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JULY 2018



GLOBAL 7500

Details of the new seat architecture and CMS controls debuting on Bombardier's new airframe

BOEING INTERVIEW

Greg Laxton, head of Boeing Business Jets, opens up about his career, sales outlook and completions

LIGHTING

OEMs detail how lighting innovations were factored into the design of their newest cabins





Wheels up

Head down the runway with a selection of the latest cabin designs, product launches, case study news and completion announcements

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THE TEAN

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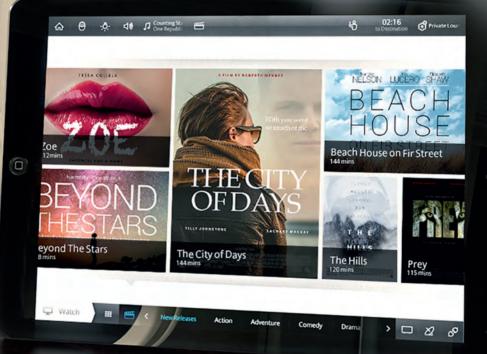
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I D A I R



BECOMING REALITY

hen the lovely people operating Gulfstream's livery configurator at EBACE asked me what base color I wanted for my virtual jet, I don't think they were expecting me to say turquoise. The joy of such technology, of course, is that design mistakes such as these can be exposed from the off, so you can avoid lumbering an otherwise beautiful jet with an unfortunate toothpaste aesthetic.

Also on Gulfstream's stand, I tried out a configurator for seats – apparently the most frequently customized element – and took an immersive VR trip into a cabin, a setup that Gulfstream uses today for internal design review. My movements in the real space were sensed and equivalated for in the virtual world, really giving me the impression of walking about.

In fact, everywhere I turned at EBACE, I found designers eager to showcase their creations using various types of VR. A case in point was Sylvain Mariat, head of creative design at Airbus Corporate Jets, who gave me a VR headset and set me loose on the galley and lounge areas of the new ACJ330neo Harmony design detailed in the

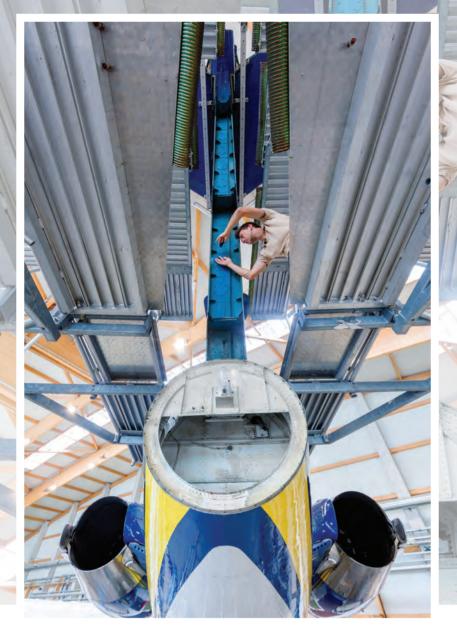
feature from page 24. "More and more of our customers are demanding this tool," said Mariat. "It's great because it gives you almost the feeling you will get in your aircraft. For a long time VR was not so good in terms of precision, but now you can see details as small as the stitching."

Mariat did not have a VR setup with sensors at EBACE, because a big dedicated space is required to replicate a cabin you can walk around, but ACJ does use that technology. "I think the next step will be to have materials you can feel," said Mariat.

Visualizing a design is one important application for this kind of technological tool, but it is not the only one – applications for these and other software innovations in the completions process are explored in the feature on page 46.

And Aura, the new private airline featured on our cover, even plans to offer some of these technologies for passengers to enjoy on board its CRJ700s – with AR applications on windows, and a tail-mounted 360° VR camera. You can read about the cabin on page 62 and enjoy the video on our website.

Izzy Kington, editor











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Program update

TEXTRON AVIATION IS ENTERING A NEW SEGMENT WITH THE CESSNA DENALI SINGLE-ENGINE TURBOPROP. A CLEAN-SHEET DESIGN THAT IS TARGETING FIRST FLIGHT IN EARLY 2019

PERFORMANCE

At high-speed cruise, with one pilot and four passengers, the Denali's range will be 1,600 nautical miles. The top cruise speed is 285kts. The aircraft's full fuel payload will be 1,100 lb.

MISSION FLEXIBILITY

The Denali has a flat-floor cabin designed for easy conversion between passenger and cargo configurations. There are two seating configurations – an executive layout with six reclining seats, club tables and a refreshment unit, or a commuter layout with nine forward-facing seats.

"Everything was made to be flexible," says Christi Tannahill. "What we're really focused on is, how can the aircraft easily be transformed? In the executive configuration you can remove the seats in the back and even the toilet, which gives a huge amount of space for things like small motorcycles, skis, golf clubs, and so on.'

All the seats are quick-change models. "Anybody will be able to swap them out," says Tannahill. "It's the same with the lavatory – they have hard-partitioned doors that are completely closed off, but there are levers so anybody can undo and remove them."

TOII FT

There are several options in terms of the toilet at the back of the cabin. One is an externally serviceable belted lavatory with a pocket door enclosure. "You can remove all the walls around it, but the toilet stays put," says Tannahill. "Or you can choose an internally serviceable toilet, in which case you can completely remove the toilet and the walls. You have the flexibility to configure it the way that you want."

OTHER AMENITIES

Other key features will include the forward refreshment cabinet, LED cabin lighting and an inflight-accessible baggage compartment.

A digital pressurization system will maintain a 6,130ft cabin altitude at the 31,000ft service ceiling.

There will also be 115V power outlets and USB charging ports, as well as cupholders



DIMENSIONS

The Denali's cabin will be 58in tall (1.47m), 63in wide (1.60m) and 16ft 9in long (5.11m), seating 8-11 occupants. Textron says the Denali will offer more head and shoulder room than its competitors, and that the windows are 35% larger than is



Q&A

Christi Tannahill

SENIOR VICE PRESIDENT OF INTERIOR DESIGN AND ENGINEERING, TEXTRON AVIATION

Why are you launching the Denali?

All our upcoming products cover areas that we don't play in today. The Denali single-engine turboprop will support our turboprop family. Being able to enter new markets and find new customers – or enable existing ones to move up through our family – is really important.

What are the cabin's selling points?

For us to enter this market, it was important to offer the best in class in every category, and the cabin is a large part of that. The Denali has the largest cabin in its class, the largest windows, a small galley to hold refreshments and so on, and a completely enclosed lavatory.

You would think that you were sitting in a jet; the quality and the fit and finish is very good, and it's a very large aircraft for its class.

How is customer feedback influencing the Denali's design?

When customers take delivery of their aircraft, we bring them through our design shop and show them all the models we're designing. Therefore, we've had hundreds of customers come through and look at the Denali. Everything we've created is based on customer feedback.

Do you incorporate inspiration from other market sectors?

We always look at other luxury items and vehicles. For example, we look at yachts and boats because they're very comfortable and can incorporate a lot of amenities in a small space. My team is constantly looking outside the aviation industry to see what else is out there, asking if it makes sense and how we can incorporate it into the aviation world.

A boat company actually made the tooling for the Denali mock-up, so that we could make the mock-up quickly.



COMPLETIONS ROUND-UP

This quarter's announcements from completion centers around the world

BASEL, SWITZERLAND

Airbus Corporate Jets approved AMAC Aerospace as an ACJ350 XWB outfitter. AMAC also announced a BBJ 747-8i green completion contract for a head-of-state customer. The work will include the installation of an Aeroloft and equipment including 4K monitors and extra water tanks.

BASEL, SWITZERLAND

Jet Aviation received approval from Airbus Corporate Jets for the ACJ350 XWB. A partnership with AGT to certify interior glass lenses with existing window shade systems on several Airbus and Boeing types was also announced. Jet Aviation is also working with Sparfell & Partners, Winch Design and DS Aviation on a VVIP solution for the ACJ380. -Jet Aviation's role is to engineer, manage, manufacture, install and certify the cabin. The company also signed another Boeing 787 completions contract and achieved an EASA STC enabling a Ka-band system to be installed on a Boeing 747-400.

GENEVA, SWITZERLAND

A Falcon 7X underwent a C-check at RUAG.

HAMBURG, GERMANY

Lufthansa Technik has become an approved outfitter for ACJ350 XWB aircraft after an extensive evaluation by Airbus Corporate Jets. It also launched SPAIRS, a refurbishment service for individual parts.

MUNICH, GERMANY

RUAG Aviation performed an 8C check on a Global Express XRS, upgrading the satcom and wi-fi at the same time.

DUBAL UAF

Falcon Aviation opened an MRO capable of accommodating four BBJ/ACJ narrow-bodies for base maintenance. It includes workshops. interior solutions, a wash bay, landside office space and 13,000m² (140,000ft²) of apron.

PETERBOROUGH, CANADA

The first Challenger 650 medevac interior was completed by Flying Colours under contract from Bombardier Specialized Aircraft, for Swiss Air-Rescue Rega. The cabin can be used as an ICU for two patients, accompanied by critical care specialists, or configured for as many as four patient units and a medical team. Features include strengthened soundproofing and customized double-width fridges for medical supplies.

NORTH AMERICA

Bombardier and Duncan Aviation are now able to retrofit the Gogo Avance L5 system to Challenger 300 and 600 jets, offering passengers inflight 4G wi-fi. The installation can be made at any of Bombardier's five service centers in North America, as well as at Duncan Aviation's three MRO facilities and some of its satellite locations.

KIRKLAND, WASHINGTON

Greenpoint Technologies inducted another BBJ787-8 for completion. The interior was designed in-house with the client. The aircraft is scheduled for redelivery in 2019. The company is celebrating its 30th anniversary this year.

CLEVELAND, OHIO

Constant Aviation completed its first installation of Honeywell's JetWave MCS-8000 Ka-band satcom hardware on a Bombardier Global Express. The work was performed along with a 60-month inspection.

INDIANAPOLIS, INDIANA

A wi-fi STC has been awarded to Comlux Completion for the Gogo Avance L5 4G inflight connectivity system on the Challenger 300 series.

SAN ANTONIO, TEXAS

Aeria Luxury Interiors was awarded a 12-year maintenance support contract for its first ACJ - an A319. Aeria will carry out heavy maintenance works that include interior and auxiliary fuel tank removal/replacement.

FORT WORTH, TEXAS

Two head-of-state completion contracts, consisting of four wide-bodies, were announced by GDC Technics. The company says it will deliver three wide-body head-of-state aircraft in 2018.

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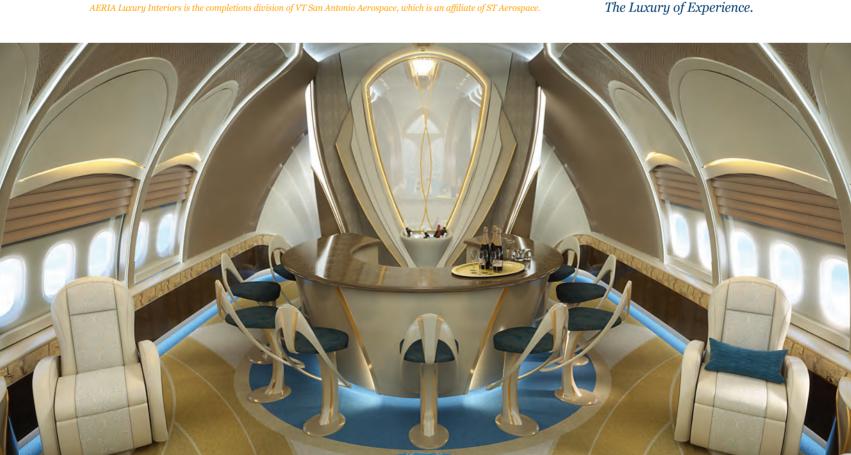
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The Luxury of Experience.



This BBJ Max concept was created by Winch Design as part of an initiative led by outfitting specialist Comlux Completions to showcase design possibilities for the next generation of narrow-body aircraft.

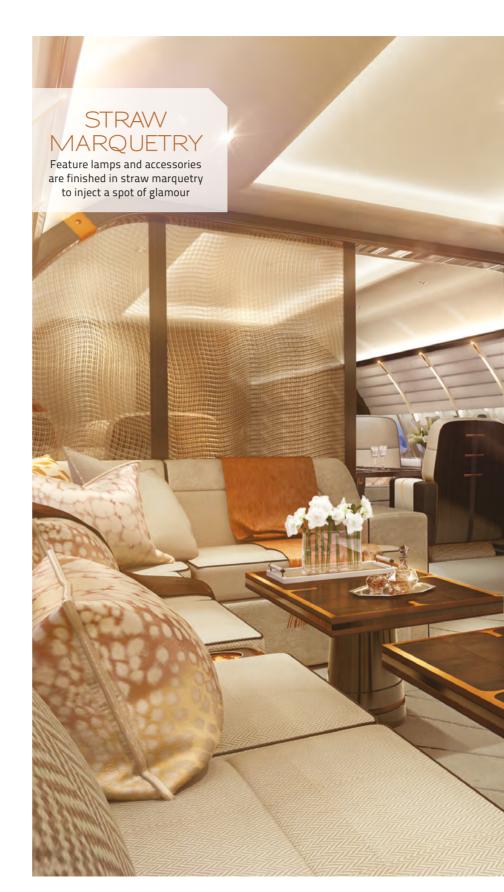
Jim Dixon, head of aviation at Winch Design, says the most special aspect of the design is its dual-lounge arrangement. "It offers both privacy and open-plan space – achieved by introducing translucent electrodimmable bulkheads that can instantly transform the very large cabin into smaller, more intimate spaces," he explains.

The forward lounge is designed to provide comfortable dining for a large family or business group, while the aft lounge can be configured either with a large side-facing TV for a movie-room experience, or as an informal mailis with divans on all sides.

Dixon explains that the fundamental aim throughout the design process was to create an aesthetic that is warm, luxurious and contemporary. "We created a cabin concept that relates both to contemporary residential interiors and a sophisticated business atmosphere - it is generous, relaxed and rich, and emulates the professional attitude of the owner," he says. "Rich wood veneers, elegant fabrics and copper plating add a warmth to the scheme as well as a stamp of authority."

He says the design is immediately feasible. Winch has thought of the challenges specific to these airframes right from the outset. "Because Neo and Max aircraft employ very different composite airframe technology, the restrictions on the cabin outfitting are also different, particularly in terms of the decompression requirements," says Dixon. "We have to be creative with the cabin architecture to accommodate frangible panels."

Winch is now reviewing and developing the design with particular clients as a blueprint for their specific outfitting projects. "As every project Winch creates is unique, we may refer to a number of our concepts to achieve a fully tailored design that reflects the owner's individual character," says Dixon.









"Users can build their own lighting schemes to create the perfect ambience"

MAIN: A RELAXING MORNING PRESET LIGHTING SCHEME IN THE GLOBAL 7500

INSET: A NATURAL LIGHT PRESET IN THE SAME CARIN



of settings that fit every activity and phase of flight. "We don't see light simply as utilitarian, but also as a sculptural part of a flight," says Tim Fagan, industrial design manager at Bombardier Business Aircraft. "We're therefore looking into different innovations and technologies, such as the development of LED lighting, as well as OLED lighting."

On the Global 7500, Bombardier wanted to replicate the lighting experience aircraft owners enjoy at home, with enhancements tailored to the cabin environment and the activities flyers most often enjoy in the air. "Lighting plays a big part in helping us achieve that," Fagan says.

FULL-SPECTRUM RGBW

In the Global 7500, Bombardier opted for full-spectrum RGBW, which Fagan says offers more shade options and better color rendering. "We wanted the lighting to help bring out the beauty and craftsmanship of the interior. We therefore selected an assembly with twice the resolution of current LED systems to help showcase the luxury of the materials."

Passengers can also select from preset lighting schemes. "For example, a passenger who wants to watch a movie will be offered the movie lighting preset," Fagan says. "Automatically, the shades will go down and the lighting will be adjusted to create the best movie experience. Those preset lighting settings are also fully customizable. The user can adjust

CIRCADIAN RHYTHMS

GAME SET MATCH



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"We met our weight targets by understanding the occupants' needs to have just the right lighting positioned at the right locations"

them and build their own lighting schemes to create the perfect ambience, and can save these personal presets so that the aircraft remembers them for future use."

EFFICIENCY GAINS

Like any other component, lighting features can add weight to an aircraft. The Bombardier lighting team was working to aggressive weight targets. "The priority was to balance those objectives with aesthetics and design," says Fagan. "We met our weight targets by understanding the occupants' needs to have just the right lighting positioned at the right locations. This enabled us to select the best-suited lighting in each zone of the aircraft for ultimate enjoyment and an optimized system.

"For example, we wanted to make sure that the reading light would properly illuminate all possible seating positions, clearly and without creating glare or shadows, whether passengers are sitting up or are fully reclined. We therefore worked with the team and our supplier on a solution to ensure that the lighting location, intensity, color temperature and focus would always support our passengers' activities."

Jay Beever, Embraer Executive Jets' vice president of interior design, says that weight and space targets took RGB lighting options off the table for the Phenom 300E, which entered service in 2018. But with a little creativity, the manufacturer was able to overcome this limitation. "RGB packaging at the time was larger than the LED packages," he





ABOVE: READING LIGHTS ON THE PHENOM 300E ARE INTEGRATED IN THE UPPER TECHNOLOGY PANEL. THE CONTROLS LIGHT UP WHEN A HAND IS DETECTED NEARBY

BELOW: OVERHEAD LIGHTS ON THE PHENOM 300E WERE POSITIONED TO HIGHLIGHT EACH PASSENGER

explains. One of the goals Embraer set for the Phenom 300E interior was to improve human factors. An RGB panel would have infringed on overhead room, Beever says, which was valued more by passengers than special lighting effects.

PRACTICALITIES

There were other considerations too. "LEDs require less power," says Beever. "We were able to optimize the system without having to change the batteries or modify the engines. The gains allowed us to add extra lighting in places like cupholders, the space under passengers' feet and overhead."

Embraer discovered that the way light

changes against certain backgrounds

SEATS ERSUS LIGHTS

Embraer finds that customers appreciate lighting more than other design features that they might initially be focused on.

"So much attention in private jets goes on the seat," says Jay Beever. "We are being told all the time about new advances in seating, but I believe we should also offer surprise and delight features. No one expected the technology and ambient lighting applications that we developed for the Phenom 300E. We did that not because we were asked to, but because it creates surprise and delight. Our customers look at the seat, but then the rest of the conversation is about the lighting and the overhead panel. They spend 10 minutes talking about the seat and 50 minutes on the lighting features."

SOMETIMES IT'S THE SIMPLE THINGS

DONE SUPERBLY

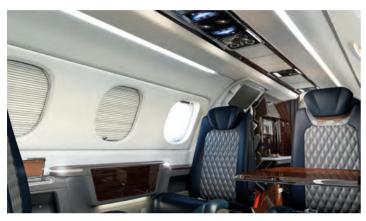


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"The more we can bring natural light in from the outside, or simulate it on the inside, the more comfortable people are going to be"

phenom
300E passengers
can control light
settings and
themes using
touchscreens



LEFT: THE PHENOM 300E
CURRENTLY USES LED TECHNOLOGY

BELOW: PHENOM 300E PURCHASERS HAVE MULTIPLE METAL PLATING OPTIONS, WHICH WILL INTERPLAY WITH THE LIGHTING IN DIFFERENT WAYS AESTHETICALLY

offered new opportunities. "We thought we'd try something different," says Beever. "The Upper Technology Panel has a multi-white lighting element behind its glass screen. As the light hits the plated metal surfaces of the dish around the glass, it creates multiple reflections, which differ according to the metal plating chosen. For instance, on the first Phenom 300E, we used soft nickel plating. When the white light reflects off that it creates a blue glow, which gives a very sophisticated and techie look. We could also adjust the Kelvin temperature of the white lighting, allowing you to play with the intensity of the blue reflection. Alternatively, the customer could choose a champagne gold plating, and then the reflection

POSITION CRITICAL

gives a warmer, sunset feel."

As RGB technology has advanced, becoming lighter in weight and taking up less space, Embraer is considering using it for future models. But it's

the positioning of light that Beever says makes the greatest difference, with beams focused where and when they need to be. "A dark movie theater does a fantastic job of keeping the focus on the experience," he says. "We make sure that overhead lights put light on the occupants, who are the focus for other passengers."





Embraer has also focused on haptic interactions. "When you touch something it should feel real," says Beever. "If it's metal, it should be cold. If it's plastic, it should be warm. Through touch, we create an analog natural experience that the human will pick up as authentic."

Including haptic elements in design serves to surprise and delight customers, Beever says, and responds to needs that customers hadn't even thought to express. "It's kind of how we all felt when we first got the original iPhone," he says.

Ultimately, the cabin design, Beever says, including the selection of materials and finishes, should be a canvas to make the most of all lighting settings. He also says structural features, like larger windows, still have an important role to play. "The more we can bring natural light in from the outside, or simulate it on the inside, the more comfortable people are going to be," he says. "So much of the future technology that is being highly publicized and proposed is artificial - for example windows with LCD screens to synthesize nature in the cabin. In reality, what you want is bigger windows allowing in more daylight when you need it."

Steward: "Sir, would you like your fried eggs over-easy, over-medium, over-hard or sunny-side up?

Passenger: "Ahhh, you must have an Aerolux AL-SK15-100 Series Skillet in the galley!"

Steward: "But, of course, Sir, this is your Business Jet."



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TALK

MEET GREG LAXTON, HEAD OF BOEING BUSINESS JETS AND GOVERNMENT AND MILITARY SALES FOR BOEING COMMERCIAL AIRPLANES

Words by Anthony James

till relatively new in his post, having only been named as vice president of Boeing Business Jets in January 2017, Greg Laxton strikes a remarkably mellow tone when discussing the inevitable pressure that comes with the responsibility of leading the teams that sell, market and support Boeing commercial aircraft to private owners and governments.

As a former fighter pilot, Laxton is clearly used to keeping a cool head and a strong focus. However, he admits the sheer diversity of his current role took him by surprise, at first. "I think that was the biggest thing that struck me when I came to work for BBJ," he says. "We deal with a very diverse customer set, not only individual principals who buy the aircraft, but we also sell to heads of state and deal in the charter world."

FLYING IN THE FAMILY

Fortunately, Laxton learned how to adapt to new situations early on, while also forging a love of flying. "I caught the bug from my father, who was a World



RIGHT AND BELOW: A BBJ MAX 7 CONCEPT BY ALBERTO PINTO INTERNATIONAL INTERIOR DESIGN The first BBI
Max 8 flyaway was
celebrated in April 2018,
and further BBI Max
deliveries are
deliveries in the
expected in the
coming months

HOME COMFORTS

Greg Laxton believes that BBJ customers benefit from cabin experience research performed on the commercial side. "We constantly conduct research in a lab setting," he explains. "For example, Boeing and Oklahoma State University carried out a study into the effects of cabin altitude on passenger discomfort, which really helped highlight the difference in how you feel after a flight with a lower cabin altitude, especially the benefits when you move that cabin altitude from 8,000ft down to 6,500ft, which is where the BBJ and BBJ Max cabin reside. This is something our competitors don't offer."

He also highlights the reduced noise levels offered by the BBJ Max's cabin: "What we refer to as community noise has dropped by 40%," he says. "Also, the Max gives customers the flexibility to sacrifice some of its range or payload for additional soundproofing. You can add up to 3,000 lb to a BBJ Max and still get the same range that you had in a legacy BBJ – if you wanted to make it ultra-quiet."

The Max 7 also offers an additional air-conditioning zone. "There are now two," says Laxton. "The passenger can really fine-tune the cabin environment so that the forward cabin is set at a different temperature to the aft cabin, which wasn't possible in a BBJ."





War II pilot, flying both P47s and P51s out of the UK, starting during the D-Day invasion," he says. "By the end of his career, he was the head of flight test for F15s, B52s and C130s. I was born in the USA, but then we lived in England before moving back to Georgia, USA, where Dad retired. I just followed in his footsteps. I was fortunate enough to fly the F-15 and enjoy an air force career, too."

Laxton accumulated more than 4,000 hours of flying time as a USAF fighter pilot, before retiring with the rank of Lieutenant Colonel. His employment with Boeing began in 2004, when he was hired to lead the capture team for the F-15K follow-on programs in Korea and Singapore. He also successfully led campaigns for



"Interest in Boeing's business

jets is translating into new

orders and a backlog"

the 737 Airborne Early Warning and Control aircraft and the F-15K, before serving as the Boeing Defense country director in South Korea.

He then switched his focus to Boeing's commercial division, taking up a position as sales director in the northeast Asia region, responsible for the sales of airliners and related services to Air China, Air China Cargo, Shandong Airlines and Shenzhen Airlines. "The military gave me a real early opportunity to lead, while my career

since has exposed me to a lot of different experiences, which helps with the current role," he says.

Perhaps naturally for a man who estimates having moved home up to 20 times, the diversity of Laxton's current role is

particularly satisfying. "I love the fact that things are different every day," he says. "Every principal has their own ideas and use for their aircraft, so it's always different and we're always looking to figure how we meet those opportunities and challenges. Then when you shift gears to talking to governments and the way they work through their procurement processes, I find it both interesting and

challenging. Charters have their own set of requirements and needs, too. So, you're never doing the same thing day in, day out. Every deal, every situation, is different – which makes it fun."

STRONG POSITION

It also helps that BBJ sales are currently doing rather well. The company has won four new orders in 2018 already, following an impressive 2017 in which customers

purchased 16 aircraft. "We continue to see a lot of customer interest in Boeing's family of business jets and that is translating into new orders and a growing backlog," says Laxton. "Customers are looking for more space and improved range, which is

driving significant growth in the large-cabin segment."

Two of the new orders this year are for the BBJ Max, adding to a backlog of 19 aircraft and making the BBJ Max one of the best-selling business jetliners in history.

Based on the new 737 Max, the BBJ Max delivers 14% better fuel efficiency matched with 787-style flight deck displays and multiple advanced new systems. It is



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RIGHT: A BATHROOM IN THE BBJ MAX 7 CONCEPT CREATED BY ALBERTO PINTO INTERNATIONAL INTERIOR DESIGN In total, BBJ has received 259 orders and delivered 233 aircraft

also capable of flying a full 7,000 nautical miles (12,964km) while passengers bathe in a lower cabin altitude.

"Since the economic downturn it took a little while to get back, but we're seeing GDP growth throughout the world, now," says Laxton. "That is one reason we're seeing a rebound in sales of BBJ aircraft – we're fortunate enough now to have a backlog of 19 BBJ Max aircraft."

COMPLETION COUNTDOWN

Having ordered a BBJ, customers might be surprised to learn just how long it might be before they receive their aircraft, given the current backlog at some of the leading completion centers. "We're always working on cost and schedules because customers don't want to wait 16 months to receive their aircraft," says Laxton.

However, he is reluctant to criticize any individual completion centers, and does not view current output as inadequate. "There are currently 14 Boeing-approved completion centers," says Laxton. "Two years ago, everybody was struggling for enough work, but as the market has come back we now have a backlog of 19 BBJ Max, plus the other aircraft that are out there and the refurbishments and updates that are going on. However, the workload has been distributed pretty well to date –

"Every BBJ sale includes hundreds of hours of engineering support"

from a BBJ standpoint, over the past three years, aircraft have gone to 11 different centers. The ratio of completion centers to the amount of opportunity is well balanced."

To cut waiting times, Laxton is a firm believer in getting the cabin design started way before the center takes delivery of the green aircraft: "We continue to educate customers on the benefits of starting design and

engineering well before aircraft delivery. This accelerates the completion process dramatically as the aircraft and the interior are built in parallel."

GREG LAXTON

DATA LOCKDOWN

Initial BBJ completions were plagued with issues that saw costs spiral and completion times measured in years, rather than months. One of the reasons behind those early delays was Boeing's reluctance to share sensitive technical data with completion centers.

Laxton believes the current situation has improved, however the manufacturer still keeps some of its cards close to its chest: "Boeing does have a package of data that we've developed specifically for completion centers," he says. "However, when information is deemed too sensitive to share outside of Boeing, or when our tools can perform the analysis faster and better, we prefer to do this in-house. Every

Sales forecast

The skies ahead are blue, believes Greg Laxton, noting that analysts are predicting high-end business jet sales to nearly double in the next 10 years, with cabins expected to grow by 30% and aircraft range by 25%. "You can see that in our BBJ Max, where you're getting almost 8ft [2.4m] more in cabin length, combined with the aircraft's 7,000-nautical-mile capability," he says. "We're leading the trend there."

He highlights strong demand from both the Asia Pacific and used markets: "The

used market is a great indicator of immediate demand, with increasing interest in North America and some shift to charter for the older aircraft."

Despite the rise of younger billionaires who have made their fortunes from digital enterprises, Laxton says he is yet to see a fundamental shift in the type of customer ready to buy a BBJ. "Is it a new customer set?" he asks. "It's more that the folks that can own such an aircraft are now more willing to release the funds. They want to connect their summer homes and yachts and their business with their permanent residence."



BBJ sale includes hundreds of hours of engineering support. Completion centers have those engineering support hours specifically so that they can come back to Boeing, and we can leverage all of our knowledge about the aircraft to figure out the best way to meet the customer's needs when it comes to the interior installation."

WEALTH OF KNOWLEDGE

Boeing can draw upon a wealth of experience from previous completions to help reduce workload and ensure faster delivery. "There are 209 BBJ products that have

MAN ON The Move

As Boeing Business Jets' vice president, Greg Laxton spends a good chunk of the year away from home. "This is a very travel-intensive job," he says. "We do the various shows every year – ABACE, EBACE, NBAA, MEBA, Paris, Farnborough and Dubai – and then there is the travel to see the different customers, stakeholders and suppliers."

Laxton estimates he travels for at least 150 nights a year. "Luckily both my kids are grown," he says. "And it helps my wife keep her sanity."

"We're always thinking how to evolve the designs we've already certified"

been completed and are in service," notes Laxton. "That is a ton of engineering and design that's already out there and certified. Completion centers are exploring ways to reuse some of that existing work and how they can develop interiors and engineering that are more modular and work with established connection points to speed interior installation. There's no magic wand – this is aviation – but there's a lot of design, regulatory requirements, flammability expertise and structural analysis already well understood. We're always thinking how best to evolve the designs we've already certified to get the next aircraft done faster. We've had a turnkey project that completed in less than 10 months, so we are seeing a marked improvement in interior flow time."

Despite the headaches that can arise during an interior project, Laxton admits to always being more than satisfied with the final outcome. "Completion centers do a great job executing on the customers' needs," he says. "When we walk inside a freshly completed BBJ, every time the reaction is 'Wow!' We marvel at the design, the features, how comfortable and spacious the cabin is. The end product is not the challenge – instead it's the cost, the schedule, how best to reuse some of the engineering work, and being able to deliver the aircraft on time."

Summing up his current role, the former fighter pilot says he is focused on working together to get the best result. "My message to the completion centers is, let's continue to enhance our collaboration, push technology, innovate and design around our customers' lifestyles. I'm always looking for new ways to collaborate, not only with the completion centers, but with the principals that are buying the aircraft, as well as the heads of state and the charter firms that we work with on a daily basis."



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aunched as the Global 7000 in 2010, the newly renamed Global 7500 is on the final approach to service entry, with certification expected in the second half of 2018. Key selling points include four cabin zones that can be tailored to suit owners' missions, and a 16-hour range. Now Bombardier is releasing closely guarded details of key components of the cabin.

Chief among the recent revelations is the Nuage seat, which has a completely new architecture that Tim Fagan, manager of industrial design at Bombardier Business Aircraft, believes makes it "the most comfortable seat in aviation". The development of Nuage began very early on in the overall program. "Seating stands out as such an important element of the cabin," explains Fagan. "It's where passengers spend the bulk of their time and because of the range of the aircraft, our customers expect to really go about their lives and their business."

VITAL CONTACTS

The seat had to support passengers in everything from working to relaxing, eating and sleeping. Bombardier started by researching human factors, drawing out important elements contributing to seat comfort. Fagan says these include firm contact between the user's back



and the backrest, and between the feet and the floor in a seated position. "People often make slight, unconscious, changes to their posture," he explains. "That is promoted and facilitated by your feet being in contact with the floor. It also lets your feet spread some of the tension and release pressure from the back of the legs."

TILTING RECLINE

The research led to the development of features including a tilting recline system. "In typical business aviation seats, the recline is okay but the backrest just tilts straight backward," comments Fagan. "Because the seat cushion is not moving with it, if you go into a deeper recline you start to feel that you may be starting to slide out of the seat. The contact between your back and the backrest becomes a bit insecure."

LONG LEGS

The Nuage seat was validated to be comfortable for a range from fifth percentile female to 95th percentile male.

"There are a couple of features that enable us to cover that spread," says Tim Fagan. "One is the seat pan depth adjustment. The seat cushion slides forward a few inches so that someone with very long legs can have full support all the way to just behind their knees. The leg rest has an extension, so those with longer legs can extend it with a simple nudge of their foot, to provide support from head to toe."

RIGHT: A 40IN, 4K STAND-UP
DISPLAY IS AVAILABLE FOR THE
ENTERTAINMENT SUITE, ALONG
WITH 5.1 SURROUND SOUND
CREATED BY A CENTER CHANNEL
AND A SOUND BAR BELOW THE
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Bombardier's solution is to link the backrest recline to a slight dip in the seat pan. "As the backrest reclines, the seat pan just below your hips starts to dip as well so that as you lean back further, your body is cradled," says Fagan. "It gives very even support across the back of your legs, your back and shoulders, dispersing the weight of your body. At the same time, the seat cushion stays in a constant position behind the legs so that your feet are always in contact with the floor."

The second new element is a tilting headrest.

"Traditional headrests only go up and down," says Fagan.

"We need to provide a little bit more head support if users are reclining but want to watch a movie or read a book.

With Nuage, as you go into deep recline, you can tilt the headrest forward and find the spot where it delivers perfect support to your head."

SMOOTH MOVES

Another new element of the seat is the 'floating' base and hidden seat tracks. "The perfect track-and-swivel mechanism needs to be super smooth, effortless and capable of tracking all the way to the table, pivoting and rotating with all of the mechanism hidden within the seat base," says Fagan. "The rotation mechanism is embedded directly below the seat, so as you move around it's always directly below your center of gravity, making for a very intuitive motion."

Curves in all the right places

Visually the goal with the Nuage seat was to create a sense of lightness. "We have a curved back shell that is thicker in the center and tapers toward the edges," says Tim Fagan. "Instead of straight lines, everything is curved gently. This also happens to be an excellent way of controlling the upholstery. As we developed the seat, we worked closely with our upholstery and engineering teams. That collaboration really helped us understand how to get the most out of leather. For example, a convex shape allows us to keep our leather nice and snug. It helps us to keep it smooth; you get very sharp precision and control over the stitch lines."





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Bombardier built mock-ups to validate the right seat geometry for the seat's static positions (for example, upright, slight recline and deep recline). The next challenge was to develop smooth mechanisms to connect them. "Having that work very smoothly and in a controlled way took a lot of focus and iterations with mock-ups," says Fagan. "We check with users every step of the way. We have a range of informal test subjects in-house and validate with customers at key milestones."

USER OPERATION

Nuage is not an electrically operated seat, but it has electrical release buttons. To operate the seat, passengers press the relevant button and shift their body weight backward or forward to bring the seat to the desired position. Releasing the button then retains that position. Track and swivel are operated in the same way.

ABOVE: THE GLOBAL 7500 WILL HAVE A MAXIMUM RANGE OF 7,700 NAUTICAL MILES AND A TOP SPEED OF MACH 0.925 Fagan describes Nuage as containing a number of in-house patents, and says it was created with only a few key partners. Currently offered on the Global 5500, 6500 and 7500, features of the Nuage seat may find their way into other Bombardier business aircraft models "based on customer feedback", reveals Fagan.

Despite the achievements of Nuage, Fagan promises that Bombardier will continue to work on new seating technologies. "We always want to be looking for new opportunities in the cabin, and questioning the status quo," he says. "Nuage is certainly worth the investment

we've made; customers will notice a difference when they fly our aircraft."

CABIN CONTROL

The other aspect of the Global 7500 cabin that Bombardier has recently opened up about is the nice Touch CMS, designed with Lufthansa Technik. There are two new modes of interaction – the nice Touch dial and the suite controllers, which were "a good six years in the making, if not more", comments Mathieu Noel, director of product strategy, industrial design and sales engineering at Bombardier.

The touch dials are small touchscreens that are located by every seated position. The touch dial has a moveable ring around the outside, designed to give the user precise control and a tactile experience when making fine adjustments in the cabin. The touch dial also features "business aviation's first application of an OLED touch display", according to Fagan.

HOW MANY TURNS?

With the nice Touch dial, creating the right tactile experience – the correct amount of friction and control, the right amount of turning – was the biggest challenge. "We iterated with Lufthansa through the course of the development to make sure that we were getting it right," says Tim Fagan.

Mock-ups proved vital in this endeavor. "With a tactile interaction, you know when it feels right or wrong," says Mathieu Noel. "Defining statistics or technical specifications for it is not easy. It was through user validation that we were able to get it right."



AROVE: OPTIONS FOR THE AIRCRAFT'S FOUR CABIN ZONES INCLUDE A MASTER SUITE WITH DOUBLE BED

"The super-high-resolution screen uses the same technology as in high-end smartwatches," he reveals. "It is very clear from every angle. We even introduced a bit of a crown to the top of the dial to make sure it was visible in all lighting conditions."

The dial sits flush in the sideledge until a passenger activates it with a swipe, whereupon it rises into a ready position. It offers control over media (enabling passengers to adjust volume, pause and fast forward) as well as over lights and window shades in that cabin zone. With another touch the dial retracts back into the sideledge.

Fagan says the dial idea was inspired by the rotary controls used in domestic settings. "For example, if you look at a high-end stereo system, often you'll see a rotary dial that gives very precise control over the volume," he explains. "There's a familiarity with that; being able to grab a dial is natural to the user."

HOME FROM HOME

Similar motivations lie behind the suite controllers, small LCD screens that are embedded at the entrance to every cabin zone, offering control over lighting, window shades, volume and temperature - just as people are used to having light switches in their homes.

"In a smaller aircraft you're more likely to be in your seat for the duration of the flight," says Noel. "That means your tablet will always be within reach and it wouldn't be very hard to control the cabin with that device. However, on an aircraft that has the capabilities and size of the Global 7500, you're more likely to be walking from one

suite to the next - perhaps eating in the front, sleeping in the back and moving to the entertainment suite. This is more like the behavior in your home and therefore there's nothing more intuitive than having

TESTED ON THE RIG

controls for the suite on the walls."

A new feature of the nice Touch

PEDs - is aggregated via a USB port into a single browsable list

With CMS, reliability is vital. Here Fagan points to Lufthansa Technik's fiber optic backbone, "which has proven reliability". The new system has been tested extensively in labs at both companies, including on Bombardier's integrated test rig - a simulated cabin set up with all the interfacing hardware and software components, including "all the buttons, switches, lights, monitors and wires that are going to be in the real aircraft, implemented with the real distances between them," explains Noel.

As with the Nuage seat, Bombardier has filed patents for certain key elements of the new CMS, including the touch dial. "We have invested heavily in this and it will be exclusive to the Global 7500," concludes Fagan. 8

DAYLIGHT

The Global 7500 features a full-spectrum RGB lighting system. As well as some pre-programmed presets, passengers can create and save their own when they find the perfect ambiance. "Daylight simulation is another thing we've spent a fair amount of time on," says Mathieu Noel. "The system accesses the time at the flight's origin, the time at the destination and the flight duration from the flight management system and will propose a simulation to ease you into sleep and wake you up at the right time."

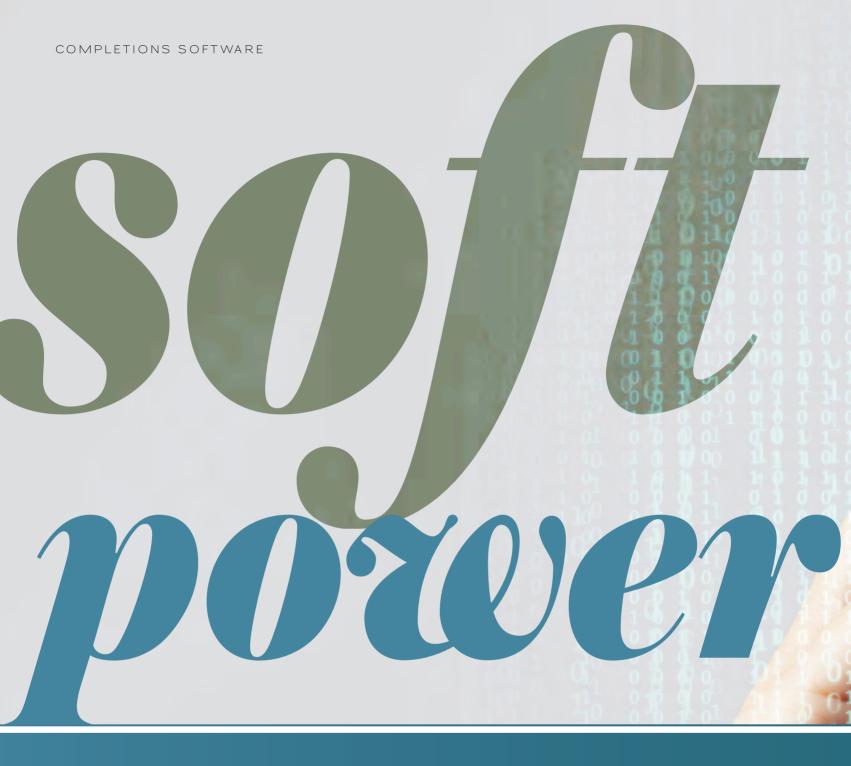
As well as dimming and raising the lights, the system will propose colors more conducive to sleeping and waking. "It'll remove the blue colors found in natural daylight as you're getting closer to sleeping, and in the morning it will dial them up to help you wake up more quickly," says Noel.



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COMPLETION CENTERS SHARE HOW THEY ARE USING SOFTWARE TO MAKE PRODUCTS MORE ATTRACTIVE TO CUSTOMERS, AVOID COSTLY ERRORS AND ENSURE TIMELY AND CONSISTENT DELIVERY ON ORIGINAL DESIGN CONCEPTS

Words by Marisa Garcia



"By using the tablet's camera and a special AR extension, we can visualize the interior parts in the desired place long before it is installed"

ompletion work still requires human craftsmanship, but increasingly sophisticated software is becoming more useful in complementing those skills.

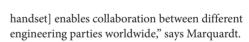
Ruth Marquardt, digital mock-up integrator at Lufthansa Technik's VIP and Special Mission Aircraft Services division, describes the company's IT landscape in VIP completions as very flexible and open. "It has enabled us to go paperless in all areas of engineering and production," she adds.

The company uses virtual reality (VR) and augmented reality (AR) to help customers visualize the end product. "We spent a lot of effort introducing headmounted displays," she says. "Marketing uses Samsung Gear VR equipment to give the customer an amazing, individual experience, an idea of what is possible in the VIP aircraft completion world."

Lufthansa Technik also uses VR to support the design process. "Working with an HTC Vive [a 3D VR

BELOW AND FAR RIGHT: LUFTHANSA TECHNIK USES AUGMENTED REALITY TO SUPPORT THE DESIGN AND INSTALLATION PROCESSES





in maintenance

Gediminas Žiemelis, chairman of the board at the Avia Solutions Group, sees great potential for AR in the aviation industry – for training applications and real-world use.

"Engine mechanics for Japan Airlines participated in a proof-of-concept program using AR for supplemental training, to eliminate the need for monotonous videos and diagram printouts," he says. "AR is similar to VR in that it

immerses the user with computergenerated graphics, except with AR it overlays these images with the real world. Aircraft mechanics using an AR headset will be able to look at an engine and see both the physical engine and an overlaid virtual heads-up display, which could be used to provide additional information about the engine. The mechanic can interact with the real world while experiencing the benefits of VR at the same time."

AR INSPECTIONS

The company's R&D team is also investigating and optimizing virtual and augmented inspection, supported by apps. "Using a tablet in combination with a customized app makes it easy to document and locate inspection items," says Marquardt. "You are able to read the required depictions and screenshots or comments."

These records can even be exported for documentation in standard office software, for example, in an Excel report.

"By using the tablet's camera and a special AR extension, we can visualize the interior parts in the desired place long before it is installed," says Marquardt. "As we establish a digital mock-up environment, the CAD data is available and it is very easy to include it in the AR world."



This approach minimizes risk by highlighting design issues before building the product. "Even in the empty aircraft, through the eye of the tablet and ahead of time, you can see the stowage, seat or any other interior part that will be installed."

According to Marc Galin, director of completions marketing at Jet Aviation, the company uses software and digital technology to enable a more seamless flow of information, in a more intuitive format, capturing efficiencies and also helping customers visualize the final product and make informed decisions.

"In the design studio, we use a variety of digital tools to complement traditional tools such as sketches and mood boards to better engage with the customer," he says. Examples include realistic renderings of cabins or 3D prints of a scaled interior.

QUICKER DECISIONS

Galin believes that these 3D visualizations give customers a great opportunity to "assess the impact of 'what if'

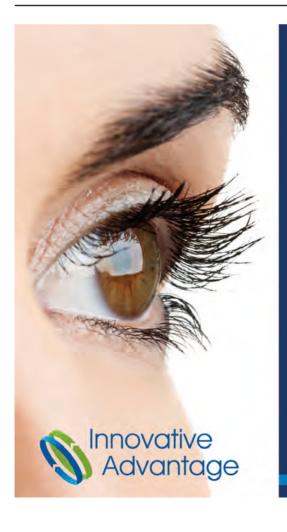
Not all AR applications require a headset or tablet. Laser projection can superimpose light diagrams onto work surfaces to help guide the production process and can also be used to match production parts, with great precision, to the original design diagrams.

"We introduced laser projection in production last year," says Ruth Marquardt of Lufthansa Technik. "We have a process running in engineering, ending with fabrication, using laser projection for every component that is useful and necessary positioning of brackets and intercostals or even big cutouts into the fuselage skin. This process is established and certified in keeping with our airworthiness procedures."



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"Technology provides efficiency but the human hand provides the finishing touches expected of a custom-built interior"

management systems," he says. "That data now flows through the entire value chain, from engineering to production and installation."

WEIGHT FORECASTING

The team thoroughly reviews the 3D engineering data before starting production. "This offers a real gain in time and a decrease in project risk," says Galin. "One efficiency gain is derived from the ability to devise more accurate weight forecasting through advanced computer-assisted design tools such as Catia. The level of confidence in projecting the weight of a table or an entire interior is much higher than with older estimating methods."

Repetitive tasks such as the cutting of honeycomb panels are already heavily automated, according to Galin. Jet Aviation uses five-axis CNC machines to ensure precision cutting – but some jobs are best left to skilled humans. "Our business relies on a fine balance of technology and craftsmanship," says Galin. "Technology provides efficiency but the human hand provides the finishing touches expected of a custom-built interior. Skilled handcraftsmanship is the only way to achieve certain levels of finish and detail, and remains a key asset in our industry."

Other systems, like SAP, help manage the supply chain. Jet Aviation also uses SalesForce for customer

ELECTRICAL
ENGINEERING

Comlux Completion also uses Visual Engineer, a databasedriven electrical software. "It is to electrical engineering what SolidWorks is to structures," says Daron Dryer of Comlux Completion. The software allows collaboration between users as the electrical diagrams are drafted. "Our wire diagrams print directly to the manuals, which eliminates redundancy and error." says Dryer.

The company uses separate software developed in-house to calculate aircraft power loads.

ABOVE: DARON DRYER OF COMLUX

BELOW: COMLUX PERFORMS ITS FIRST DIGITAL MAINTENANCE ON A HYUNDAI BBJ, USING DASSAULT SYSTÈMES' SOLIDWORKS relationship management. Like a number of its competitors, Jet Aviation sees the industry shifting to paperless exchange of data, from design to engineering, production and installation.

Comlux Completion has also used software to improve the design process, production control and customer engagement. The company uses Dassault Systèmes' SolidWorks for engineering design. "This software allows us to build the VIP interior as a virtual cabin and check it for form, fit and function," says Daron Dryer, chief operating officer at Comlux Completion. "It gives you a virtual 3D model that you can spin and populate with real components. You can estimate the weight of the cabin and send it over for stress analysis."

The system also allows Comlux to identify interferences in the cabin and better understand the human factors of the design: judging headspace with better accuracy, evaluating how seats pivot, and what happens when cabinet doors are opened, for example. "If a picture is worth a thousand words, then a solid model is worth a billion," says Dryer.

3D MODELING

Duncan Aviation also uses SolidWorks for its 3D modeling. John Scully II, a structural engineer at the company, says the program provides a "full spatial concept for monument





"We also use several programs to develop 3D renderings so customers are able to better envision their completed interiors and paint schemes on their aircraft," says Scully. "For those renderings, we use a combination of Blender, 3ds Max, Keyshot, SolidWorks Visualize and Photoshop."

MARKETING SUPPORT

Comlux also finds that VR plays an important role in marketing, helping customers visualize the choices they make. In addition, it uses enterprise resource planning (ERP) software, which has advanced to support all phases of process control and documentation, allowing quick population of forms and task cards from one production point to the next, alerting all stakeholders of progress or problems. The company built its own ERP system in-house, working on a Corrplus backbone, which allowed the level of customization Comlux wanted to track all processes from the bill of materials to procurement, inventory management, production planning and quality control.

One of the features that helps keep the completion center's projects on time and spec is barcode scanning of parts as they are used, which simultaneously updates the project's progress and weight in real time.

Tablets are used to review engineering models and update digital task cards, including the quality control sign-off. Previous completed steps are automatically populated to all related forms, eliminating redundancy.

MOVING TARGET

Duncan Aviation's Scully also finds that mobile digital tools are essential to operations. "The ability to be mobile

ABOVE: CUTTING OF HONEYCOMB PANELS IS HEAVILY AUTOMATED BUT JET AVIATION BELIEVES SOME ELEMENTS ARE BEST LEFT TO SKILLED HUMANS with our data is hugely important for us, whether it's the ability to take a laptop to the production floor to capture data or show something to our production team members or customers," he says.

This efficiency not only eliminates confusion and error, it also empowers craftspeople and increases job satisfaction. "No one goes into their trade to do paperwork," says Comlux's Dryer. "The more we automate, the more we allow our craftspeople to do what they love and what they are best at."

Scully agrees: "Human input will always be something that will be essential as design has to have a personal element to it. Customers will always want something to look a special way for them and it is our goal to provide them with the service they expect."

Data capture

Duncan Aviation recently purchased a Creaform 3D scanner to capture data and convert it into a solid model. "This process reduces our time on the design end of the project," says John Scully II. "We are using the scanner on complex airframe pieces,

interior cabinet components and upholstery products.

"As always with human interface/entry, there is the possibility of error. With the 3D scanner, the tolerance is precise and therefore we have to put less additional time into that data."



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CAMBIANC

This business shell seat, designed for mid- and long-range airline flights, was exhibited at Aircraft Interiors Expo 2018. It is the creation of Iacobucci HF Aerospace and Pininfarina, and recently picked up a prize at the 2018 International Yacht & Aviation Awards.

The seat extends into a full flat position with 67in pitch. Features include an Alcantaralined drawer, a 16.1in display, PC power outlets and three USB chargers. Iacobucci says some aspects can be customized.





lthough not the most glamorous part of a VIP cabin, entourage/staff seating areas are common features. Designers have the challenge of finding elegant, practical and comfortable business and economy seat products for these sections - in order quantities that limit their choice of supplier.

Elisabeth Harvey, director of completions design at Jet Aviation, says that the company may specify business or economy seats - not often in high volumes - in one out of every three or four VIP completion projects. "In particular, business or pod-type seats are an interesting option when higher density seating is required in certain areas of the aircraft, and VIP single seats are not needed for their functionality or design," she says. "I particularly like the cocoon style seats, which can be installed elegantly, even in a single-aisle aircraft. B/E, Iacobucci and Optimares all offer such seats."

Various factors influence the choice of seat. "The challenge is finding a seat that offers the functionality that the customer requires, and fits into budget, timeframe and weight requirements," says Harvey. "Then we will

PRESSURE MAPPING

Intelligent remote monitoring technology has been harnessed by FliteTrak to measure and map pressure points on airline seat cushions.

"ViatorComfort can provide key data that our Al learning platform can interpret, delivering visual pressure mapping for seat design based on live passenger use," explains Andrew Barnett, joint managing director at FliteTrak. "It also means that they can track seats and cushions for wear and tear, and ensure they can be replaced or repaired either individually or in batches to maximize efficiency for



carriers and comfort for passengers. The system, which is the only working technology of its kind, also logs data for analysis to allow manufacturers and carriers to improve their airline interiors and ergonomic designs."



work closely with the manufacturer to create a bespoke version of the seat for our customers, tailoring the shell, upholstery and functionality to ensure it meets design and customer requirements."

Harvey's initial concern is understanding whether the basic seat structure and functionality work for clients. "We have had some interesting recent examples where customers asked for a particular functionality for a seat, based on their experience flying first class on a commercial airline," she adds. "We also need to consider the seat buildup requirement from a certification perspective and whether it works with the design we have in mind. With business and economy seats we consider things like pitch and integrated IFE - anything that will enhance entourage passenger comfort, as you would expect in any interior."

Aircraft Interiors The small order International quantities involved can be a barrier when working with suppliers whose main business is the airline market. "It is sometimes a challenge to interact with suppliers who are used to dealing with the highvolume orders seen in the commercial market, when you are requesting information for an order of only a few seats," says Harvey. "We have an excellent relationship with business and economy suppliers who can serve the business aviation market, but I do notice that some are more geared up to respond to these types of requests than others. That said, we've had some really great recent experience in developing very high-end business and first class solutions, particularly at the higher end of the scale."

SUPPLIER SUPPORT

Harvey would like the inquiry and ordering processes to be smoother. "This would mean better responsiveness from the suppliers and more information about their

Butterfly

This clever concept from Paperclip Design converts flatbed suite modes from premium economy to business class by flipping over the inboard seat.

In its staggered premium economy mode, the aisle seat of the double is offset backward. It also offers features including cocktail trays, seat pockets and an adjustable ottoman.

In suite mode, the product offers a seat, side couch/companion dining surface, and storage rack with feature lighting. By flipping the aisle seat over as well, passengers can enjoy a diagonal sleeping surface.

The concept won a Crystal Cabin Award in 2014 and has since received a boost as the company has been selected to participate in Airbus's BizLab mentoring and acceleration program.

seats and testing programs, as well as increased opportunities for collaboration in this market," she says.

CUSTOM SPECIALISTS

The approach at Alberto Pinto International Interior Design is to create a unique design built around a seat frame provided by a manufacturer specializing in custom structures. "We design all our seats from scratch and they are all different from one project to another," says Yves Pickardt, designer at the Linda Pintoled agency. "Each customer gets a Pinto original. We never provide a customer with a seat design that has already been used on a past project."

This limits the pool of potential suppliers considerably. Pickardt says that small orders are definitely a barrier, with the airline market prioritized at the

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type seats.

"In a VIP aircraft we may still refer to business and economy seats, but other than similar sizes driven by aisle widths and seat track locations, VIP versions are vastly different from their commercial aircraft cousins," believes Andrew Perl, director at PAC. "These differences include finishing, options, arm and He adds that a key advantage of VIP-specific seat products is that the 16g certification includes the upholstery build-up. "Commercial versions of these seats are certified with a harder and thinner foam, to minimize their weight and maximize durability for long-term use," comments Perl. "Of course, a workhorse airliner will typically fly 10 times the hours and carry 10 times the passenger load of a low-hour VIP aircraft."

Certified for: 16g and HIC. Deployed on Airbus, Boeing, Saab, Fokker and ATR types

Minimum order quantity: None

Typical lead time: A typical program will be delivered in 20 weeks, subject to the level of customization required

The latest from the VIP market...

SEAT STATS

PAC Pod Sleeper

Launched: April 2013

Width: Approximately 48in for double, depending on options and aircraft type

Height: Approximately 44in for double, depending on options and aircraft type

Depth: Approximately 65-70in, depending on seat type, options and aircraft type

Weight: Approximately 350 lb for finished double with options

Construction materials: Aluminum and composites

Standard features: Motorized operation, recline to full flat, motorized leg rest and foot rest

Optional features: Manual or motorized privacy divider, custom surround cabinet styles, motorized headrest, four-way lumbar adjustment, massage system, custom meal trays, custom reading lights, custom IFE provisions, power outlets, custom seat controls

Certified for: 747-8, 777, 787 (with Harper fittings), BBJ family, ACJ family

Minimum order quantity: None

Typical lead time: 6 months

The PAC Pod Sleeper seat above was finished and upholstered by AMAC Aerospace for a BBI 777 project



SEAT STATS

UTAS VIP

Launched: 2017 Width: Up to 28in

Height: 41in finished

Depth: Information not available Weight: 135 lb upholstered

Construction materials: Aluminum, steel, composite, ABS

Standard features: Multiple box arm designs, mechanical headrest, single-lever track and

swivel release, recline to full flat Optional features: Custom arm designs; leg

rest; flex-wing headrest; lumbar; meal trays; plug-in monitor provisions; floor track; electric control of track and swivel, recline, leg rest, lumbar and headrest

Certified for: 9g and 16g platforms

Minimum order quantity: None

Typical lead time: 75 days for structures



Starling Aerospace's latest release is a VIP Track and Swivel Seat certified for 9g and 16g. The seat was designed, manufactured and certified in-house. It lies flat at 179°, turns 359° and accommodates passengers over 6ft (183cm) in height. The seat also tracks sideways, backward and forward to optimize passenger space for recline and relaxation. The company designed it to meet the latest aircraft regulations without compromising on style or comfort.



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Aviation, a Part 135 charter operator and management company.

"Aura is a deliberate effort to create a beautiful flying experience," explains Zander Futernick, founder and CEO at Zed Aerospace, which plans to operate the new carrier. "There is a great deal of complacency in aircraft design today. Working with aircraft currently available was not an option for us, so we had to go to the drawing board to develop exactly what we wanted. Aura offers a newly crafted flying experience, combining the luxury and convenience of a private jet with the affordability and reliability of commercial airlines."

SEAT DESIGN

Christopher Mbanefo, Yasava's founder and CEO, says the Aïana Wave seat accommodates multiple body positions, including enabling passengers to sit sideways to interact with fellow passengers. Armrests can be raised and lowered.

Rather than lying flat, the seat reclines to a 'zero gravity' position. "The Aïana Wave is the only seat designed for the optimized neutral body position as defined by NASA and the Russian Space Program - resulting in the most ergonomic and comfortable position available in aviation today," contends Mbanefo. "For flights less than six hours, a full-flat position is not the optimum, especially on a typical 1.5in-thick aviation seat cushion with multiple junctions and pressure points. The neutral body position of the Aïana Wave allows for the deep sleep phase to be quickly achieved over a shorter period of time. This has been measured to offer superior sleep quality and deeper relaxation than a full-flat position. Full flat is not the criteria that defines a good sleeping solution; after all, sleeping on a flat floor on a gym mat is actually the equivalent of your typical businessor first-class seat, albeit with leather and maybe a thin duvet."

SEAT CERTIFICATION

The Aïana Wave has been designed to meet the requirements of several 9g and 16g aircraft types. "To make full use of the design features of the seat, we offer the Astral Cabin Upgrade program for corporate aircraft," says Mbanefo of Yasava. "To date, we are working on four different programs, excluding Aura, which will lead to four different certifications, both FAA and EASA."

Yasava's technology partner is the seat manufacturer Optimares, recent winner of a Red Dot Design award. "We are currently evaluating the opening of a dedicated Yasava Center of Creation in Switzerland, in which the Aïana Wave and components of the Astral Cabin will be manufactured with leading luxury artisans and experts, including those from the Swiss watchmaking sector," says Mbanefo.

Each passenger will enjoy two windows and direct windows access

THE CHOICE OF OUTFITTING PARTNER IS YET TO BE MADE. "THERE WILL BE AN RFP/RFQ THROUGH WHICH THE MRO AND COMPLETION CENTER WILL BE SELECTED," SAYS YASAVA'S MBANEFO. "THE CABIN INSTALLATION WILL COINCIDE WITH NECESSARY TECHNICAL UPGRADES FOR CERTAIN COMPONENTS AND SYSTEMS FROM THE STANDARD CRJ700"

> "Because Aura seats 29 passengers in a dual-class configuration – unheard of in an aircraft this small – we are able to achieve a starting Pricepoint well below US\$400 (one way) on almost all routes," says Futernick of Zed Aerospace



LIGHTING

The cabin will incorporate OLED technology in the ceiling and sidewalls, allowing for the creation of various mood-lighting effects, as well as the display of pertinent flight information.

"Today, there is hardly any anticipation of discovery from passengers when first entering transport aircraft," says Mbanefo of Yasava. "We wanted to reignite the feeling of discovery, to provide a new sense of experiencing an aircraft interior, a new sense of space, resulting in a rediscovery of the flight experience. With the incorporation of OLED lighting on the ceiling and side panels in the cabin, we can create custom light effects, images and animations during any phase of the flight. These can be optimized to the time of day, city of embarkation/disembarkation, and more."

"OLED ceiling integration delivers a magical experience that melds into the surrounding cabin," adds Zed Aerospace's Futernick. "Extremely high pixel density, rapid refresh rates, perfect blacks and wide viewing angles make OLED as realistic as a window. OLED lighting has a spectral power distribution closest to natural sunlight and provides an exceptionally high color rending index (CRI) ideal for replicating realistic colors, textures and sunlight."

DEVIL IN THE DETAIL

Every inch of Aura was developed with a discerning attention to detail, claims Futernick of Zed Aerospace, giving two examples to prove his point. "The stitching of the leather on the seats will resemble the hemlines and necklace styles of the American Art Deco era," he notes. "Aura does not invoke a nostalgic past of what air travel once was, but instead the excitement of tomorrow. To bridge the eras, Aura combines the glamour and exuberance of American Art Deco ambiance with sharp, modern Swiss design."

Aura also plans to do away with cold silverware. "Businessand first-class on some of the world's most prominent airlines pair well-plated and delicious food with ice-cold silverware that is harsh to the touch," says Futernick. "Aura silverware will be stored in a warming tray – a little detail that few will notice, but amounts to the stellar service Aura plans to deliver every flight."



a matter of taste

The latest developments in galley insert technology created for private, business and commercial aircraft



businessjetinteriorsinternational.com

068 JULY 2018

ACE (Any Capsule Espresso)

The latest unit from Aerolux, the ACE (Any Capsule Espresso), can be used with any Nespresso-compatible capsule – from tea to coffee variants (including flavor-infused coffees) and hot chocolate. It can also produce hot water and milk. Noel Ellison, general manager at Aerolux, says that the development was made in response to requests from airlines, airframers and coffee producers. The ACE enables customers to offer bespoke coffee variants tailored to suit specific demographic tastes.

In a departure from previous machines, the ACE has no capsule holder – a loose part that had in the past found its way accidentally into the trash or was otherwise lost, and was expensive to replace. "We researched the latest units available and redesigned the loading mechanism in line with advances made and proved by large-scale machine producers," says Ellison.

The user interface has no unnecessary elements, enabling simple selections. A counting system is being developed for ongoing production runs, so crew won't have to make a visual inspection to see when to empty the waste capsule container/drawer.

Aerolux has more than 30 years' experience developing aircraft galley equipment. It has applied this expertise to develop a new decalcification system that means there is no need to descale the machine, preventing the build-up of limescale, chlorine and other impurities. "Calcification is one of the biggest causes of waterheating equipment removal from aircraft," says Ellison. "It depends on the type of water used and the location of the water supply, and the operator cannot tackle this on the aircraft, instead having to remove equipment for maintenance. Our new decalcification system reduces service costs, avoids downtime and ensures the efficiency and long life of the equipment."

The ACE comes in Atlas standard size and fits a standard aircraft mounting rail. Ellison notes that to retrofit the unit, maintenance staff simply disconnect the existing espresso or coffee maker from the mounting rail and slide on the new unit. The connections and electrical characteristics are identical. For aircraft without a rail, the unit can be fitted directly into the galley and filled manually using bottled water. Another benefit is that the ACE has been developed to have a quick brewing cycle, eliminating the need for complicated and expensive dual-cup machines.

The ACE was unveiled at Aircraft Interiors Expo in April 2018. "We saw great interest from existing and potential customers," reports Ellison. "This is because the ACE offers three huge improvements – it is a simple retrofit solution, the number of compatible capsules has been greatly expanded, and reliability is improved significantly."



Atmosphere Executive Line

The latest insert line from Zodiac Aerospace, the Atmosphere Executive Line, was developed specifically for business jets. The range includes a coffee maker, an espresso maker, a kettle and a microwave, as well as small, medium and large convection ovens.

The range is designed to combine a luxurious look and feel with capabilities including brewing a wide range of espresso-based beverages such as cappuccino, latte and macchiato, and tea. The espresso maker can be used with ESE pods and espresso capsules. It has a manual fill function, so pure mineral water can be used.

The products have electronic controls and were designed for low weight, safe operation and reliability.

Elisabeth Harvey DIRECTOR DESIGN, COMPLETIONS, JET AVIATION

What are the key challenges in integrating galley inserts?

Whereas the interiors we work on are completely customized, galley inserts tend to be standard elements. Fitting these elements into a non-standard space requires some sensitivity and thought.

We also have to consider practical elements, including drainage, ventilation and extraction. It all has to be integrated into a much smaller and more complex space than in kitchens on the ground.

As new platforms such as the ACJneo and BBJ Max come into service, we also have to respond to the longer ranges these aircraft offer. More time in the air often means more use of the galley and more extensive storage requirements, which we need to integrate into the layout.

How have you overcome these challenges on projects?

It is important to have close communication with the operator and flight attendants as early as possible to understand the requirements of the space. This means we can design – even from the LOPA stage – with specific needs and inserts in mind so that the final galley and associated spaces will fulfill what is required day to day on the aircraft. This could mean building in custom cupboards for glassware storage or integrating spaces for specific appliances.

What other types of equipment would you like to see?

There is potential for some further developments in multifunctional and modular equipment, such as combination steam ovens, maybe with a sous-vide for water bath cooking, multifunctional food processing equipment, or induction cooktops with modular additions such as a teppanyaki griddle or fryer. Jet Aviation recently developed a dishwasher that is receiving good feedback and interest from our clients, so future developments such as a really fast kettle for boiling water for tea, and a high-end certified espresso maker using fresh beans, would also be good.

How could existing equipment be improved?

Galley equipment has traditionally focused more on basic functionality than form, flexibility and aesthetics. While there have been some very interesting recent developments, such as cooktops and multifunctional ovens, qualified equipment has generally been transferred directly from commercial aviation. In the few instances where customers wanted something extraordinary, such as a larger chiller cabinet, wine cooler or dishwasher, these items had to be developed in-house.

As a designer, I would like to see more options in terms of size, functionality and flexibility. Galleys are now expected to have more customization than ever before – not just in appearance, but also in functionality. While I would want to be able to customize every visual element of, for example, a qualified refrigerator (not just the front face, but also the handles, latches and so on), I would also want to be able to offer true flexibility with respect to the equipment itself. For example, offering a range of sizes and including quick release and interchangeability would enable the crew to tailor the equipment for each mission.

SUPER SIXTY

Aero-Dienst is celebrating its 60th anniversary by expanding its already considerable portfolio of general aviation services



stablished in 1958 in Nuremberg, Germany, 2018 will see

Aero-Dienst celebrate 60 years of operation and 20 years as part of ADAC Group. During the past six decades, the company has gone from being a regional maintenance company to become an internationally recognized full-service provider for business aviation and air ambulance services.

"We shall celebrate our 60th anniversary with a big summer party for our employees and their families," says Viktor Peters, CEO at the company. "Their competence, flexibility and high level of commitment have secured our company's success since its foundation."

The company's combination of technical maintenance expertise, going back decades, and the professional management of business jets, as well as its ADAC air ambulances, means it spans all facets of general aviation.

Peters believes this makes Aero-Dienst an attractive employer, with a workforce that now consists of 320 employees.

In terms of current market dynamics, Peters believes there is great demand for agility across all parts of the business. "Steady improvement – leading to increased customer benefits – is being achieved through innovative solutions and increasing digitization, for instance with the introduction of tablet-based shop-floor applications," he says.

RECENT EXPANSION

With a view to providing maintenance customers with an even more comprehensive range of services, Aero-Dienst has extended its interior solutions, engineering services and component maintenance sections. It began offering line maintenance in Vienna in 2006 and in Klagenfurt, Austria, in February 2018, and established a

component shop in Landsberg am Lech, Germany, in June 2018.

In addition, over the past eight months, the company's fleet of managed aircraft has grown to include two more business jets – a Bombardier Challenger 300 and a Challenger 604. As part of its services to the purchaser, Aero-Dienst conducted the entire transaction including market assessment, coordination of the pre-purchase inspection, the purchase negotiations and obtaining approval.

"With fairness, open communication and social cooperation, Aero-Dienst has laid the foundation for unparalleled team performance, enabling it to provide its customers with excellent service, quality and reliability," says Peters.

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perfect sense

MOOD LIGHTING IS WIDELY USED IN VIP AIRCRAFT - BUT VOLVO'S S90 AMBIENCE CONCEPT SHOWS HOW TO TAKE THE IDEA EVEN FURTHER

With its S90 Ambience Concept, Volvo proposes synchronizing visuals, sound and scent to create a truly luxurious automotive experience. The concept is based on the S90 Excellence three-seater executive sedan and was created particularly with chauffeured passengers and the Chinese market in mind.

Passengers can use a smartphone app to select from seven visual themes that play across the ceiling inside the car. The themes are designed to evoke a variety of moods, from Freedom (for invigoration) to Nocturnal (for resting). The other themes are called Scandinavian Forest, Northern Lights, Swan Lake, Archipelago, and Rain.

The visuals are synchronized with audio, delivered through the car's Bowers and Wilkins sound system, which includes tweeters in the headrest. Meanwhile, one of four scents created by Byredo is emitted from a portal in the car's center console.

The concept could be made available in production S90 Excellence cars.







OTHER EYE-CATCHING DESIGNS FROM VARIOUS INDUSTRIES...



This design by Massimo Brancati, part of Studioart's Textures Collection for 2018, shows how flat and padded leather tiles can be juxtaposed to create a statement wall. The collection can be customized in terms of pattern, leather, color and finish.



The F Sport version of the seventh-generation Lexus ES mid-size sedan features a 17-speaker Mark Levinson PurePlay system and a new kind of metallic cabin trim with fluctuating wave patterns, inspired by traditional Japanese sword making.



Switch panels needn't be plain, as this design by Meljac illustrates. The French company shows how pictograms, words and motifs can be engraved into metal surfaces to transform the most functional of items into a subtle decorative detail.

the bench seat



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