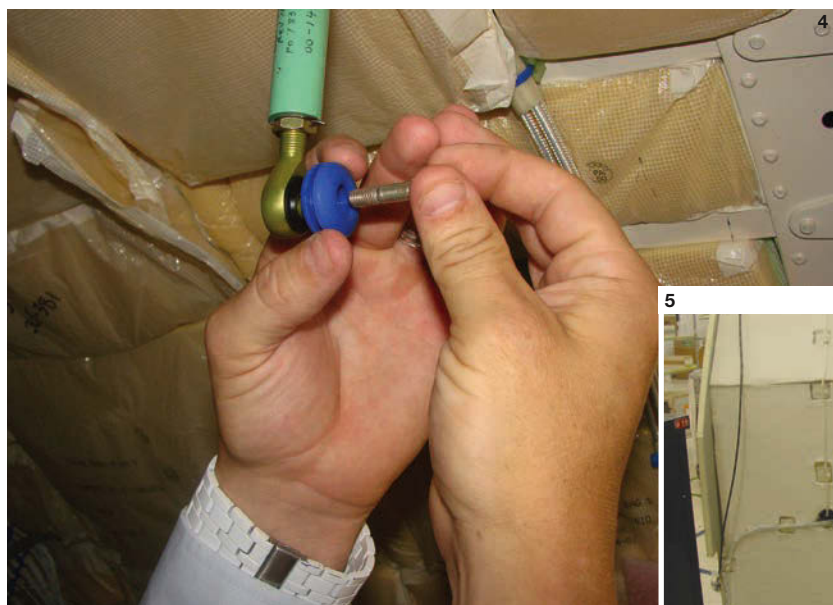
Absolutely. We recommend avoiding wood veneer for very large surfaces, because these can end up like a drum. Instead we advocate sound-absorbing materials such as leather, fabric or a combination of both. Fluffier materials absorb more sound, but sometimes do not have the look required.

What can you do in terms of cabinetry to contribute to the sound level target?

With our cabinetry, we cover a high proportion of the non-visible surfaces with soundproofing. We also isolate attachments to adjoining cabinets or mounts to reduce vibration and therefore sound. We often put extra material on items that are exposed to the outermost edges of the aircraft, such as bulkheads.

How do you account for the inflight conditions that cabinetry is exposed to?

Every cabinet and installation, regardless of the amount of soundproofing used, is implemented taking inflight conditions into account. The aim is always to avoid excessive noise caused by twisting or rattling in flight. On projects with a lower sound level target, extra attention is paid to the gaps between the cabinetry and the fuselage. These gaps allow sound through from the exterior to the interior of the aircraft, so you don’t want them to be too big. However, eliminating them completely would mean the fuselage transfers vibrations directly to the cabinetry, again leading to sound. Therefore it is critical to ensure there is a gap, but it is the optimal size.



4. An engineer at Jet Aviation St. Louis isolates an attachment to reduce vibrations
5. Soundproofing material on a cabinet made by Jet Aviation St. Louis



noise level to enable interactive speech at 8-16ft,” he says.

Moved to tiers Customers often accept a tiered approach, says Weisner from Greenpoint, with sound attenuation efforts concentrated around an office or cinema. “The more a customer accepts the idea of a tiered approach, the more the weight budget is distributed, or even reduced,” he says.

The choice of materials used for monuments, seating and other cabin components also affects cabin noise. Softer materials, such as fabrics, will absorb sound, while harder materials such as wood veneer and leather will not only reflect sound, but may even amplify the frequency. “Designers who recognize the acoustic value of softer



padded fabrics and other more absorbent surfaces greatly contribute to the success of the acoustics package,” says Weisner.

Also critical, according to Pobanz, are the elastomeric isolator mounts used to attach cabin components such as overhead and sidewall panels, floors, interior trim and dado panels. Mounts such as those supplied by Lord Corporation are actually tuned

6. Comlux America says its fuselage blanket system provides 100% coverage with minimal penetrations
7. An insulation package by Flight Environments being installed on a BBJ
8. A soundproofing installation by Lufthansa Technik

MANY COMPLETION CENTERS FIND IT PRUDENT TO ENLIST THE HELP OF INDEPENDENT ACOUSTICS SPECIALISTS AND MATERIAL SUPPLIERS FOR SUPPORT IN THIS AREA

Purrfect harmony

Study after study has shown a relationship between noise and stress-related illnesses such as high blood pressure and sleep disruption. A report by Dr Robert Fifer, director of audiology and speech language pathology at the University of Miami's Mailman Center, noted that when exposed to high-intensity sound, the human body releases stress hormones, starting with adrenaline. This is rapidly followed by a jump in blood pressure, rapid respiration and an increase in the heart rate as the body works much harder than it usually would. And Fifer added that the high-intensity sound might be of a frequency that can't even be detected by the human ear.

But can noise be good for you? Advocates of vibration therapy have promoted it as a means to treat multiple sclerosis, phantom limb syndrome, cerebral palsy and tinnitus. Multiple studies are underway into vibration

therapy as a means to treat pain and reduce bone loss.

On the lighter side is a study suggesting that a cat's purring can speed up the healing of wounds and bone fractures. Dr Clinton Rubin, director of the Center for Biotechnology at the State University of New York at Stony Brook, researched non-invasive, non-pharmacological intervention to control bone loss. As part of this, he and his associates determined that exposure to frequencies between 20-50Hz creates robust situations of increased bone density. The report noted that the purring of three species of cats is exactly 25-50Hz. So perhaps hugging a cat could be good for you. You probably wouldn't want to bring it on to the aircraft though!



to dampen vibration and the elastomeric materials are made to perform in aviation environments.

Air support Sound attenuation is a specialist area of expertise, and many completion centers find it prudent to enlist the help of independent acoustics specialists and material suppliers for support in this area. In fact, these suppliers are often only too happy to be involved during the installation process, because they are typically required to guarantee a specific level of acoustic performance.

“We've found our acoustics supplier provides a very personalized analysis of each project, and having its technicians and installers oversee the activity helps ensure an excellent outcome for all parties,” says Hart. **END**



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The panoramic window being developed by Fokker Services and Boeing for the BBJ 737 taps into the trend for bigger and better windows





One of the most interesting launches at EBACE 2014 was Fokker Services' panoramic window, SkyView. The window takes up the width of three conventional windows (1,385mm), and at 495mm is also 30% taller. It is being developed for the BBJ 737 NG and upcoming BBJ 737 MAX. Fokker Services showcased the concept in a full-size mock-up on its stand.

The company, a BBJ completion center in the Netherlands, also has a background in product development. James Aspell, who is vice president of technical services and aircraft conversions and completions at Fokker Services, says the idea stemmed from a feasibility study conducted about a year ago. "When you look at the lifestyles of the very high net-worth individuals who buy these aircraft, in particular at their homes and yachts, you notice that everything has a panoramic view of the outside," he says. "We thought, 'Why can't we mimic that on an aircraft?'"

Big and beautiful Aspell also points to the demand for ever-bigger IFE screens. "With our completions business, we see constant demand for huge screens," he says. "Everybody wants big, so we're giving them big."

The original concept was the width of two window bays. "I thought that didn't look impressive enough, so I challenged the team to make it at least three bays wide, being mindful of the structural integrity of the aircraft," says Aspell.

Fokker entered discussions with Boeing Business Jets in late 2013. "I approached Captain Steve Taylor [president of Boeing Business Jets] with the opportunity and he was extremely excited because he saw this as being a great discriminator for Boeing and its customers," says Aspell.

"If you look at the Gulfstream 650 or the BBJ 787, which both have big windows, it makes such a difference," comments Jeff Dunn, senior manager for business development at Boeing Business Jets. "Having this even bigger window makes the cabin like a movie theater. It's exciting for passengers



to experience something so unique. We've taken customers over to the booth and everybody has made positive comments like 'I need to look at that'. Some very experienced people, who've looked after a lot of aircraft for BBJ customers, have asked 'How do I get that?'"

Fokker Services and Boeing are now working on the detailed design engineering together. "If you're going to do something different to a Boeing aircraft, you've got to go through a very stringent process," says Dunn. "It involves going through all Boeing's engineering groups to see if it's feasible, and then getting it certified. We're not going to let just anybody put a hole in the airframe!"

The plan is to gain EASA and FAA STC certification by mid-2015 and begin installations in the third or fourth quarter of 2015. Aspell says the certification approach has already been accepted by EASA.

Sense of place The windows will be marketed by Boeing as an option on green aircraft, and by Fokker Services for refurbishments. As well as installing the windows at its own facility as part of an interior completion package, Fokker Services will also install the windows for customers who choose other completion centers for the main cabin. It will send a team either to that facility or to PATS Aircraft Systems at Georgetown, Delaware, USA, where a lot of BBJs have auxiliary fuel tanks installed when they come off the Boeing production line. The fuel tank



4

SkyView windows can be installed on a BBJ 737

65-70

kg added by each SkyView window

US\$1m

price tag for a pair of SkyView windows

6-8

weeks likely installation time

1. The BBJ 737 SkyView window, which is as wide as three standard window bays
2. The windows can be installed in the aft bedroom and in the VIP lounge
3. The windows will come with a shade system rather than tinted glass

forward or backward. "There are also zones where we would prefer not to put the windows because of the wing or cargo doors, and also in terms of systems," says Aspell.

Each window will cost US\$500,000. "Of course, we recommend to buy in pairs, so it's literally going to be a US\$1m view," says Aspell. "But looking at the big picture, with everything else in the aircraft, is US\$1m for a set of windows going to break the bank? Probably not." Customers can also opt for the two-bay window, which can be installed in the same locations. Aspell sees a market for that in the bedroom.

Fixing a hole Aspell acknowledges that the biggest challenge will be tackling rapid decompression requirements on the BBJ 737. "Because of the size,

modification takes 6-8 weeks, which Fokker Services believes is ample time to install the windows.

Customers can opt for two or four SkyView windows in the BBJ 737. Ideally the windows should be installed in pairs and symmetrically, so each window will face another on the other side of the fuselage. They can be installed in the positions shown in this article, give or take one or two bays

WE'RE NOT GOING TO LET JUST ANYBODY PUT A HOLE IN THE AIRFRAME



3

it's almost like installing a cargo door," he says. "When Boeing designed the original aircraft, they designed it with holes of a very specific size. Now we're altering that configuration, so we have to be mindful of what happens to the structure. You also need ventilation systems capable of handling rapid decompression. Our engineers are working with Boeing's, to make sure we're not compromising anything."

Airframe experience Aspell points out that Fokker Services used to be an OEM, so the company knows a lot about aircraft structures. "We are really able to understand what happens when you cut a structure that big," he says. "We've also modified aircraft by putting in cargo doors and observation windows, etc. We know we have the engineering know-how."

The window kit will include the pane, doublers, frame strengtheners and pick-up brackets. Ventilation and heating ducts will run underneath. The latter will involve the installation of a piccolo tube, so named because it has lots of tiny holes, through which warm air will be pushed, preventing the window from frosting over.

In terms of framing, on the exterior the skin is only 3.5mm thick. "It's virtually invisible from the inside," says Aspell. "All the framing is done on the inside and then it gets covered up by the valance and the covers."

With larger areas of hard surface, some might question whether

The future for SkyView

Although James Aspell of Fokker Services is not ruling out making SkyView available for other aircraft types, he is keen to emphasize that the company is currently completely focused on the BBJ 737 development.

"We've had conversations with Boeing about the possible application of this on other derivative Boeing aircraft, but we don't want to get too far ahead of ourselves yet," he explains. "We want to do this well, get it into the market and build excitement in the customer base. Then we'll start to look at the next set of developments. Other potential applications could be the BBJ 777 or the BBJ 747, but right now we're very focused on the BBJ 737 family."

He says Boeing's input will be vital in choosing which platforms to work on. "They know what their customers want," says Aspell. "We'll follow their lead."

Although Boeing will be first to market with SkyView, Aspell is also not ruling out working with other manufacturers later on. "Another OEM actually came here yesterday wanting to know more about it," he said at EBACE in May 2014. "We also had some people asking about it for other aircraft. We could certainly explore those opportunities, but right now we want to support Boeing in getting this to the market first. We don't want to distract ourselves and we don't want to take away from the commitments we've made to each other on the project."

Another avenue for development would be to integrate tinted glass. "Everybody talks about tinted glass," comments Aspell. "Right now, the glass is transparent and the window is installed with a blind. We'll start looking at tinted glass later, but right now, we want to certify the product that we have."

passengers will pay for their view with a noisier cabin. Aspell says that won't be the case. "With the acoustic packaging that we'll be putting around the window, and other smart measures, we don't expect there to be any increase in sound levels," he says.

The weight penalty for each window, all included, is estimated at 65-70kg. What will be harder to measure is how much extra light could

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Product development at Fokker Services

SkyView is not Fokker Services' first foray into product development. Its avionics projects include an iPad-compatible electronic flight bag (EFB) developed with Navtech and an integrated global navigation satellite system developed with other partners. It has sold more than 300 units of the EFB. For the interior, Fokker Services partnered with Emteq to develop an LED cabin wash lighting system.

"You have to remain relevant," says Fokker Services' James Aspell. "We've got to keep bringing new products to the market that are exciting and that people want."

The company also offers full maintenance, completion and refurbishment services. It currently has an ACJ319 in for completion, and says a key business is redelivery work for leasing companies – reconfiguring interiors, modifying galleys and applying new paint for aircraft changing hands.

DESIGNERS WILL START TO STYLE INTERIORS MORE AROUND THE WINDOW

enter the cabin – a focus of continuous development in the industry. "When I worked at an OEM, we were always trying to create the effect of more light in the cabin," recalls Aspell. "The window size was always the same, but the surround was flared out to try to create the effect. That's one way to do it, but this is the ultimate way to do it."

Of course, the task of replacing three window bays with one on such a large and completely customized aircraft is very different from that of increasing the size of all the windows, or even installing a similar product, in a business jet. For starters, business jet OEMs have to factor in seat placement and have less space to work with. Business jet owners expect every seat to line up perfectly with a window, and they may not want to sacrifice capacity for slightly larger windows.

For Aspell though, the value of SkyView is more about the view. "It's an opportunity to experience the flight in a completely different way," he says. "Instead of craning your neck to look out of these small windows, you can really relax and enjoy the view. Imagine

observing the take-off, landing, sunsets and sunrises through this window."

Collective view Likewise, he believes it will make the aircraft a more social environment. "This changes the paradigm of what you do in your aircraft," says Aspell. "As opposed to sitting in your own little entertainment zone, this is going to be something you can share with everybody."

He even thinks the window could take over from the IFE monitor's prominence as the cabin's centerpiece. "Designers will start to style interiors

4-5. Fokker Services integrated a full-scale mock-up on its EBACE 2014 stand

more around the window, because it's quite a statement," he says. "It's going to lend itself to some interesting interior designs."

The company is working with a couple of interior designers right now to showcase the possibilities offered by this product. "And we'll be seeing more designers over the coming weeks and months," says Aspell.

Hopefully, these designers should embrace the opportunity to draw attention to an asset people can only enjoy while on an aircraft – the truly spectacular view. **END**



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dreamteam

The first fruit of the alliance of Lufthansa Technik, LIST, Schott and DesignQ showcases the merits of integration

Several business jet cabin component suppliers have seen the benefit of offering a wide range of products, as it enables them to market their offering as a one-stop shop. A new company called Inairvation aims to take this approach further, by not only offering a wide product range, but also putting the focus on how these products are integrated with each other within the cabin.

The company is the 50/50 joint venture of Lufthansa Technik and LIST

1-3. The mock-up Inairvation displayed at EBACE 2014

components & furniture, and is based in Edlitz-Thomasberg, Austria. Aside from its extensive manufacturing expertise (mostly centered on cabinetry, galleys and tables), LIST has made waves with its stone and wooden flooring, stone veneer and other materials. Most recently the company worked with Embraer on the new Lineage 1000E design.

As well as its completions business, Lufthansa Technik has launched many products. These include the nice HD IFE/CMS system, a moving map, a non-electrical floor path marking



system and a medical stretcher. In addition, at EBACE 2014, the company announced its expansion into the seating business with its chair family, developed in cooperation with Pierrejean Design Studio. Lufthansa Technik also took the cooperative route for Heliojet Spectrum CC, an LED mood lighting system that marries the company's wireless access point and interface unit with Schott's Heliojet TCS lighting system. The experience must have been positive, as Schott is Inairvation's preferred lighting partner. DesignQ is its preferred design partner.

New order Dr Philip von Schroeter of Lufthansa Technik, one of the two CEOs of Inairvation (the other is Werner Kartner of LIST), explains that the joint venture was borne out of frustration with the OEM design process. "In the past we have been contracted individually by business jet OEMs at different times during the project," he says. "We always suffered from the fact that the OEM struggled to align the conflicting interests of the multitude of vendors. Normally vendors come on board at different times and fight over aspects such as space, cooling, power consumption, design, ergonomics, etc."

4. Inairvation's constituent companies and partners will provide most of the components needed for a cabin
5. Lufthansa Technik's new chair seat platform, launched at EBACE 2014

Lufthansa Technik enters the seat market

At the moment, the main omission in Inairvation's product offering is seats. "It would be nice to offer seats and we are optimistic about finding a partner for them, but at the moment that's not part of our offering," says Inairvation's Philip von Schroeter.

An obvious contender would be Lufthansa Technik's new chair, which was launched at EBACE 2014. "It would be a bit premature to say this is going to be our seat, but we're definitely thinking about it," von Schroeter concedes.

The product is based on a seat frame that can be configured in several thousand ways, according

to the company, through the addition of individually sized ribs, customized upholstery of various thicknesses, backrests in different heights, leg rests, armrests and other add-on elements.

The product will be made in cooperation with Dräxlmaier, an automotive supplier headquartered in Germany. The models shown at EBACE were developed with Pierrejean Design Studio. The range is now in the process of being certified as a 16g seat.

"It's the most innovative seat that I've seen for a while," says von Schroeter. "Other manufacturers all seem to agree it's not necessary to



4



do anything new, so seats look like they've always looked. At the moment you might have a beautiful, modern cabin – but with grandpa-style seats that don't go with that aesthetic. The chair family might stir up the market; it's a great product.”



About three years ago, Lufthansa Technik and LIST decided to team up, find design and lighting partners, and offer integrated cabins to OEMs. “Some companies buy smaller companies so they can offer a wider range of products,” says von Schroeter. “This is not like that; this is about integration from the bottom up. From day one, we will work together so we can offer furniture, lighting, CMS and IFE that is integrated in terms of design and technical aspects. By doing so, we

6. By enabling early cooperation between different disciplines, features such as tables with integrated capacitive switches are possible

avoid all the extra loops that we usually have in a cabin project – where companies are fighting each other and the OEM is trying to manage it all.”

Target market Inairvation is pitching OEMs for serial-production aircraft programs, and completion centers for green completion series. It also plans to offer a retrofit program, but that concept is “still in the making” according to von Schroeter, so the company is not actively selling retrofits

NORMALLY VENDORS COME ON BOARD AT DIFFERENT TIMES AND FIGHT OVER SPACE



yet. Inairvation will concentrate on business jets rather than larger big iron aircraft such as the ACJ or BBJ types, and it will not do one-off designs.

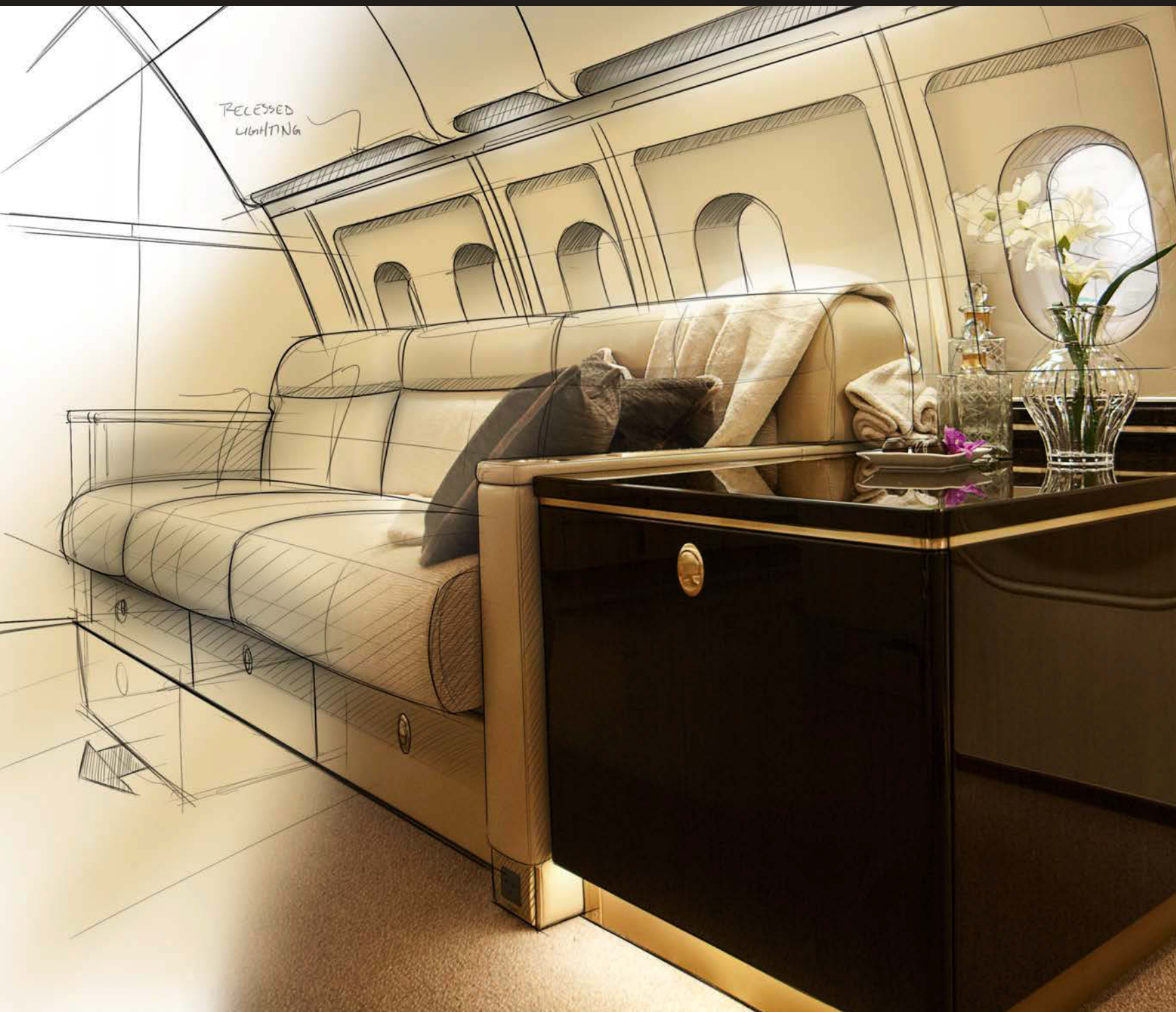
“We’re targeting to be the baseline of an OEM program,” explains von Schroeter. “We could also work on something like a signature series cabin for a particular aircraft type, in parallel to the OEM’s normal production model. Our offering is somewhere between the OEM cookie-cutter program and the one-off VIP aircraft.”

Kartner explains why it doesn’t make sense for the company to do one-off projects: “Our business model is based on the fact that we’re investing up-front to certify all our ideas, and this approach won’t fit with being a one-off business.”

In the mix The process will involve Inairvation’s design representative, DesignQ, collaborating with the OEM’s designers. “The OEM has its own design ideas and concepts, which we will obviously respect,” says von Schroeter. “We will take its design concept and turn it into a detailed design for the integrated furniture, IFE and lighting. So these two design teams will work together.”

The designers will be involved throughout the project, not just at the start. “It’s very common for a designer to deliver a nice concept and then the OEM hands it over to the engineering

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department to produce something certifiable, and the design is changed over the next two years or so, and they end up with an engineering product that is totally different from the original concept,” says Kartner.

“What we often find is that somewhere in the process of refining the product, the OEM’s designers are no longer included and the original design is watered down,” says von Schroeter. “We feel it is very important that the designers are included throughout the whole process, until the cabin is really finished. And whenever there is a problem – something doesn’t fit, or needs to be changed – the designer is involved in the solution, so we don’t end up with something that the engineer thinks is what the designer wanted.”

Majority share Inairvation will design and supply most of the cabin’s components, including furniture, lighting, IFE/CMS systems and linings.



IT’S VERY USEFUL FOR THE PERSON WHO DESIGNS THE WIRING TO KNOW WHERE EVERYTHING GOES FROM THE START

It will also integrate items supplied by other companies – such as wires, water systems and window shades – when they are components of its own parts. “We physically integrate anything that goes into the monuments, so that when we deliver a monument, it’s ready to be installed,” says von Schroeter. “If that monument needs cables and air ducts, then we attach them. It’s hard to do a monument and not touch another system.”

The short list of parts that the company won’t be involved in includes carpet and maybe oxygen systems. “But even those we might touch because we need to integrate oxygen masks into the linings,” says von Schroeter.

The company says that one of the major efficiencies of this approach is that one company is responsible for all the cabin wiring. “It’s very useful for

7-8. The mock-up features some lovely integrated features, such as lighting in the wooden floor, and mood lighting in the headliners

the person who designs the wiring to know where everything goes, from the start, and not have to move and shuffle things around,” says von Schroeter.

Play it cool Another prime example where early integration is helpful is with cooling systems. “With anything electrical, that consumes a lot of power, there is always a cooling problem,” says von Schroeter. “We can tell the OEM, ‘Make sure there’s enough cooling for our media center’, but we may still end up with a little box with no air circulation whatsoever. This is something we would take care of.”

The main benefits for the OEM, argues von Schroeter, are that they get better value for money (a more consistent and efficient design, plus features that could not be realized otherwise) in a shorter time. “Our



cabin may not be the cheapest, but we can offer higher quality for the same price,” he contends. “OEMs get an integrated cabin that works, that has fewer compromises in its design and has a higher aesthetic standard – and they get it more quickly.”

In fact, Inairvation believes months can be saved during development, which Kartner argues means that when the product comes to market, its technologies are more up-to-date. Inairvation also says weight savings can be made, not only through efficiencies, but also through the use of materials provided by LIST, including carbon fiber structures replacing honeycomb, as on the Lineage 1000E.

Design possibilities The mock-up Inairvation displayed at EBACE demonstrated some lovely design features that the company believes are only possible to achieve through this collaborative approach. For example, capacitive CMS switches have been integrated into the wood veneer of the tables. Mood lighting has been integrated into the headliner. Fiber optics have been integrated into the wooden floor and table edges. Cup holders feature lights in the bottom, creating a beautiful prism effect when the passenger places their crystal glass inside. All the light effects, as well as other cabin features such as window shades and IFE, can be controlled through the CMS or by passengers’ personal devices. Efficient wiring design means a thinner sideledge, creating more room for seats and even a bar.

“No individual company could offer this; these features could only be offered by a team,” says von Schroeter. The company says all the technologies used are certifiable for aviation.

Kartner points out that the purpose of the mock-up, which is the size of a Bombardier Challenger 605 fuselage, is purely to indicate possibilities. “For example, you might not integrate illuminated cup holders on a smaller



LIST expands flooring options with wood veneer

Aside from Inairvation, LIST’s big focus at EBACE 2014 was its new wood veneer flooring for business and private jets. The company says the solution will be possible to implement with any species of veneer that can already be used elsewhere in the cabin (LIST is sourcing the veneer itself) and inlay and marquetry work will be possible.

Dieter Franz, sales manager at LIST, says the product was developed because the company has received many inquiries about the possibility over the last two years. “It should be seen as an option to replace carpet,” he says. “In conjunction with our stone offering, we have very interesting options for flooring.”

Although these non-textile flooring options can be installed in the main passenger cabin, Franz notes that demand is currently focused on entrance and lavatory areas. “Passengers still see the main cabin as a living room, and they prefer carpet there,” he says. The company has two projects in the pipeline for the wood flooring. It is targeting completion centers for one-off projects and OEMs for serial production.

The wood flooring is available in both rectangular and curved panels. LIST has developed a special locking system and ‘floating’ installation that it says makes the panels easy to install and maintain.

aircraft like a Learjet or Phenom 100,” he says. “Ultimately it’s up to the OEM to say what they want and we will try to fulfill that, and really think about how it can be installed efficiently, and in terms of its maintainability.”

Leap of faith Despite the many benefits the company promises, it has struggled to convince OEMs to take the plunge. “We’ve been pitching this for the past 2-3 years to OEM customers,” says von Schroeter. “They were always very

9. LIST’s new wooden flooring product

interested, but no one was brave enough to go for it, because it means giving us more control. With this approach, the OEM is basically handing over most of the cabin to one company, so that is a big decision.”

However, the company has just secured its first customer, an OEM that will work with Inairvation on a cabin for one of its aircraft. The project began the week after EBACE, in May 2014.

“The OEM has clear ideas about the design theme,” says von Schroeter. “We’re going to take this theme and turn it into a cabin design. We will have several rounds of discussion with them, make sure it all works technically, optimize aspects such as wiring and weight, and deliver a truly integrated cabin.” **END**

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Although 3D printing isn't yet established as a way of making final parts for VIP interiors, some within the industry are already finding it useful for rapid prototyping and cabin visualization

Over the past decade, 3D printing – also known as additive manufacturing – has become a more useful tool, as the price of printers has decreased and the quality and versatility of their output has increased. The technology has not yet taken off for producing final parts in the business jet interiors industry, but many designers and completion centers use it for client visualization and rapid prototyping.

“We’ve been using 3D printing for 18 months and plan to continue,” says Jason Dennis, director of interior completions at Flying Colours Corps’ facility in St. Louis, Missouri, USA. “We’ve found it really helpful. So far we’ve used it for prototyping and R&D, but we’re now in the process

of evaluating our existing engineering to see if and how 3D printing can fit into some of our traditional processes and perhaps replace some.”

Flying Colours Corp has found the technique useful for reducing the amount of money, material and time spent on producing prototypes. “Instead of asking a machine shop to produce a prototype component and having to wait maybe 10 days, with 3D printing you can take the concept from the designer’s or engineer’s screen and send it directly to print,” says Dennis. “The turnaround time can be very quick – recently I was quoted two hours for a part. It’s useful for the more intricate pieces where you really want to see how they’ll fit and you want more stakeholders to get involved and buy into the concept.”





1. AERIA's 3D-printed BBJ model

WE CAN GO STRAIGHT FROM CREATIVITY TO REALITY IN HOURS INSTEAD OF WEEKS



In essence, Flying Colours Corp is using 3D printing as a rapid and less expensive way of proving engineering solutions. “We can physically have the part and put it in the application it’s going to be used in, to validate and verify that the design concept and plan will work,” says Dennis.

Breaking the mold 3D printing can even save time and money when prototypes and parts need to be made in other materials, because it can be used to make molds. “Some parts made from resin or similar materials require an expensive mold,” says Dennis. “With 3D printing we save on curing time and the expense of creating the mold.”

And if the part proves unsuitable, instead of being left with a useless but expensive mold and having to start creating a new one from scratch, the completion center can revise a digital file on screen, potentially enabling the revised mold to be reprinted in a couple of hours.

Trev Ellis, head of design at Marshall Aviation Services’ site in Broughton, Cheshire, UK, cites similar cost and efficiency incentives for using 3D printing. The facility, acquired from Hawker Beechcraft in August 2013, has been using 3D printing (through an external supplier) for rapid prototyping for around five years, supporting cabin refurbishment and completion work.

Creative freedom AERIA Luxury Interiors, an ACJ and BBJ completion and refurbishment specialist based in San Antonio, Texas, USA, is another facility sold on the idea and has invested in an in-house 3D printer. “It would be hard to list everything you can do with this technology. We constantly find new ways to use it,” says Timothy O’Hara, manager of design at AERIA. “Imagine not being limited to conventional ways of building, eliminating tooling, long lead times and the endless number of technical drawings. We can go straight from creativity to reality in a matter of hours instead of weeks.”

While AERIA reports it has made aircraft-certified 3D-printed parts using Ultem, O’Hara says the main barriers to wider implementation are surface quality and the size of parts that can be produced. “Some parts take additional time to be production-ready,” he says. “Another limitation is size – some splicing may be required to reach the intended size.”

Still, he believes the benefits greatly outweigh the drawbacks. “This is the future of production,” says O’Hara. “I think larger printers are in our future, and also printers with multiple heads that can lay down wiring while building a part so that the part is prewired. Being a designer, this is one of the very best tools in the box – whatever you can imagine you can

AERIA prints a BBJ

At EBACE 2014, AERIA Luxury Interiors unveiled a 1:5 scale model of a BBJ that was produced in-house using AERIA’s 3D printer. Located in San Antonio, Texas, USA, AERIA specializes in the completion and refurbishment of ACJs and BBJs.

The model includes a lounge and dining room, complete with 1080i digital screens, RGB lighting and custom carpet. “I think this is a great way to be able to visualize what an interior arrangement is going to look like,” says Ron Soret, AERIA’s vice president and general manager of completions. “We will be using models similar to this for future presentations to our clients. This service ensures that the form, fit and function of the cabin is defined before a single component is purchased or fabricated.”

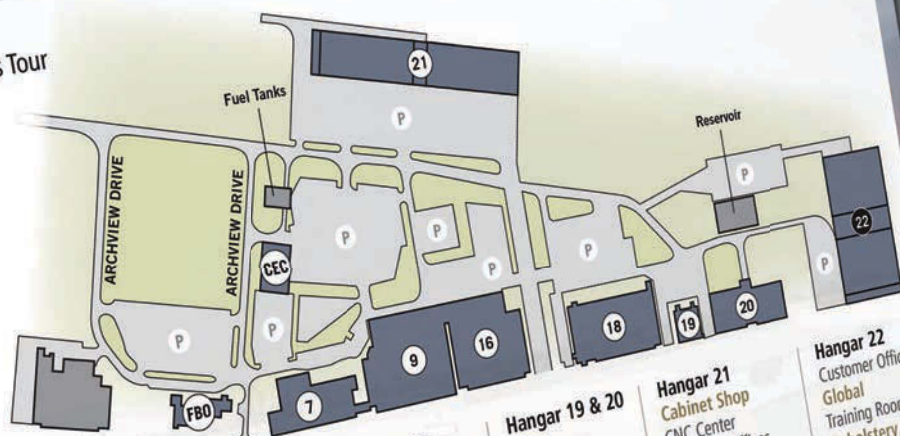
Everything included in the printed model was created digitally by AERIA’s design team using SolidWorks. “Using SolidWorks improves efficiency when design turns the project over to engineering, thus speeding up the production process,” says Soret. “Digital manufacturing offers many incentives, such as more customizable products at no additional cost and a quicker turnaround time.”

To complete the model, some of the interior pieces were hand-painted, while others were finished with wood veneer, metal or leather. The valance and ceiling panels were covered with leather, while the deco panels and bulkheads were wrapped in fabric. In addition, the lamps and chandeliers were connected to the RGB control system. Using wi-fi emitters, the CMS can link up to a tablet device enabling users to modify the color temperature of the lighting, and adjust dimming to meet their preferences, just like in an actual VIP interior. Custom Control Concepts provided an iPad interface that controls the RGB lighting and IFE in the model.

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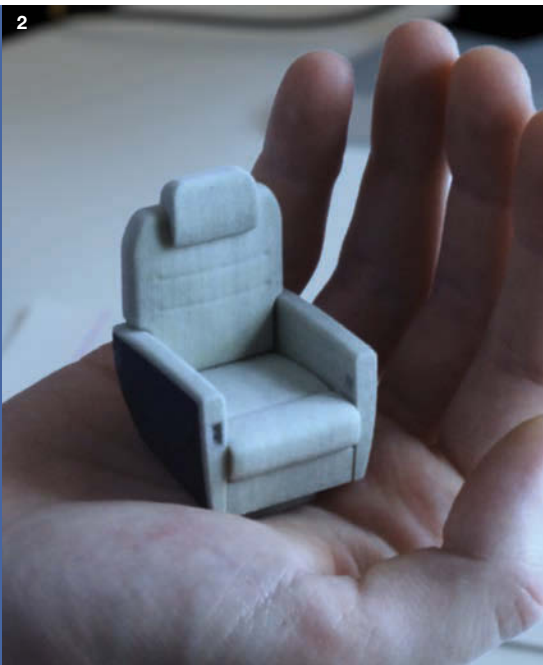
Helping clients visualize cabins

Advanced Computer Art (ACA) is now offering 3D printed models, or 'doll's houses', to complement the 3D renderings it produces. "Renderings are useful for providing a photorealistic impression of the interior, but customers often lose their orientation, struggling to understand the viewing direction, if a room is located fore or aft, or which room is behind a closed door," says Tobias Malangré, CEO and owner of ACA. "By producing small scale models of the interior furniture, stowage units, etc, we can illustrate discussions while the needs of the customer are defined."

Malangré says 3D models are used to associate the views shown in the renderings with the layout. He contends they are a much better aid to understanding than 2D layouts. ACA also uses an iPad app loaded with its renderings and a digital 3D layout. The app allows the viewer to jump into rooms and

view them in panorama mode. Malangré says that the app is a fine complement to a touchable 3D print. The app provides better aesthetic quality, and the 3D printed model shows every viewing angle.

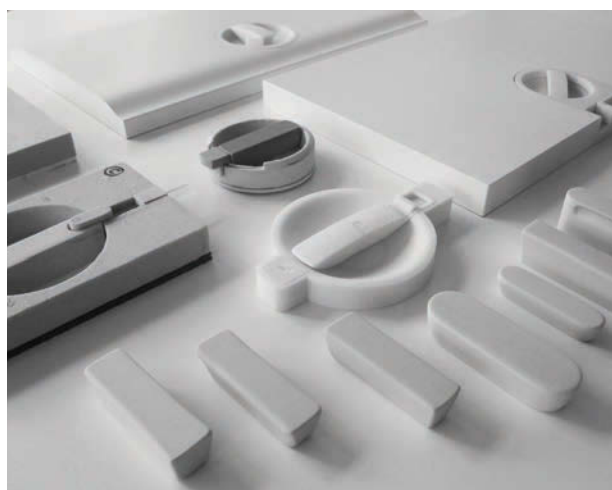
A 3D printed model of the cabin interior is therefore very desirable, but quality of surface finish has been a concern. "ACA is confident that progress in the 3D printing sector will lead to greater, affordable quality," Malangré comments. "We tested a color 3D printer and the quality of affordable 3D prints was acceptable, but not for the VIP sector. We concluded that 3D printing is a good starting point to ensure that the geometry of an interior is correct, but the enhancement of surface properties is crucial before a 3D-printed model could be used beyond this stage. We continue to test printing methods that could be useful for our designers."



print. Soon the only limitation will be your imagination."

Fire wall As well as surface finish, Ellis says that Marshall doesn't currently use 3D printing for final components because there are flammability and toxic fume considerations with the plastics used. "These problems will be overcome very soon, and printed components will be made from appropriate materials with a finish to suit," he says. "The price of 3D printers is coming down and the materials employed for printing are becoming more usable, while finishes are improving all the time."

Meanwhile, 3D printing technology continues to develop rapidly. "Today the primary problems are the size of the print, the materials used and the finish, but the advantage is the speed with which you can hold the actual object in your hands, rather than relying



2. A 3D printed seat created by ACA
3. Galley latch prototypes made by Teague using 3D printing
4. Teague demonstrates the technology's ability to create 3D geometries

on a model on the screen," says Ellis. "Once the flammability, finish and size issues have been resolved, Marshall could start printing interior parts such as window panels and other pieces."

Designers and suppliers It isn't only completion centers that are using the technology. "We 3D print all manner of things," says Sarah Matheny, marketing director at design company Teague. "It's a huge part of our business with respect to prototyping and validation. We also do a lot of 3D printing as part of Teague labs, the exploratory side of our business."



Ship shape

It may be some time before we see 3D-printed seats installed as final parts in the business jet industry, but they've already been used in its sister sector. Wetzels Brown Partners (WBP), which designs interiors for yachts, aircraft and private residences, created 3D-printed dining chairs for a yacht called Chrisco in 2009.

"We were looking for something unique, high-performing, practical and very light," says Rob Wetzels, one of the founding partners of WBP. "We used a type of 3D printing called SLS after seeing a fruit bowl that had the very organic and beautiful structure we were looking for. We wondered whether we could make a chair using the same technique."

The project was developed in conjunction with Freedom of Creation, a design and research company specializing in 3D printing technologies. Additional suppliers were brought in for the white leather upholstery and white gloss paint finish.

The chair has a steel base that enables it to swivel and is pinned to the deck while the yacht is under way. The whole structure weighs about 18kg. "The latticework construction that provides the chair's integral strength and visual appeal recalls structures found in nature that would be impossible to reproduce using any other manufacturing method," says Wetzels. "These chairs are the largest single objects that could be manufactured on these machines in 2009."



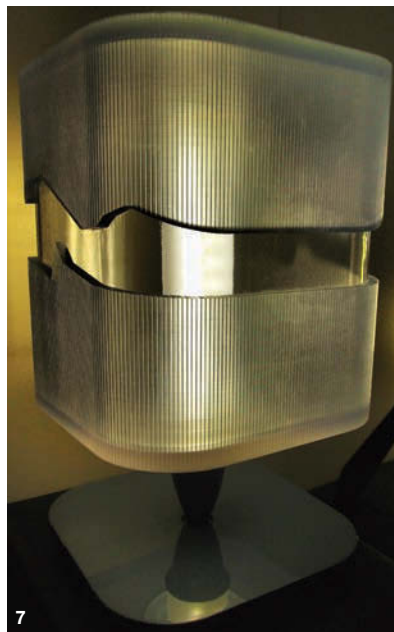
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Some suppliers are also getting in on the act. "We use 3D printing for both production and prototype units," says Austin Campbell, marketing communications manager at Custom Control Concepts (CCC). "Our capabilities range from simple and small parts to more complex 3D fabrications." Campbell argues that compared with machined aluminum, 3D printing offers weight, performance and strength advantages.

CCC also offers 3D-printed mock-ups of components to customers to assist with fit checks as the interior is readied for installation, the aim being to reduce program and installation risk. "Given our production and prototype capabilities, we are able to support customer requests and changes in a timely fashion," says Campbell. He would like to see more aerospace-grade materials, and color and surface options in the future.

Spare change In the more distant future, 3D printing technology could revolutionize how spare parts are distributed. Companies could support overseas customers by emailing a 3D

- 5-6. 3D-printed chairs designed by Wetzels Brown Partners for a yacht
7. Plus 33 and SELA validated the design of this lamp using 3D printing



7

model of the spare part needed to a facility close to the client. There would be no shipping costs, no customs clearance procedures, no need to stock inventory and virtually no waiting time. Clearly the potential benefits are huge, but so are the hurdles in certification, quality control and copyright security.

The future for 3D printing is bright and potentially industry changing, but a huge amount of development work lies ahead before the 3D revolution can be fully realized. **END**

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elegant solution

By offering a modular version of its most popular aircraft, the ACJ319, Airbus Corporate Jets believes it can save its customers time, effort and money



Limiting billionaires' choices might seem counterintuitive, but that is exactly what Airbus Corporate Jets is proposing with its new version of the ACJ319.

The ACJ319 Elegance was launched at ABACE in April 2014. It is a modular alternative to the fully customizable ACJ319, which is still available. The ACJ319 Elegance has set areas at the front (a galley, bathroom and crew rest) and rear (VIP bedroom and bathroom) – because demand for these elements is fairly constant. This leaves three zones in the middle of the aircraft that can be outfitted with the customer's choice of modules.

"People tend to want the same basic things, but the arrangement differs

from customer to customer," explains David Velupillai, marketing director for Airbus Corporate Jets. "Customers always need somewhere to sit and relax, work, sleep and wash, and they're after the practical rather than the exotic – a place that enables them to continue their lifestyle in the air. Our designers have tried to come up with an approach that preserves the element of choice while delivering speed, simplicity and savings."

The design involved over a year's work by Airbus Corporate Jet Centre (ACJC), a 100% subsidiary of Airbus based in Toulouse, France. ACJC's workforce (formerly part of EADS Sogerma) has completed 26 cabins – including 50% of all ACJ319s and ACJ320s delivered since 2011.



Blue Jay way Sylvain Mariat, head of ACJC's creative design studio, points to the company's Blue Jay concept from 2013 as an important step in confirming the approach Airbus is now taking with the Elegance model. "We received very positive feedback to the Blue Jay concept, especially to the big lounge with three areas," says Mariat.

In the ACJ319 Elegance's central areas, customers can "play with a lot of possibilities", according to Mariat. The predefined modules include a cinema lounge, other more social lounges, conference and dining spaces with circular or square tables, and various offices. Airbus says there are more than 100 configurations.

There is also still scope for personalization, mainly in terms of

materials. "We have some predefined materials – aniline leather, wood veneer and metal plating – but after that, we can customize," says Mariat. "If a customer wants a specific design for their carpet, we can customize it for them. Maybe his wife loves a French luxury brand with a specific kind of stitching, in which case I can bring something similar to the design. We have vendors we know, but we love to discover new ones that have never been used in an aircraft before. And if the customer wants a specific module, it can be discussed with Airbus. We never close the door."

Design enhancements ACJC has also taken the opportunity to redesign certain elements of the ACJ319.

WE HAVE SOME PREDEFINED MATERIALS BUT AFTER THAT, WE CAN CUSTOMIZE

For example, the ceiling is higher now, with several domed areas replaced with a single larger one. Additionally, at the point where the ceiling meets the sidewall, a handrail has been added to assist passengers.

Mariat has also removed the valance panels from above the windows, and encased the windows with a new light-



2

What billionaires really, really want

In the summer of 2013, Airbus Corporate Jets commissioned Ledbury Research to conduct a study to better understand the buying patterns of billionaires in China, the Middle East and Russia. Airbus got the results at the end of 2013.

“The report gave further confirmation of what we had already found over the years,” says David Velupillai, marketing director for Airbus Corporate Jets. “While some of our customers want customization, others want something simpler, more quickly and maybe for less of an investment.”

“While the media likes to paint billionaires as exhibitionists, this is an inaccurate picture,” reads the report. “Most are discreet individuals, although visible signs of wealth can be observed with some in Russia. Billionaires in Russia and China are much more traditional than those from the Middle East.”

When it comes to private jets in particular, the report concludes, “Considerations prior to purchase are practical and generally very centered on the needs and preferences of the individual. The selection has less to do with showing off, since jets are seen ‘by invitation only.’” Ultimately, the report highlighted billionaires’ four key needs: flexibility, privacy, familiarity and tailored experiences.

diffusing surround that funnels light into the cabin in a softer way. The surround’s circular cut-outs create a porthole effect around each window. The surround is made from a suede-like material, with each circle trimmed in metal, echoing the look of an engine.

Circle of influence Mariat is particularly pleased with these new window surrounds, which were the result of listening to customer feedback. “I have often heard customers say, ‘It would be very cool to have a big circular window. We don’t know why most of the time they are rectangular.’ So this aircraft wasn’t just designed within our studio. It came from 10 years’ experience.”

Elements that were housed in the valance panels have been relocated elsewhere – the air-conditioning to above the handrail, and the LED lighting into transverse strips that follow the curves of the sidewalls and serve to demarcate the aircraft’s various sections. ACJC enlisted the help

1. One of the ACJ319 Elegance’s dining options – a six-place circular dining table
2. Three office modules are available



of PGA Electronic for the lighting. The lights can be turned on and off individually to define areas, so for instance an area at the back can be made darker if the customer wants to create a more relaxed ambience.

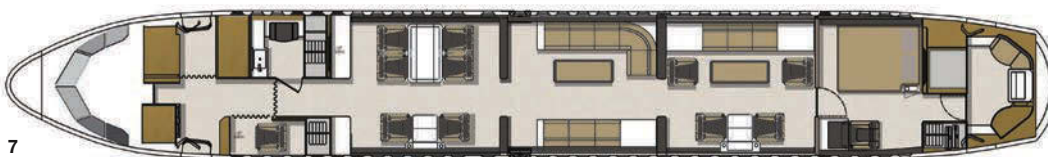
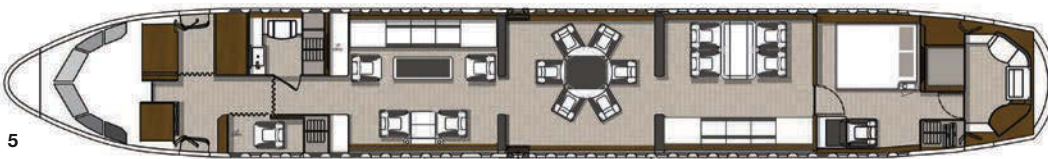
Another important change is that the sideledges have been made slimmer. "When you have technology like wi-fi, you don't need a wide sideledge to house a lot of cables," explains Mariat. "We have fewer cables now, so it's nonsense to keep the sideledge so big. All the IFE systems can be controlled by iPhone or iPad, and this helps reduce weight. Customers like it too, because it's the same kind of technology as in their own houses."

4



WHEN YOU HAVE TECHNOLOGY LIKE WI-FI, YOU DON'T NEED A WIDE SIDELEDGE TO HOUSE A LOT OF CABLES

3. The bedroom is a fixed element, and is located at the aft
4. Another office option
- 5-7. Airbus believes more than 100 layouts are possible



He adds that the slimmer sidewalls were also enabled by the availability of full internet protocol, whereby a single wire (coded at each end) can be used to send signals to several systems.

Cash back Defining just how much money can be saved with this modular approach is tricky, because the fully customizable ACJ319 that the Elegance is measured against is by definition different in every case, with a budget that is far from fixed. However, Airbus says that a fully customized ACJ319 typically costs about US\$90m and the ACJ319 Elegance costs less than US\$80m, so a customer could potentially save US\$10m.

Velupillai argues that the modular approach also offers benefits beyond the first purchase. "When you've pre-engineered something that can be used across many aircraft sales, that helps spread the cost," he says. "If the customer wants to upgrade at a later

Custom Interior Products for VVIP Completions



Initial layout of 747-8 Ceiling Panel Assembly at Jormac Aerospace



747-8 Ceiling panel assembly during fit check in full-scale mockup

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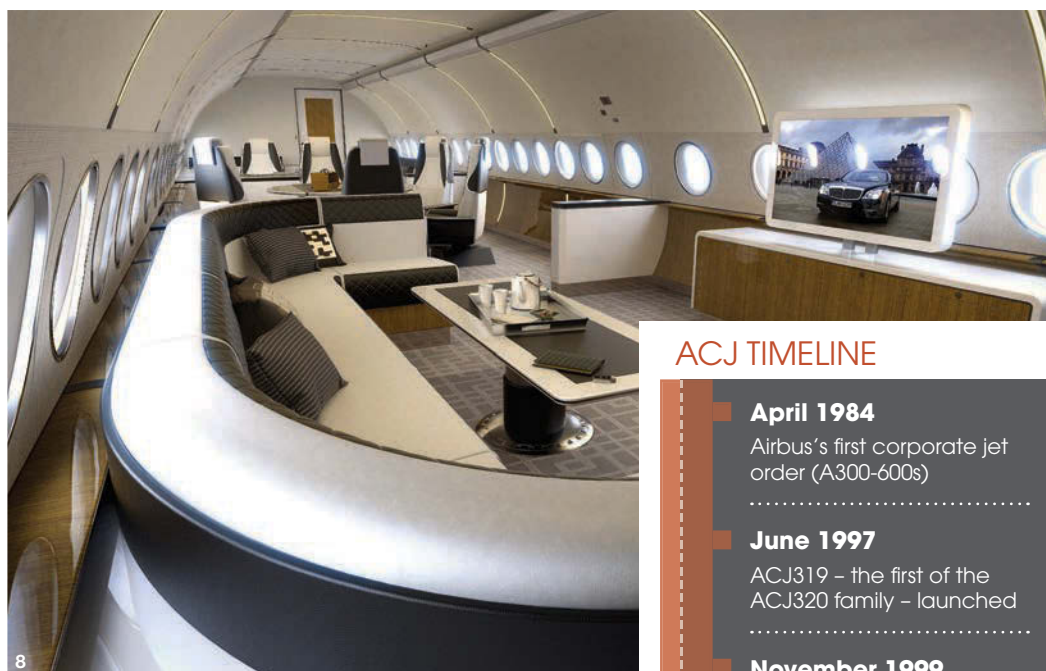


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IF THE CUSTOMER WANTS TO UPGRADE AT A LATER DATE, THE MODULAR APPROACH MAKES IT EASIER



8



9

- 8. One of the two cinema lounge modules
- 9. The windows have a new surround that makes them look like portholes

date, the modular approach makes it easier, and when a customer comes to sell the aircraft, this approach enables the new owner to change something more easily."

Time flies But there are factors other than cost that may be more important to busy customers. "The key point is time," says Mariat. "While some customers love to spend a lot of time talking about the customization of the whole aircraft, including the galleys, other customers want something as soon as possible."

Airbus is confident that clients will eventually be able to take delivery of their jets sooner. "We expect the

ACJ319 Elegance to initially take about 20 months from contract signature to delivery, later reducing to 18 months and then 16 months, says Velupillai. "Fully customized versions take around 20 months."

This is quite a lot longer than the six months an ACJ318 Enhanced project can take; an aircraft that would appear to have similarly pre-engineered elements. "Let's be clear, the ACJ318 has no modularity," says Velupillai. "You don't have the ability to move things around, you're essentially talking about the same cabin layout with different color and trim and options, so spread across several aircraft you can reduce lead times."

ACJ TIMELINE

April 1984

Airbus's first corporate jet order (A300-600s)

June 1997

ACJ319 – the first of the ACJ320 family – launched

November 1999

First ACJ319 delivery

December 2000

First ACJ320 delivery

November 2005

ACJ318 Elite launched with a predefined cabin designed with Lufthansa Technik, which also performs the completion

May 2007

First ACJ318 delivery

July 2007

ACJC established

October 2012

ACJ318 Enhanced – an update of the ACJ318 Elite – launched in cooperation with Lufthansa Technik

February 2013

ACJC unveils the Blue Jay concept for the ACJ319

June 2013

First ACJ321 delivery

April 2014

ACJ319 Elegance – a modular version of the ACJ319 – launched

10



Gravity bites

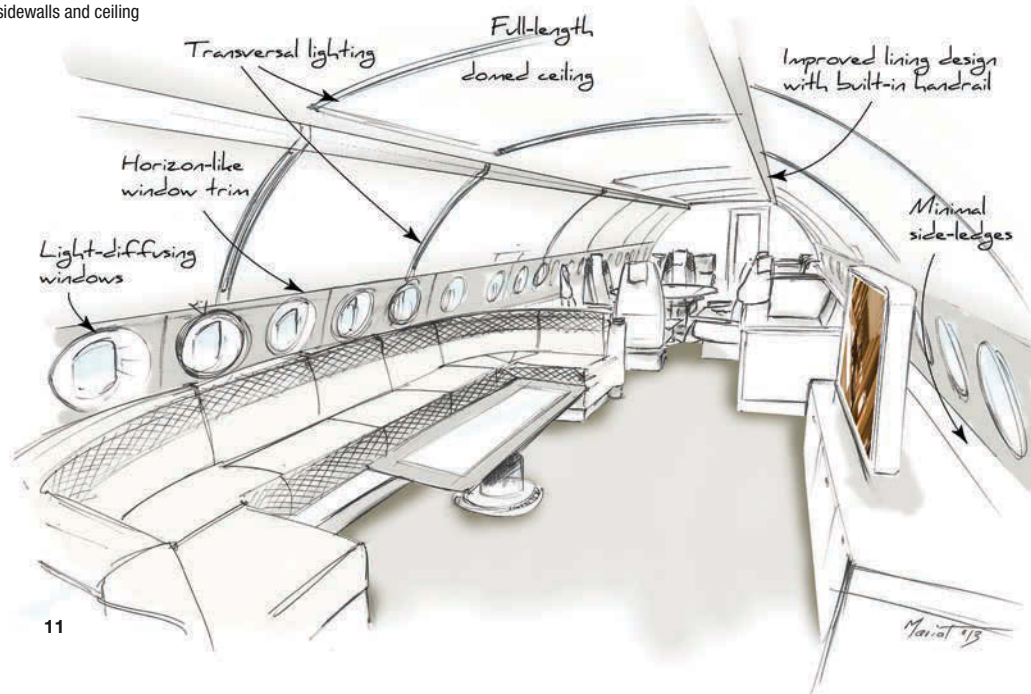
In developing the ACJ319 Elegance's modules, Airbus has had to bear in mind the potential effect on the aircraft's center of gravity. "There's been a lot of engineering design work behind the scenes to enable this," says David Velupillai, marketing director at Airbus Corporate Jets. "We've chosen modules in such a way that we can maintain the balance of the aircraft."

This consideration also extends to material choices. "If customers want something that looks like solid granite, it will have to be a granite veneer," says Velupillai. "But we are still offering a lot of customization. It's not like a smaller jet, where you are just choosing from a catalog."

Whereas the ACJ318 Enhanced is completed by Lufthansa Technik's US subsidiary BizJet International, the ACJ319 Elegance will be completed by ACJC. If a customer wants a fully customized ACJ319, they have a choice of completion centers, including the eight approved by Airbus.

Velupillai does not anticipate capacity being a problem because ACJC has the potential to undertake four cabins a year and is at the moment focusing on the single-aisle ACJ319 and ACJ320. Indeed, the ACJ319 is one of the most important corporate jets Airbus offers. The company has sold 170 ACJs in total, of which 110 were ACJ318s, ACJ319s, ACJ320s and ACJ321s, with the majority being ACJ319s. In addition to the obvious reason that the ACJ319 has been offered for the longest time, Velupillai says that another major reason for its strong sales is that it has the longest range of the single-aisle ACJs. **END**

10. The ACJ319 Elegance will be completed by ACJC
11. A sketch illustrating changes made to the sidewalls and ceiling



11



ACJ319 Elegance

Cabin width: 12ft 1in

Cabin height: 7ft 4in

Cabin length: 78ft 9in

Seats: 2 crew + 8 passengers

Range: 6,000 nautical miles with 8 passengers, NBAA reserves, IFR profile

High-speed cruise: 542kts

Max altitude: 41,000ft

Price: Less than US\$80m

ACJC HAS THE POTENTIAL TO UNDERTAKE FOUR CABINS A YEAR

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Completed turnkey galley for Boeing 747-8

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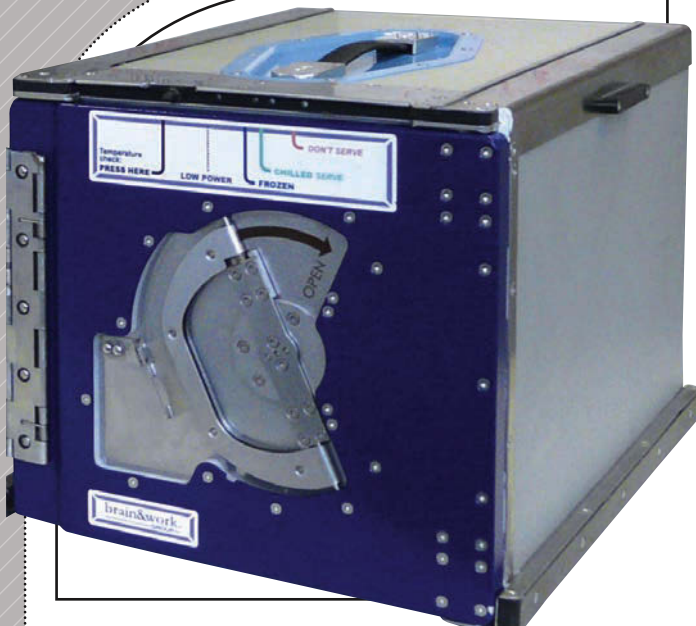


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The trolleys are available in a variety of exotic finishes, including ebony with shagreen accents, santos rosewood with trim in sports rust shagreen and cream leather trimmed with black anodized aluminum. The latest addition to this range is a chrome version.

The trays can also be completed with complementary finishes to match the frame. The front and rear face plates can be embellished with a crest, monogram or logo in embossed leather, marquetry or laser etching. The lockable casters can be finished in nickel or bronze. Alternatively, the trolleys are available with gold or chrome plating or in frosted acrylic finishes.

www.dahlgrenduck.com

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A roundup of some of the best solutions for catering service on business jets



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Installation in new or existing aircraft is simple, requiring the same space as a typical aircraft coffee maker, a 28V DC 600W supply and a suitable galley graywater system. Aerolux will configure the unit to suit the aircraft.

The company also manufactures bespoke galley equipment, offering a high level of customization. Recently it even manufactured ovens for a customer who wanted to roast whole goats on board. “Whether you want the best roasted coffee or the best roasted goat, Aerolux can help,” says Rob Shelton, sales director at the company. The extent and variety of the company’s custom engineered galley solutions – including refrigeration units, wine chillers and even rice cookers – is truly impressive.

www.aerolux.co.uk



Q&A: JEAN-PIERRE ALFANO CREATIVE DIRECTOR AT AIRJET DESIGNS

HOW ARE VIP AIRCRAFT GALLEYS BEING USED TODAY? WHAT EQUIPMENT IS IN DEMAND?

One noticeable trend in VIP aircraft interiors over the past few years has been the evolution from using simple, customized airline galley units (which basically refrigerate and reheat catered food, or prepare hot beverages) toward the design, today, of dedicated cooking stations with induction stoves, new-generation steam and convection ovens and espresso makers.

HOW ARE AIRCRAFT OWNERS INFLUENCING GALLEY DESIGN?

The push from the industry toward new products is clearly driven by passengers’ desire to have an onboard experience similar to life on the ground. Based on my experience as a designer, I would say that most of the time, private jet owners have a hard time understanding – given all the technology in their on-ground lives – why they can’t enjoy their filet mignon just the way they like it (crispy on the top and tender inside) on the aircraft, like in their favorite restaurant.

HOW CAN GALLEYS BE IMPROVED?

The challenge now is to contain the cooking area inside the aircraft, to control cooking odors and smoke so that we can avoid making the entire aircraft smell like roast chicken for hours.

eyesandears

A completions manager's job is to represent the aircraft owner's interests at all stages of the design and completion

1. Herbert Artinger, president and owner of CQM



The success of an aircraft interior completion depends on several factors. "These include choosing the right completion center and a performance-oriented manager, as well as avoiding changes once the design has been frozen and work has begun," says Herbert Artinger, president and owner of CQM. "Changes are often very expensive and unfortunately cause delays."

Ultra-high-net-worth clients often seek expert advice and guidance through the completion process. This is where CQM comes into play. Its services include advice and representation from the brief and design ideas through to the final delivery of head-of-state, corporate and VIP private jets. CQM is contracted by aircraft owners for project management, to supervise the interior completion, as well as to protect their interests.

"We provide clients with more power and control to personalize their private jets," says Artinger. "We know what it takes to ensure delivery of the jet the client really wants and provide the personal service they are looking for. Our clients want to be sure they get the interior of their dreams and that their time, money and identity are well protected. We offer an exclusive service, representing the client and personally guiding them through essential decisions."

The process starts with defining the specification. "Doing this right at the very beginning is the most sensible thing to do," says Artinger. "It's the way to ensure the right purchase and a successful completion. CQM ensures that the specification of every element of the interior and exterior is fully prepared."

The next stage is design visualization, where clients can see their vision coming to life. "Part of CQM's job is to ensure that the aesthetic and technical aspects of the design convey the owner's visions," says Artinger.

Once the design is approved, a completion center must be selected that will outfit the jet

according to the contracted specification. "The completion center should be selected carefully, and really an audit is needed for risk assurance," says Artinger. "The completion center's capabilities, slot availability, quality of work, estimated price and genuine interest in the completion should be considered very carefully. The audit covers these elements, to ensure the client can be confident when reserving a slot."

CQM is also there to provide advice to clients when contracts such as these are signed. "The first completion specifications drafted by the owner and the completion center are never identical," comments Artinger.

To ensure the aircraft is delivered according to the contract and to ensure the quality and accuracy of the work, CQM provides completion management services, based on-site at the completion center. One of its services is to keep the client informed with thorough progress updates throughout the completion. "CQM monitors the completion of the private jet to ensure accuracy and an on-time delivery, as well as to eliminate program risk," says Artinger. The company conducts comprehensive audits of the program and inspection surveys to ensure completion to the contractual specification.

Overall, Artinger contends that investing in a completion manager provides real value for money. "CQM provides a single point of contact for a client during the VIP completion, which provides many benefits," he says. "These include protecting the client from purchasing something they don't need, from paying too much for something that can be negotiated, and from suffering the financial impact of not having an operational aircraft by the contracted completion date."

CQM

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youthful outlook

As a relative newcomer to the VIP market, SR Technics brings a fresh perspective to the art of VIP aircraft design and completion

- 1-2. SR Technics has built up in-house teams specializing in design and upholstery, among other disciplines
3. The company's new solution for narrow-body VIP aircraft

With its new cabin solution for narrow-body VIP aircraft (see feature on page 20), SR Technics believes it can shave three to four months off a green completion, and 20% off the price, while also offering enhanced functionality for the customer. It speaks as a relatively young player in the VIP completions market, unabashed about challenging the status quo.

"Legacy companies have been full for years and the completion process has slowed down," contends Eric Jan, head of interior design for SR Technics' VIP Aircraft Services division. "Now we, and others joining the market, are challenging these companies to the point where they need to adapt to new requirements."

SR Technics' solution involves replacing bulkheads with cabinets that are wide enough apart to mean that during a completion or refurbishment, furniture can be carried straight down the aisle without having to remove anything – meaning it can be installed in any order. Jan has also attempted to inject multifunctionality wherever possible, make the whole aircraft usable by the owner, and strip it of items such as in-seat monitors and call buttons, which he deems unnecessary clutter.

"Innovations start when you ask yourself simple questions, like what if our cabin was more functional? What if our cabin was simpler? What would happen if it was timeless and multifunctional?" says Jan. "These are the needs expressed by customers. They are struggling to find solutions."

Jan also has criticisms for modular concepts "not bringing anything new" and avant garde designs that are "fake dreams that don't stick to reality". The latter is a particular bugbear: "Designers always come up with some funny concept, but don't think about the functionality, and the time and the money they can save for the customer," he says. As an interior design studio within a completion center, Jan believes

his team is particularly in touch with the realities of aircraft interior outfitting.

SR Technics' VIP division grew out of its MRO business in 2010. It is based in Zurich, Switzerland. The company says the most challenging part was recruiting the specialists it needed, not only skilled cabin completion craftspeople such as upholsterers and cabinetry experts, but key personnel in areas such as interior design, VIP engineering and production, sales, planning and project management.

Rather than building its VIP cabin completion teams from scratch, and putting them to work exclusively on VIP projects, the company decided to share completion specialists across the commercial and VIP markets.

"Both businesses can be quite volatile, and we are able to offset certain highs and lows with the other business units," says Michael Gringmuth, sales director for SR Technics' VIP Aircraft Services division. "It gives us the flexibility to react to market demands."

To ensure its team was ready to work on VIP jets, the company hired 15 VIP veterans skilled in each category and planted them in each workshop to "train our local staff the art of VIP", as Gringmuth puts it.

After a year of building up its capabilities, the company secured its first VIP project – the refurbishment of a wide-body ACJ. "Getting the first deal was the hardest," says Gringmuth. "We got it, first of all because we were one of the only companies who had this aircraft type approval, and secondly through the history of our experts, and the setup." Gringmuth also says the client liked the company's policy of taking on only one VIP project at a time.

"Here, he is the one and only, whereas if he went somewhere else, he could be one of many and maybe not as high a priority," he says.

The ACJ was delivered on time in the fourth quarter of 2011 after a seven-month refurbishment. The company has since delivered eight more VIP aircraft.



1



2



3

SR Technics

Reader Inquiry No. 502

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good-lookingglass

Glass offers many exciting design opportunities for VIP cabins
– as recent projects by Glass Deco Corporation illustrate

European company Glass Deco Corporation has been active in the design, manufacture and fitting of luxury glass objects for superyachts, hotels and private residences since 1978. In recent years, the company has developed a specialization in applications for the aviation industry. "We have seen a rising demand for high-quality materials for VIP aircraft applications," says Joos van Bussel, founder and creative director of Glass Deco Corporation. "By working closely with the finest interior architects and designers, we have inspired them to deploy pioneering specialty glass solutions for their clientele's aircraft."

Glass Deco Corporation is a professional partner in the manufacture of glass components for VIP aircraft interiors. "The durability and transparency of real glass make it superior to alternative materials used in the aircraft industry," contends van Bussel. Glass Deco Corporation deploys various techniques to keep the glass used in its applications as lightweight as possible and to minimize or even entirely neutralize its fragility.

The company is currently involved in a number of projects for private jets. "A good example is a BBJ for which we are creating special glass sinks," says van Bussel. "This project is impressive both because of the special technique we are using (double-bending solid glass, faceting and gluing at 45°) and because of the unique way glass is being applied in this VIP aircraft. Moreover, a tailor-made light will be integrated, and will make this object a real eye-catcher."

Another ongoing project for a Boeing aircraft involves manufacturing special illuminated glass floor panels, which will be integrated in a marble floor. While the aircraft is flying, a number of the floor segments will light up to indicate the direction north. In addition to the floor segments inlaid with glass (which will also feature gold leaf inserts), Glass Deco Corporation has also designed and manufactured the lighting technology for this application, with a select partner.

Glass Deco Corporation says its glass is also often used as art in itself – as a decorative glass panel, for example, which is often also laminated indirectly. Mirrors are also commonly used to boost the

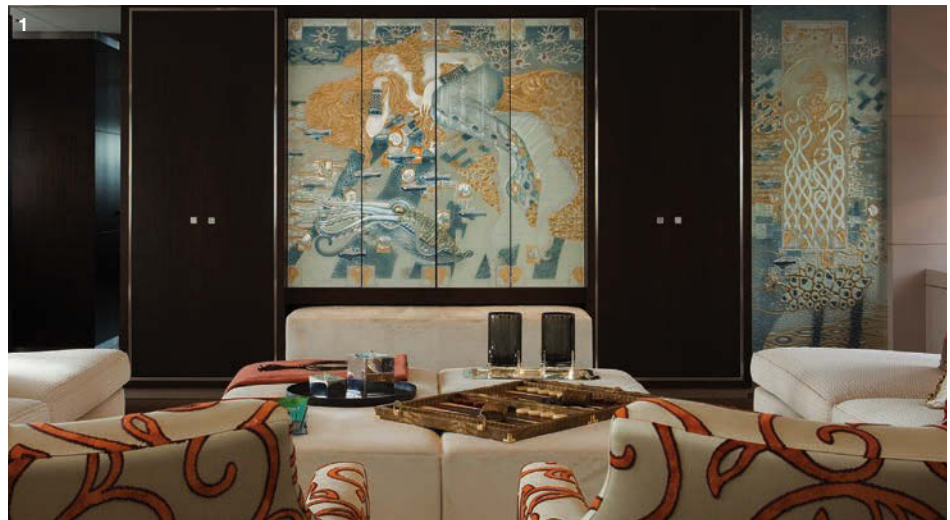
feeling of space in an aircraft, and can be used to create a 3D effect.

"It goes without saying that such projects are the result of close cooperation with designers and architects," concludes van Bussel. "We give their ideas form. Close cooperation with various completion centers throughout the world is another prerequisite for success. At Glass Deco Corporation, we are experienced in both and can also arrange for onboard installation should clients wish."

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1-2. Decorative glass panels installed on an aircraft

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partspartner

Advent Aerospace offers a wide spectrum of engineered products that are used in narrow- and wide-body ACJ and BBJ interior completion projects. Through its VIP interiors divisions, Cabin Innovations and Jormac Aerospace, Advent's experienced engineering teams generate design data and the associated analysis for custom turnkey galleys, lavatories, showers, overhead luggage bins, VIP headliner systems, environmental control system integration kits, VIP cabinetry and the installation hardware required to install all of these.

Over the past year, Jormac Aerospace has produced custom VIP lining systems, monument installation attachments, environmental control system integration kits, VIP showers, and toilet and bidet shrouds for eight BBJ 747-8 and BBJ 737 series aircraft, as well as an ACJ340-600.

Jormac has a full-scale BBJ 747 mock-up at its facility in Florida, USA. This can be used to pre-fit, align and test custom VIP liners, bin systems and lighting before they are shipped to completion centers.

At the same time, in addition to turnkey galleys for several BBJ and ACJ aircraft, the Cabin Innovations division has delivered its first complete shipset of BBJ 747-8 turnkey galleys (12 in total) to a completion center in the USA. Cabin Innovations is scheduled to deliver its second complete shipset of turnkey galleys (15 in total) in July 2014, to an overseas completion center. Cabin Innovations is also supplying VVIP seat surrounds for a BBJ 747-8.

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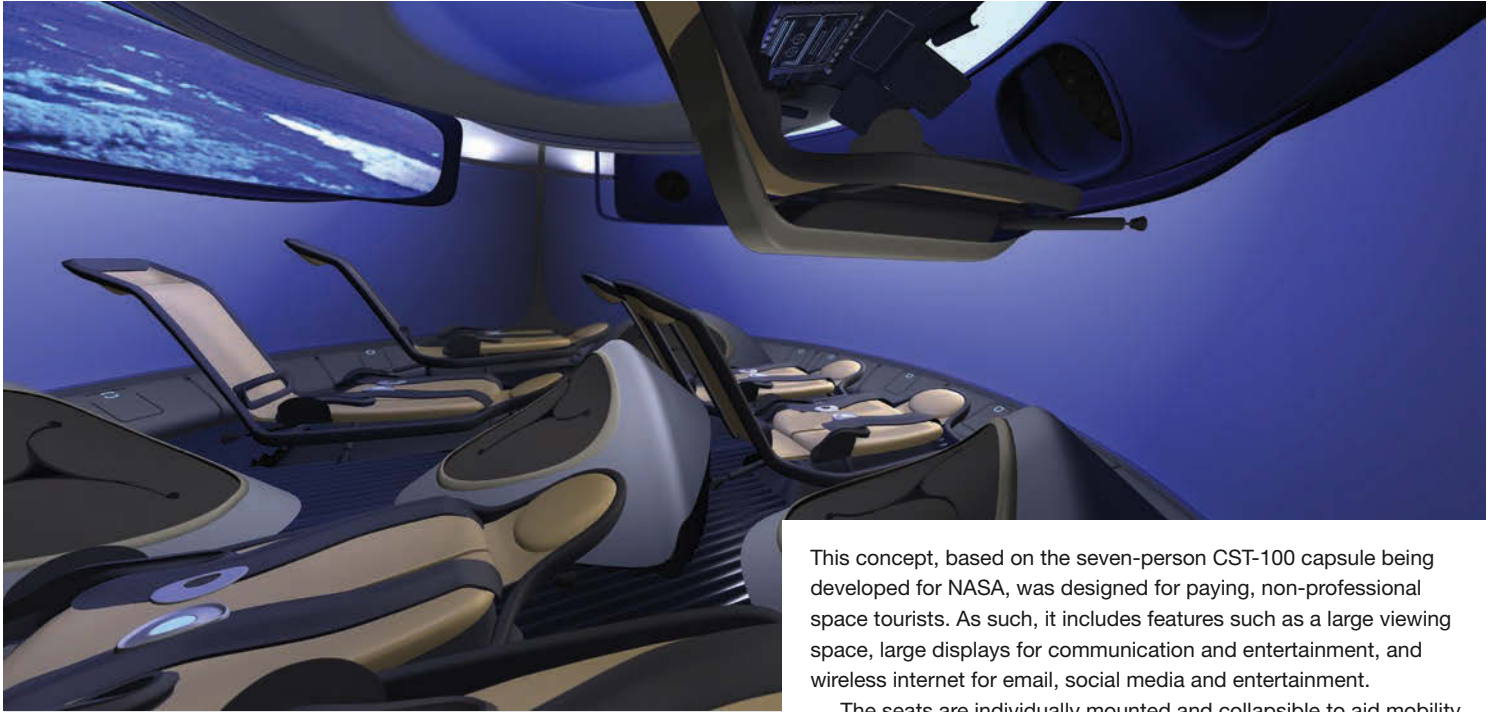
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starquality

Boeing and Bigelow Aerospace unveil their vision for commercial space travel



This concept, based on the seven-person CST-100 capsule being developed for NASA, was designed for paying, non-professional space tourists. As such, it includes features such as a large viewing space, large displays for communication and entertainment, and wireless internet for email, social media and entertainment.

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

Boeing has also appropriated its Sky Interior mood-lighting, which was originally developed for the Boeing 737 airliner. “Boeing’s teams have been designing award-winning and innovative interiors for our aircraft since the dawn of commercial aviation,” says Rachelle Ornan, regional director of sales and marketing for Boeing Commercial Airplanes. “Designing the next-generation interior for commercial space is a natural progression. A familiar daytime blue sky scene helps passengers maintain their connection with Earth.”



OTHER EYE-CATCHING DESIGNS FROM VARIOUS INDUSTRIES...



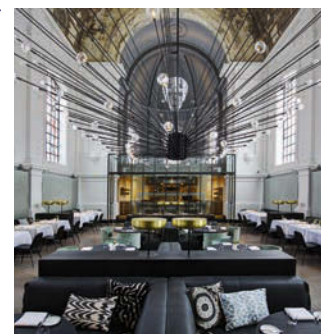
Inspired by Design created this architectural lighting design using Panzeri’s Invisibili product, available with T5 lamps or LEDs.



The XchangE autonomous car concept by Rinspeed (with an interior developed by Strähle+Hess) showcases what driverless cars could be like. The seats can be arranged in more than 20 ways.



Highlights of Elounda Beach Hotel’s new Yachting Club Villas in Crete include infinity pools, heated teak floors, leather-clad ceilings, nautical furniture, sliding doors and outdoor decks.



Piet Boon transformed a former military hospital’s chapel into this contemporary high-end restaurant, The Jane, in Antwerp, Belgium.



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