

# BusinessJet *interiors* INTERNATIONAL

JANUARY 2015

THE INTERNATIONAL REVIEW OF BUSINESS JET INTERIOR DESIGN AND COMPLETION



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TEAGUE BELIEVES AN ENTERPRISING CHARTER  
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WITH AN AIRCRAFT TAILORED FOR ATHLETES

 **ALSO IN THIS ISSUE: G500 AND G600 JET CONNEX SEAT INNOVATIONS IFE TRENDS COMLUX AMERICA BBJ AUDIO SYSTEMS**

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published by **UKIP Media & Events Ltd**  
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**NBAA** (member)

**Annual Subscriptions (four copies)**  
Worldwide Rate: £42/US\$75

Airfreight and mailing in the USA by agent Air Business Ltd,  
c/o Worldnet Shipping USA Inc, 155-11 146<sup>th</sup> Street, Jamaica,  
New York 11434.

Periodicals postage paid at Jamaica, New York 11431.  
US Postmaster: send address changes to *Business Jet Interiors International*, c/o Air Business Ltd, c/o Worldnet Shipping USA Inc, 155-11 146<sup>th</sup> Street, Jamaica, New York 11434.

Subscription records are maintained at UKIP Media & Events Ltd, Abinger House, Church Street, Dorking, Surrey, RH4 1DF, UK  
Air Business is acting as our mailing agent.

The views expressed in the articles and technical papers are those of the authors and are not endorsed by the publishers. While every care has been taken during production, the publisher does not accept any liability for errors that may have occurred.

ISSN 1755-8182.

*Business Jet Interiors International* January 2015.  
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Printed by: William Gibbons & Sons Ltd,  
PO Box 103, 26 Planetary Road,  
Willenhall, West Midlands, WV13 3XT, UK

## playtime

Imagine you are the owner of a professional sports team. Your business is based on winning as many games as possible, so you want your players to be at the top of their game, every time they play. Therein lies the problem: a lot of games are held far away from home, necessitating long and tiring journeys.

Very few teams have reacted to this scenario with an aircraft specifically designed with athletes' needs in mind. Design company Teague intends to change this state of affairs with its Athletes' Plane concept, pictured on the cover and featured on page 30. It is designed to enable athletes to arrive for games feeling as fresh as possible, and to enable them to start their post-match recovery, and even receive medical attention, on the flight home. A sports star traveling on this aircraft would be able to enjoy a massage, compression and ice sleeves, and a shower. Another interesting aspect is that they'd be able to review their match performance over the IFE, uploading personal data gathered from wearable technology.

The Athletes' Plane is currently conceptual, but wearable technology is a new subject of development in the IFE industry today. As the feature on IFE trends on page 54 discusses, the industry is locked in a constant drive to integrate passengers' favorite consumer technologies into the business jet cabin, and wearable technology is no exception. A couple of suppliers are considering it as a way to control the CMS. Other trends explored in this feature include 4K monitors, which are now starting to make their way onto the scene, and further developments in the ongoing quest to increase integration of PEDs.

Another common demand is for the best possible internet service. Inmarsat and Honeywell expect to start delivering broadband internet at speeds up to 50Mbps from mid-2015, using Ka-band. On page 38 we look at how it will work and what it could mean for passengers.

As you might have noticed, entertainment equipment crops up frequently in this issue. Therefore it was only fitting that this time around the *Design Panel* (page 16) addressed the challenges and opportunities of cabin sound systems. And as the superyacht IMAX theater featured in this issue's *Design Spy* (page 72) shows, other industries are also pushing the showboat out. It is a fitting conclusion for an issue bursting with entertaining ideas.

Izzy Kington, editor



Cover image:  
Teague's Athletes'  
Plane concept



“When professional athletes travel across multiple time zones, their team is statistically more likely to lose. The Athlete's Plane essentially levels the playing field”

## Athletes' Plane 30

THE ATHLETES' PLANE CONCEPT FROM TEAGUE AND NIKE IS DESIGNED TO ENABLE TOP-FLIGHT SPORTS TEAMS TO ARRIVE IN PEAK CONDITION FOR AWAY MATCHES  
*Chris Colvin, Business Jet Interiors International*





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design panel

AUDIO MAESTROS REVEAL HOW TO  
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G500 and G600

SERENITY AND FLEXIBILITY WERE THE KEY AIMS IN  
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LARGE-CABIN PORTFOLIO – THE G500 AND G600

Chris Colvin, Business Jet Interiors International

Jet ConneX

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INMARSAT AND HONEYWELL BELIEVE KA-BAND  
HOLDS THE KEY TO REVOLUTIONIZING THE  
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Paul Eden, Business Jet Interiors International



seat innovations

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RECENT ANNOUNCEMENTS INDICATE THE  
BUSINESS JET SEATING MARKET IS TAKING NOTICE  
OF CUSTOMER DEMAND FOR GREATER COMFORT  
AND FUNCTIONALITY

Kirby Harrison, Business Jet Interiors International



## IFE trends

THE LATEST DEVELOPMENTS IN THE IFE INDUSTRY INCLUDE UPGRADED SCREEN RESOLUTION AND COMPLETE INTEGRATION OF PEDS

*Kirby Harrison, Business Jet Interiors International*

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## 62 Comlux BBJ

THE LATEST GREEN BBJ TO BE DESIGNED AND COMPLETED BY COMLUX AMERICA FEATURES AN EXTREMELY FLEXIBLE INTERIOR WITH TWO QUICK-CHANGE COMPARTMENTS

*Guy Bird, Business Jet Interiors International*



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## CONSTANT AVIATION UPGRADES GLOBAL EXPRESS WITH ART DECO THEME

In April 2014, Constant Aviation began design work on a Global Express. The client wanted the aircraft to be completely reconfigured, upgraded and finished in an art deco style. The Global Express arrived at the company's facility in Cleveland, Ohio, USA, in June 2014 and was redelivered in September 2014.

The aircraft now features a refurbished crew rest area; a redesigned forward galley; a lounge area with redesigned seats; a reconfigured dining area with a four-place dining club plus two extra seats housed in a custom credenza; a reconfigured theater room at the aft with a divan, single seat and a 42in high-definition monitor housed in a custom unit; plus a redesigned aft lavatory.

There is new veneer throughout, with intricate marquetry incorporating three species of wood. Seats, the divan, sidewalls and the PSU/headliner all feature new materials. There are new countertops in the lavatory and galley, a bright new carpet and new plating.



The aircraft has redesigned B/E Aerospace seats featuring electric footrests and tracking. There are five single seats, a four-place dining club, a three-place divan and a crew rest. There is also a two-place kibitzer, but this is not certified for use during taxi, take-off and landing.



Honeywell's Ovation Select CMS was chosen. Equipment includes touchscreen passenger control units, high-definition LCD monitors, a Blu-ray player, satellite TV, an external camera system, 3D moving map, audio on-demand, and an all-digital surround-sound speaker system.



Three species of veneer from Custom Plywood were used. Other material suppliers include Garrett Leather for the seat leather; Scott Group for the carpet; Kalogridis for the diamond-quilted sidewall material, Deconel; and Tapis for the headliner/PSUs.

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The window reveals were enlarged to create the illusion of larger windows. Electric window shades were also installed.



## Q&A: JOHN SHIRLEY, DIRECTOR OF INTERIOR PROGRAMS, CONSTANT AVIATION

### WHAT WAS THE BRIEF?

The customer wanted to reconfigure the cabin to provide areas for working, dining, sleeping and entertaining. With many of our large-cabin interior reconfigurations and refurbishments, we have found that customers want to create a unique theme for the aircraft. Here the customer requested an art deco theme. The custom pattern of the veneer inlay, the seat design, the carpet and diamond pattern on the window surrounds contribute to this design scheme.

### WHAT WORK DID YOU PERFORM?

Each section of the cabin was reconfigured and finished with new materials. The galley was rebuilt to house a special liquor cabinet with lights inside, inspired by the speakeasies of the past. Seats in the lounge area were rebuilt to include a winged headrest, customized middle cushion and curved armrests. We provided multiple versions of the seat for the customer to test. The customer also wanted more seats at the dining table. Our solution was to build a custom credenza that, when open, provides two additional seats. We have called this a kibitzer. Another special aspect is the aft section of the cabin, which was turned into a theater room with the addition of a divan and a 42in high-definition flatscreen monitor.

### DID YOU USE ANY NEW MATERIALS OR TECHNOLOGIES?

The most unusual aspect of this project is the inlay work. In some areas, three species of wood veneer were used. The work involved producing a digital drawing of each design, and using this to laser-cut the inlay pieces precisely. In terms of technology, we used an iPad app in the design phase of the project to show the customer a rendering of the cabin. The app even enabled us to give the customer a virtual tour of the entire cabin, so we could ensure every detail was exactly as they wanted.

### WHAT ACHIEVEMENTS ARE YOU MOST PROUD OF?

Achieving perfection with the veneer inlay was a challenge. We also worked intensively with Kalogridis to ensure the Deconel sidewall material would work well with the other materials and the overall design. In particular, because the cabin has an eye-catching and intricate carpet design, we needed to optimize the size of the diamond shapes on the sidewalls to complement it.

### WAS ALL THE WORK ACHIEVED IN-HOUSE?

All the interior, engineering, avionics and maintenance work was performed in-house at our 175,000ft<sup>2</sup> facility in Cleveland, Ohio, USA. This site incorporates six maintenance bays, a full interior modification and refurbishment facility, as well as a composite and accessory facility. The Constant Aviation network also includes facilities in Birmingham, Alabama, and Las Vegas, Nevada, USA.

### WHAT ARE YOU WORKING ON NOW?

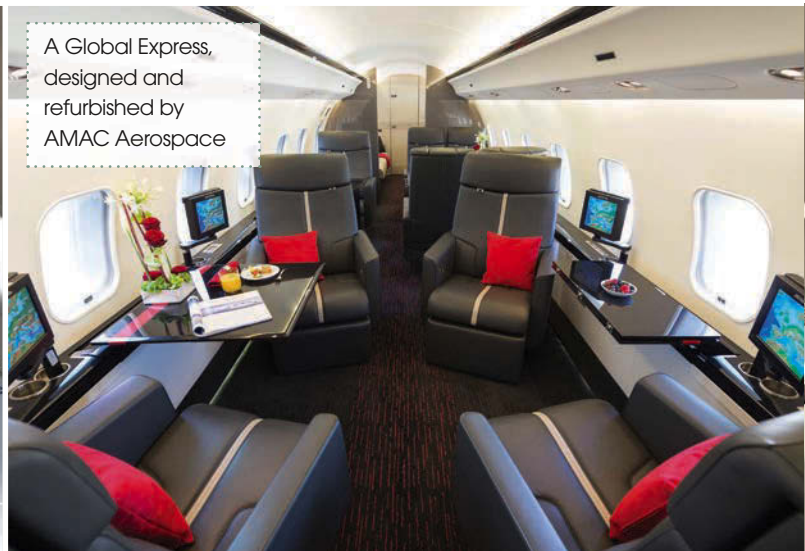
We have begun another Global Express interior reconfiguration and refurbishment project. This one has a New York loft theme.



# PINBOARD



A sports utility jet interior, designed and visualized by iDS Hamburg



A Global Express, designed and refurbished by AMAC Aerospace



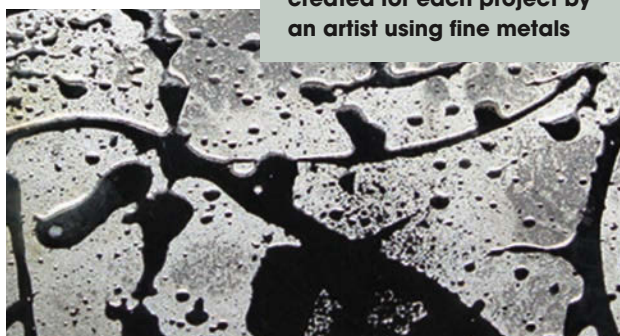
The master bedroom on a BBJ, designed for a US customer by Pierrejean Design Studio



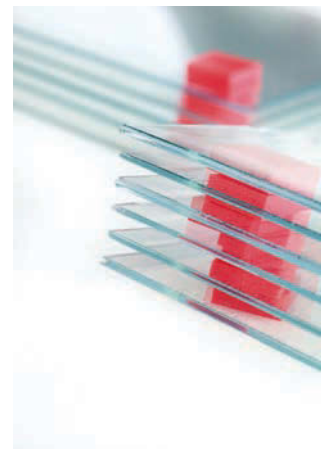
The upper deck lounge on a BBJ 747-8 concept, by Greenpoint Technologies



Edelman Leather has added colors to its Metallic Dream Cow line



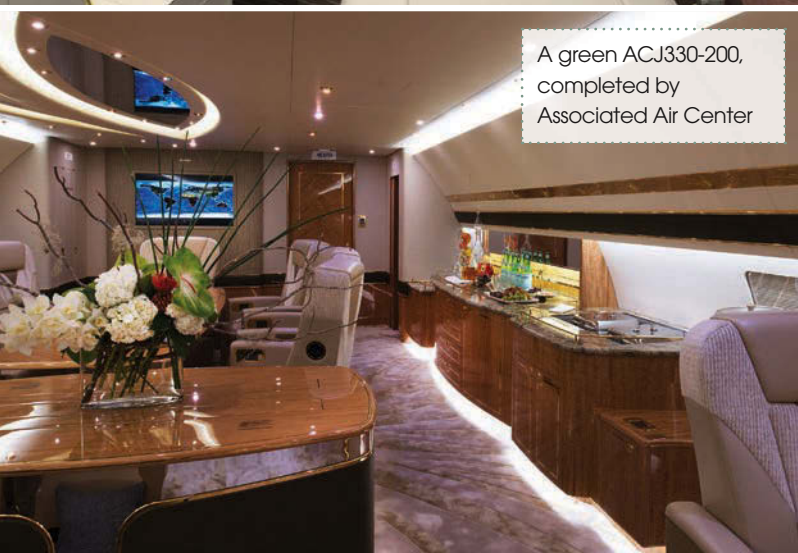
Techno Coatings is now Techno Aerospace and has expanded its range - one of its new offerings is Stylos, a one-of-a-kind surface created for each project by an artist using fine metals







Lufthansa Technik's Executive Shuttle VIP interior concept for Airbus and Boeing narrow-bodies



A green ACJ330-200, completed by Associated Air Center



AviationGlass & Technology now offers AeroGlass, a range of glass mirrors and transparencies for business jets



Green Hides has expanded its Tango range of leathers

## LAUNCHES

## LUXURY LIVING

Porsche Design Chronograph Titanium watch; €4,950 (US\$6,850)



Mercedes-Benz Style MBS 1040 sunglasses; €199 (US\$248)

elit by Stolichnaya pristine water series vodka, Andean edition; US\$3,000



Katharine Pooley parchment and shagreen bookends; £1,600 (US\$2,533)



## BEST OF THE WEB

Honeywell has created a Google Glass app that gives flight attendants control over the Ovation Select CMS, as demonstrated here:

[www.youtube.com/watch?v=dnBN\\_u48YBk](http://www.youtube.com/watch?v=dnBN_u48YBk)

J P Magnano of 3D Viz explains the role of virtual configuration programs:

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# COMPLETIONS ROUNDUP

THIS QUARTER'S ANNOUNCEMENTS FROM COMPLETION CENTERS AROUND THE WORLD

**PETERBOROUGH, CANADA:**

Flying Colours Corp entered a joint venture with Sparkle Roll Technik of China. The first project involves the conversion of eight CRJ-200s into VIP jets at Flying Colours Corp's facility in Peterborough. For later conversions, the interior monuments will be made in North America and final installation will be completed in China by the joint venture's technicians. Flying Colours Corp will train these technicians in Canada and provide on-site support in China, as well as handling final certification by the Civil Aviation Administration of China. It is anticipated that the agreement will extend to a wider range of conversions, modifications and maintenance projects.

**SPRINGFIELD, ILLINOIS, USA:**

StandardAero Business Aviation can now provide OEM-supported modifications for Embraer aircraft through its Organization Designation Authorization (ODA).

**TULSA, OKLAHOMA, USA:**

Lufthansa Technik and Airbus Corporate Jets extended their ACJ318 agreement until 2020, building on a cooperation that began in 2005. Under the initial agreement, Lufthansa Technik designed the Elite cabin for these aircraft with Airbus, and then performed the outfitting in Hamburg, Germany. The work later shifted to Lufthansa Technik's US subsidiary, BizJet International. The predefined cabin gave customers a choice of modules, colors and fabrics. The first of an updated version, the ACJ318 Enhanced, has just been completed. In other news, BizJet International opened a new hangar for maintenance and refurbishment.

**KIRKLAND, WASHINGTON, USA:**

Greenpoint Technologies began the certification flight testing process on a BBJ 747-8, following a 36-month completion.

**BORDEAUX, FRANCE:** Sabena technics was granted Boeing 777 rating approval by the French Civil Aviation Authority, enabling the company to deliver customized airframe solutions for the aircraft.

**INDIANAPOLIS, INDIANA, USA:**

Comlux America delivered a BBJ for an Asian customer (see page 62) and an ACJ321 for a customer in central Asia.

**GEORGETOWN, DELAWARE, USA:**

PATS Aircraft Systems announced a new board of directors, following its acquisition by Moelis Capital Partners.

**DALLAS, TEXAS, USA:**

Associated Air Center (AAC) inducted its first BBJ 787-8 for completion. The interior was also designed in-house. Redelivery of the head-of-state aircraft is planned for the end of 2015. In other news, AAC completed the nose-to-tail customization of a green ACJ330-200. Cabin highlights include high-speed data service, high-definition IFE, a sound insulation package, a stand-up shower, forward and aft galleys and a zonal drier and humidification system.

**SAN ANTONIO, TEXAS, USA:**

AERIA Luxury Interiors secured the maintenance contract for a head-of-state BBJ 757-200. The aircraft arrived in October 2014 and is scheduled for redelivery by the end of 2014.

**MONTREAL, CANADA:**

Innotech Aviation is completing its first installation of a Honeywell Ovation Select CMS in concurrence with a 120-month inspection on a Bombardier Global Express.

**HAMBURG, GERMANY:**

Lufthansa Technik launched an Executive Shuttle refurbishment concept for the A320 and B737 families. The refurbishments should take two to six months, depending on the interior. In other news, the company developed electronic cabin configuration tools for the ACJ318 Elite/Enhanced program and the Leadership Select program. The configurator shows interactive 3D views of the interiors and can be used to demonstrate configurations. Lufthansa Technik also introduced an onboard stowage solution, the Fly Away Kit, which is integrated in a modified LD9 unit load device.

**BASEL, SWITZERLAND:** AMAC Aerospace completed the first interior refurbishment wholly designed by its in-house design team. The Bombardier Global Express refurbishment took eight months and comprised refurbishing eight seats with perforated leather; reworking six bulkheads, two divans and three tables; installing new carpet throughout; and fitting a new VIP lavatory. The aircraft features five single and two double business-class seats. Warm grays and a red accent stripe were incorporated throughout the cabin.

**ALPNACH, SWITZERLAND:**

RUAG Aviation upgraded an Airbus Helicopter AS350 B3e for a VIP. The modification included avionics and a VIP interior tailored for comfort.

**TOULOUSE, FRANCE:**

Airbus Corporate Jet Centre (ACJC) delivered its 27<sup>th</sup> ACJ cabin, for a customer in the Middle East. This is the third VVIP cabin ACJC has delivered to this customer. The ACJ320 is certified to seat 27. It was designed by ACJC's Creative Design Studio to offer a modern Arabian ambience and the latest technologies. Highlights include a partition in the main lounge on which a modern Arabic motif lights up; and a lift system for a 52in screen that stows in a low sideboard.

**HONG KONG, CHINA:**

HAECO Group's 19 subsidiaries and joint venture companies now come under a single new brand: HAECO.

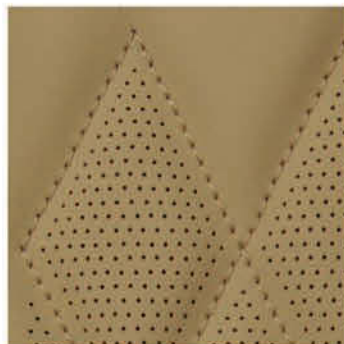
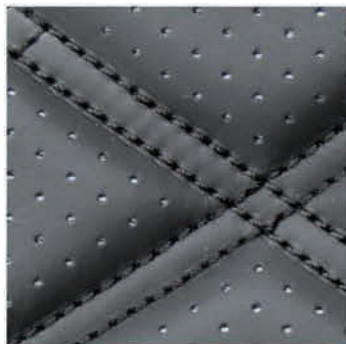
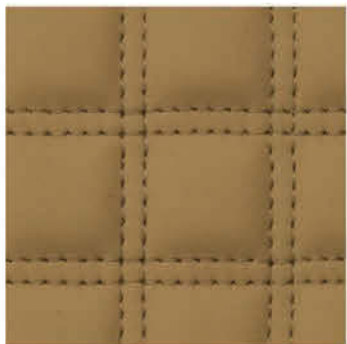
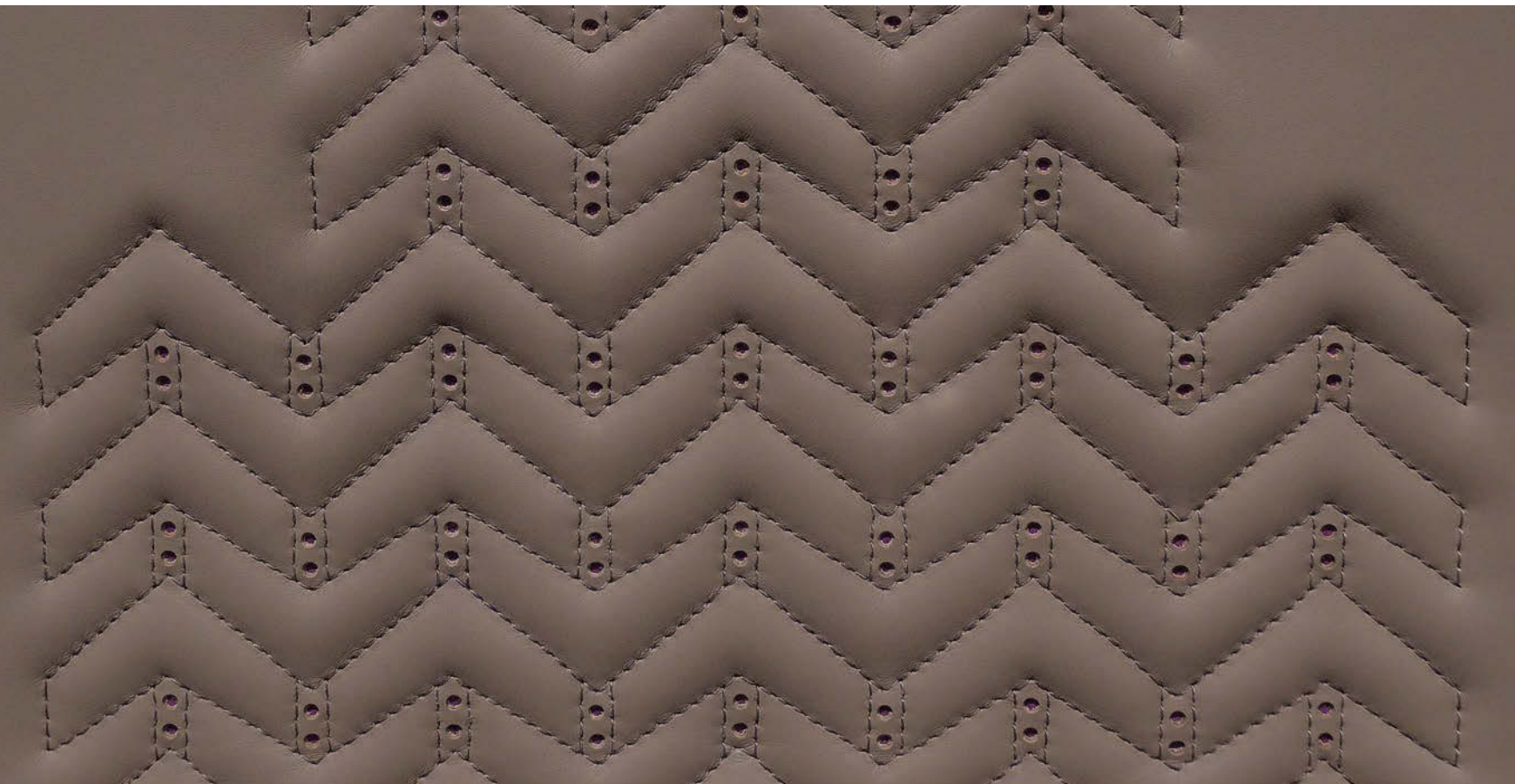
**COLUMBUS, OHIO, USA:**

Spirit Aeronautics accepted its 10<sup>th</sup> FAA King Air B300 aircraft for avionics upgrades and interior refurbishment as part of a 17-aircraft commitment.

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# AERISTOCRAFT



# GOTHIC SPLENDOR

This Dassault Falcon 2000 is available in any color as long as it's black. Its designer is Nina Reategui, who launched her interior design agency, Cabin ID, in Aachen, Germany, in 2011.

Reategui was inspired to create an entirely black jet, in the pursuit of simplicity and elegance. "The intention is to create a calming atmosphere that facilitates concentration and relaxation, without disturbing the eye with a heady mixture of loud materials," she says. "Using the color black enabled me to create a masculine and luxurious interior that will be suitable for business use and relaxing at the same time."

While most of the materials are black, Reategui has played around with shades, textures and levels of gloss to create "understated sophistication" rather than monotony. "The surfaces harmonize with each other in terms of shade, while offering mild visual stimuli in terms of texture," she says. For example, high-quality "soft and warm" linoleum has been used for the fronts of cabinets and the tabletops, while side cabinets are topped with black glass.

Lighting was also very important given the dark scheme. Reategui has included indirect lighting, dimmable ceiling spots and fun pop-up desk lamps.

For technical and certification advice, Reategui worked with Oldenburger's aircraft interior department. "We've worked together in the past," she says. "The cooperation ensures that the design can be realized to the highest standard." Reategui has more than 10 years' experience in the yacht industry, as a carpenter as well as a designer. She now designs interiors for residences, yachts, hotels and other spaces. She hopes this new concept will showcase her talents in the business jet industry. "The next step will be to acquire a customer," she says. "I would work with them to tailor the interior to reflect their personality."



## LAMPS

There is a Spingi Qua pop-up desk lamp next to each working station to add a warm and playful touch.

## SEATS

The designer has selected seats by Iacobucci HF Aerospace. The seats would be finished in custom leather upholstery. Reategui has chosen to provide a textural contrast to the leather by using wild silk for the cushions.



## GUIDED TOUR

## MEETING ROOM

The forward area is designed for business and dining. Four seats face each other to facilitate business meetings and/or a homely dining atmosphere. The tables are set up for full office functionality. There are also two bulkhead-mounted monitors, which can be used to display presentations or for video conferencing.



## LOUNGE

The lounge area features a three-place divan and hi-lo table. There is also a fully integrated bar unit. IFE equipment is hidden in the cabinet above the bar unit. Particularly eye-catching is the carved silk carpet from German company OT, which contrasts with the matted Italian leather floor tiles used throughout the aircraft cabin.



## PRIVATE OFFICE

The aft part of the aircraft can be separated from the rest of the aircraft for privacy. It can be used as an office and as a relaxation area. There are two seats, each with its own table. The tables can be moved to provide enough room to enable the seats to recline to a comfortable sleeping position.



## CONTACT:

[www.cabin-id.de](http://www.cabin-id.de)

## COPPER

Small details are finished in copper to break up the otherwise all-black color scheme



# COMMERCIAL SUCCESS

Believe it or not, these images are of a commercial airliner. The Residence by Etihad is a 125ft<sup>2</sup> private three-room suite incorporating a bedroom, a lounge and a bathroom. It is designed to offer an experience akin to private jet travel.

Passengers can relax on a 60.4in two-seat reclining sofa (with electronic controls and a massage function) in the living room and a double bed in the bedroom. IFE equipment includes a 32in monitor with dual controls in the lounge, and a 27in monitor in the bedroom.

There will be one suite on board each of Etihad's new A380s, at the front of the upper deck. The suites – along with the aircraft's First Apartments and Business Studios – were designed by Acumen Design Associates.

The brief was to create a luxury boutique hotel experience and a modern Arabic feel. But it is the space provided that is the big selling point. "The proportions offered throughout the cabin present a living space that credibly sustains real domestic architectural treatment – with walls instead of privacy screens, sliding drawers instead of expandable nets, and integrated cabinet doors instead of stowage lids," says Anthony Harcup, associate at Acumen and the design lead on this project.

The Residence and the First Apartment are both manufactured by B/E Aerospace, and certified for two people. "Until this point mini suites had only been certified for one person," says Harcup. "EASA was required to write an entirely new certification chapter to cover all potential new safety issues. This required years of prototyping and presenting different solutions until we found the answer."

Acumen even built a partial full-scale mock-up of the upper deck in a warehouse near Heathrow Airport, UK, which later became the 'innovation lab' for development meetings and concept testing work.



## OTTOMAN

The retractable ottoman offers both stowage and a mini-bar, which can stay chilled for up to 15 hours.



## GUIDED TOUR

## FRETWORK

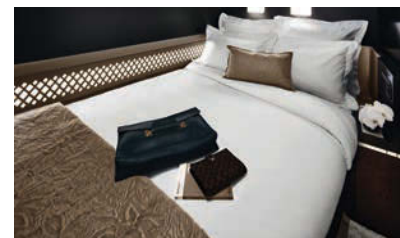
The diamond-shaped fretwork is a unifying aspect of the design featured on the sliding doors separating the suite from the aisle, and also on the fuselage side in the bedroom, where it is backlit.

## UPHOLSTERY

The leather upholstery on the sofa, bed and ottoman is by Poltrona Frau, and includes its characteristic paneling. "Incredibly detailed stitch documents were created to inform the stitching spacing, type and termination for every upholstered panel," says Harcup.

## THE RESIDENCE BEDROOM

The bedroom features a double bed that is 82in long and 47.5in wide. There is stowage under the bed, in the side table and in a full-height wardrobe. Reading and ambient lights are integrated into the bed's headboard.



## THE RESIDENCE EN-SUITE

The full-height shower provides a four-minute cycle of water. There is also a toilet, a vanity unit with a magnifying make-up mirror, and a hairdryer.

## FIRST APARTMENTS

The first-class cabin also features nine 39ft<sup>2</sup> First Apartments, set in 1-1 configuration around a single central aisle. Each has a 30.3in-wide reclining chair; an ottoman that converts into an 80.5in-long, 26in-wide bed; a chilled mini-bar; a 24in monitor and a vanity unit. Six of the apartments can be joined to create double apartments for couples.



## BUSINESS STUDIO

Acumen says its 'dovetail' configuration, in combination with staggered interlocking ottomans, increases passenger space by 20% without affecting seat count. Every passenger has immediate access to the aisle and a seat that converts into a flat bed.

## LOBBY

This area includes a six-seat circular sofa, a 27.6in-diameter table, a 32in monitor and a serviced refreshment bar.

## CONTACT:

[www.acumen-da.com](http://www.acumen-da.com)



# DESIGN PANEL: AUDIO SYSTEMS

A GREAT SOUND SYSTEM RELIES HEAVILY ON THE PRECISE POSITIONING OF SPEAKERS, BUT ON AN AIRCRAFT A LOT OF SYSTEMS ARE COMPETING FOR LIMITED SPACE

**CRAIG DEPNER:** We see several recurring issues. The first is interior ambient cabin noise generated by the rush of air past the fuselage. Another is interior acoustics created by the cabin layout and materials chosen. Then there is the positioning of surround-sound speakers/channels. Cabins requiring surround sound tend to be the most difficult to configure as the layout tends not to be optimal for a 5.1 or 7.1 layout. Finally, analog speaker wiring is extremely susceptible to picking up electronic hums in a cabin, especially from lighting circuits.

**KEVIN HAYES:** The key to achieving maximized sound performance is the strategic placement of properly tuned speakers throughout the cabin, but some customers want to use existing speaker locations, which may impact the final listening experience. Alto's acoustical engineers partner with each customer to analyze their expectations and design the custom audio system that will provide their cabin with the most outstanding sound.

Our most common constraint is the implementation of subwoofers, because the enclosures are larger and more difficult to locate. We often encounter resistance to mounting subwoofers in the cabin, which is a problem because bass is such a critical component to great sound.

WHAT ARE THE MAIN CHALLENGES  
IN CREATING GREAT AUDIO  
SYSTEMS FOR BUSINESS/VIP JETS?

**ELISABETH HARVEY:** VIP jet owners expect their aircraft to meet the same high standards in terms of audio as they are accustomed to at home or in their cars. As private jets become quieter, with the aid of more sophisticated soundproofing technology and applications, audio systems are gaining attention as a key area in which the passenger experience can be enhanced. Our VIP jet interiors can now be 10dB quieter than commercial aircraft interiors. Thus an important part of Jet Aviation's cabin completion strategy is to incorporate advanced high-quality audio systems that take advantage of this opportunity.

One of our biggest challenges is to be able to design the sound system in parallel with the cabin design. To ensure optimum quality we need to take into account the sound system, of course, but we also need to fully appreciate the impact of its location in the cabin, as well as understand the effect that overall design and surface materials have on performance. A good collaboration between the designers, engineers and technicians assigned to the project is essential.

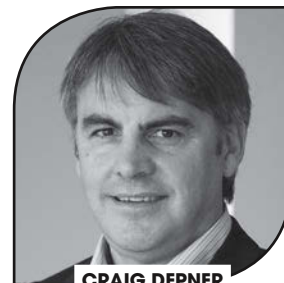
**RYAN MEREDITH:** As with most systems on jets, size and weight constraints are a challenge. Designing audio systems that create a powerful listening experience, while remaining concealed behind walls, under seats and in the ceiling, is a constant battle. Audio on any aircraft is also competing with the ambient noise pollution generated by the aircraft. This puts an added premium on sound quality.



## THE PANEL

**KEVIN HAYES**

vice president of sales and marketing, Alto Aviation

**CRAIG DEPNER**

president and chief technical officer, IDAIR

**RYAN MEREDITH**

electrical/acoustic engineer and certified FAA repairman, Custom Control Concepts

**ELISABETH HARVEY**

manager, Jet Aviation Basel Design Studio

**RHIANNON MACLEOD-COOK**

director of engineering, Jet Aviation Basel Completions Center

## WHAT ARE YOUR LATEST SOLUTIONS TO THESE CHALLENGES?

**KEVIN HAYES:** We have developed very small and lightweight speakers that can be positioned with minimal interference to the cabin structure. In particular, we have developed a combinational enclosure, encapsulating mid- and high-range speakers and a subwoofer into the same unit. These speakers are placed in the ceiling panel.

**CRAIG DEPNER:** Cabin layouts are analyzed and optimal speaker locations are chosen. For surround sound, the center channel may need to be distributed in several locations. The optimal speaker layout also has to be checked against other requirements, such as space needed for lighting, ceiling features and oxygen systems.

We work very closely with the completion center to ensure that all wire runs are done in accordance with our requirements, with adequate spacing to ensure speakers don't pick up hums. Tuning is also still required to ensure optimal sound quality.

**RYAN MEREDITH:** Our current line of audio equipment uses light materials and high-quality drivers to create a theater-quality experience, while saving weight and space. We use 3D printing to create our speaker housing, enabling innovative designs. Using this technology, we are able to get richer, deeper tones out of smaller speakers.

**RHIANNON MACLEOD-COOK:** We implement sound-absorption techniques to reduce aerodynamic noise, in conjunction with improvements in speaker quality. Speaker placement and fine-tuning are also key.

**ELISABETH HARVEY:** There will be more flexibility and options generally, and audio systems will diverge into two streams. Either the components will be showcased in full view, with a discreet and compact design, or all components will be completely hidden using flat-panel invisible speakers. In the latter case, loudspeakers will transform walls, ceilings and furniture into sound-producing surfaces that are camouflaged by decorative concepts.

**CRAIG DEPNER:** An expert will probably always be needed to fine-tune the system on the aircraft. However, we would also like to see speakers that can auto-tune reliably by automatically adjusting for the varying acoustic features in a specific cabin.

## WHAT DOES THE FUTURE HOLD?

**KEVIN HAYES:** As more VIP jets implement HD video, there will be demand for sound quality to match. New speaker technologies and designs are being considered to improve sound quality within the aircraft's size constraints. One of the new buzzwords in the audio world is 3D audio, which has a vertical component to it rather than just a 2D sound profile. The quest for cabin noise-reduction systems continues to be an alluring and challenging goal.

**RYAN MEREDITH:** We have seen helicopters starting to employ audio systems with active noise-canceling for the entire cabin, and this could easily cross over to business jets.



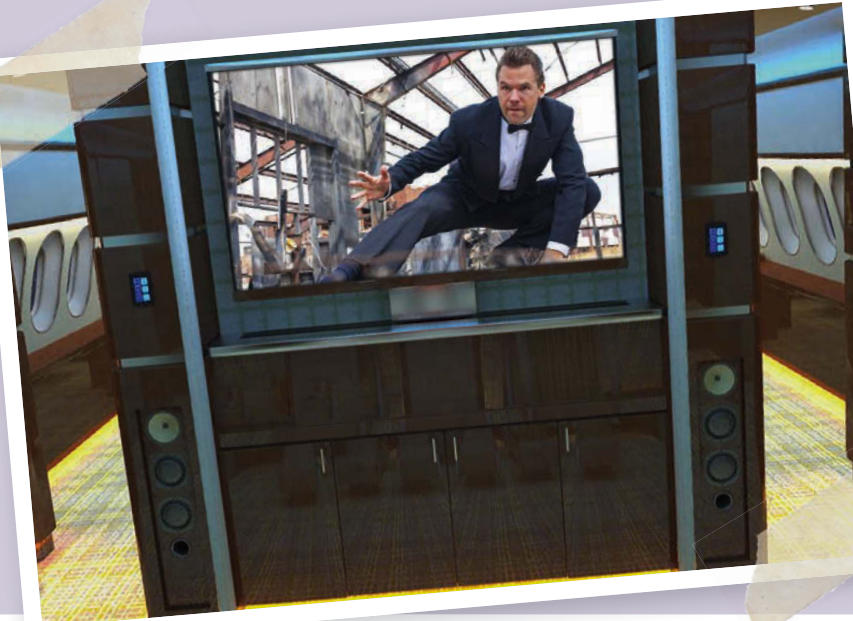
**KEVIN HAYES:** If we could influence customers toward a radically different approach, it would be to encourage them to implement cinema rooms with strategically positioned monitors and seating. In most VIP configurations, the seats and monitors are off-center and the seats are based on visual impact and functionality, not the sound system. In a defined cinema room, a central monitor and centered seating would provide the best seat in the house for all viewers. Our speakers would be positioned to provide every seat with surround sound, not just one sweet spot.

**CRAIG DEPNER:** What some may consider radical, others may just see as the next step. IFE/CMS systems are becoming all-digital, so we see cabin IFE speakers also taking this step. As intelligence is added to the speaker, it should also be designed to counteract interior ambient cabin noise with wave-level noise cancellation. Is robust and reliable technology available today to satisfy this desire in an aircraft-qualified unit? Perhaps not, but we believe it will get there very soon.

IF YOU HAD THE OPPORTUNITY TO CREATE  
A RADICALLY DIFFERENT AUDIO SYSTEM,  
WHAT WOULD YOU DO?

**RYAN MEREDITH:** We recently intensified our research and development efforts and built an in-house anechoic chamber to enable us to develop and test some amazing new designs. At this stage we can't reveal specific details, but we have come up with some radically different solutions to create a theater-caliber audio experience, involving a more accurate acoustic reproduction of the electrical signal being sent to the speakers.

**RHIANNON MACLEOD-COOK:** We are now designing cabins using 3D imaging through CATIA, which enables us to think about where audio features will be integrated from the outset. We like to push design limits, but only recommend systems that we believe can be feasibly integrated. However, I love the idea of incorporating wireless 3D audio technology.



A CONCEPT SHOWING HOW  
CUSTOM CONTROL CONCEPTS'  
SPEAKERS COULD BE INTEGRATED  
IN A VIP CABIN





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1. The G600 mock-up, which is nearly 70ft long





# serenebeauty

Serenity and flexibility were the key aims in developing the two new additions to Gulfstream's large-cabin portfolio – the G500 and G600

**G**ulfstream unveiled two large-cabin jets in October 2014 following a secretive five-year development program. While the minute details of the cabins have yet to be finalized, Gulfstream has already assembled and placed the shorter of the aircraft, the G500, into taxi tests and is displaying a cockpit and cabin mock-up of the other, the G600. The mock-up will be used in part to solicit customer feedback and fine-tune the design.

The G500 rolled out under its own power at the launch event for the two aircraft, which was held at Gulfstream's headquarters in Savannah, Georgia, USA, on October 14, 2014. The G500

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2. G600 customers can mix and match from 10 cabin modules



## The cockpit

Far from being out of sync with the clean and modern cabin, the cockpit planned for the G500 and G600 is a triumph of design. It's built around the Gulfstream Symmetry flight deck and powered by Honeywell's Primus Epic touchscreen avionics system, along with tablet controllers at both pilots' positions, the center console and the overhead panel. Pilots can transfer displays between the four main screens via Gulfstream's cursor control device.

"Pilots have touchscreens as their everyday consumer devices and are therefore much more accustomed to interfacing with machines through interactive screens," says Jeff Merdich, director of product marketing for cockpit systems at Honeywell Aerospace. "Our engineers are responding to this change by bringing consumer device interaction to the cockpit and matching the modality to the mission. The Honeywell User Experience, a human-centered design approach, gives pilots the information they need, when they need it, in the most intuitive way."

While the cockpit does have a few switches, most have been eliminated, enhancing the clean appearance. In a major departure, Gulfstream is eschewing the traditional control yokes for active control side sticks that connect to the aircraft's fly-by-wire flight controls. Arm comfort is enhanced with adjustable arm/elbow rests aft of the sticks.

The cockpit features black leather and metal accents, giving a very clean and modern appearance and feel. There are numerous places for pilots to store personal items. A pull-out work table that deploys from below the instrument panel at each pilot position, provides a hard surface for eating, writing or for the use of supplemental electronics. The center console still extends aft of the seats, but it is lower slung, to enable easier access and egress. Handholds built into the center console also make sitting and standing easier.

The seats are a new design, and will be made by Ipeco. They feature full seat pans and perforated leather, and are highly adjustable.

Adjustable rudder pedals and new gasper placements are designed to enhance pilot comfort further. The low-slung panel gives excellent visibility out of the window.

## SOME OF THE STYLING CUES ARE DERIVATIVE OF THE G650 INTERIOR, BUT IT IS REALLY A NEW LOOK

has a range of 5,000 nautical miles at Mach 0.85 or 3,800 nautical miles at Mach 0.90. The G600 can fly 6,200 nautical miles at Mach 0.85 or 4,800 nautical miles at Mach 0.90. The top speed for both aircraft is Mach 0.925, the same as Gulfstream's G650ER flagship. Power will come from Pratt & Whitney Canada's PW800 engines.

The aircraft differ in length, but share the same cross-section, which is 7ft 11in wide and 6ft 4in tall. This is almost 7in wider and 2in taller than the in-production G450 and G550, but not as wide as the G650.

The G500 and G600 can be configured for 18 passengers. The G500 has three living zones, while the G600 can have four, plus an optional crew rest area.

Customers can work together with Gulfstream designers to configure the aircraft, choosing from pre-engineered options for working, relaxing, dining and sleeping areas. There are 10 cabin modules for both the G500 and the G600. The G600 even includes

a shower option. Both aircraft have lavatories at the front and back and include a full-size galley that – as on previous large-cabin Gulfstream aircraft – can be located either at the front or the back.

**Family feel** The mock-up's cabin reveals common themes with the interior Gulfstream developed for the G650. These themes include an absence of clutter, stylized display of high-tech galley and IFE equipment, and an understated, elegant flair.

"We were really going for a serene theme," comments Tray Crow, director of interior design at Gulfstream. "Considering how far and how fast these aircraft go, we wanted to create a place where passengers could really relax and disconnect. Some of the styling cues are derivative of the G650 interior, but it is really a new look, it's still its own aircraft."

Crow says one of the key differences between these new aircraft and others in the company's range is increased

3-4. Both the G500 and G600 (pictured) will have lavatories at the front and back of the aircraft, with plenty of storage



3 4



CABIN  
STATS

### Gulfstream G500

**Cabin width:** 7ft 11in

**Cabin height:** 6ft 4in

**Cabin length:** 41ft 6in

**Seats:** 18 passengers, 3 crew

**Range:** 5,000 nautical miles at Mach 0.85 with 8 passengers, 3 crew and NBAA IFR reserves

**High-speed cruise:** 516kts

**Max altitude:** 51,000ft

**Price:** US\$43.5m

flexibility. “We’ve built in lots of flexibility,” he says. “For example, panels and lower sidewalls can be finished in almost anything the customer wants – leather, fabric, hard or soft surfaces.”

Both aircraft feature the same windows that are on the G650. There are 12 on the G500 and 14 on the G600. They are equipped with a dual-shade sheer/blackout system. The aircraft also feature Gulfstream’s 100% fresh air system, which replenishes the cabin air every 90 seconds, and a 4,850ft cabin altitude at the service ceiling, which is 51,000ft.

In the mock-up, Gulfstream has made every attempt to maximize personal storage space in both the sidewalls and the seats. For example, personal devices can be stowed in niches next to the seats that also provide USB charging.

**New seating** The passenger seats are a new design. Gulfstream did not confirm the identity of the supplier, except to say it is the same company that supplies seats for the G650.

The new seat design for the G500 and G600 makes greater use of composite materials, including in the load-bearing structures. The seats are 27in wide, and further hip room has been created by sculpting pockets into the sidewalls. The new seats also include articulating footrests, and can convert to full-flat berths for sleeping (as can the divans).

The seat controls have been relocated to the inboard armrests. Gulfstream is currently evaluating what level of technology to make available on the new seats, but full electric control is expected. The seats are now undergoing dynamic testing and “doing well”, according to Gulfstream.



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5-6. Despite the integration of a 32in flatscreen, the G600 mock-up's mid-cabin credenza yields yet more storage



5 6

### Storage solutions

The baggage compartment on both the G500 and G600 has 175ft<sup>3</sup> of usable space and can be accessed from the aft lavatory and through a larger external loading door. Tracks on the floor and ceiling enable cargo nets to be positioned as desired, while fold-down shelves enable the optimum configuration for each operator. There is also built-in storage at each seat.

The cabinets at the ends of the divan have been raised up to the height of the divan's back to provide a cozy corner and yield more storage. "Any place where we could increase storage, we did," says Crow.

**Sound and vision** Quietness was also an important aim, and lessons learned from the G650 have been used to achieve it in the G500 and G600. "As you get the cabin quieter, you hear things you've never heard before," says William Gay, director of completion sales at Gulfstream.

In terms of IFE, the company plans to offer high-definition monitors, high-speed communications service and Gulfstream's own CMS (which will enable control over window shades, lighting, temperature and IFE through

touchscreen devices). Onboard printers and scanners will also be offered.

However, final decisions have yet to be made regarding the details, given the rapid pace of technological change in the IFE arena, particularly when it comes to monitors. "That's an area where we are soliciting particularly comprehensive feedback from our customers, asking them whether they want in-seat or rail-mounted monitors, or if they think personal electronic devices are going to take their place," reveals Gay. "We're getting mixed feedback, so we're preparing to go down either path."

**Entertainment show** Right now, the G600 mock-up incorporates a 32in flatscreen in the mid-cabin credenza. Gulfstream is also keeping a watchful

CABIN  
STATS

### Gulfstream G600

**Cabin width:** 7ft 11in

**Cabin height:** 6ft 4in

**Cabin length:** 45ft 2in

**Seats:** 18 passengers, 3 crew

**Range:** 6,200 nautical miles at Mach 0.85 with 8 passengers, 4 crew and NBAA IFR reserves

**High-speed cruise:** 516kts

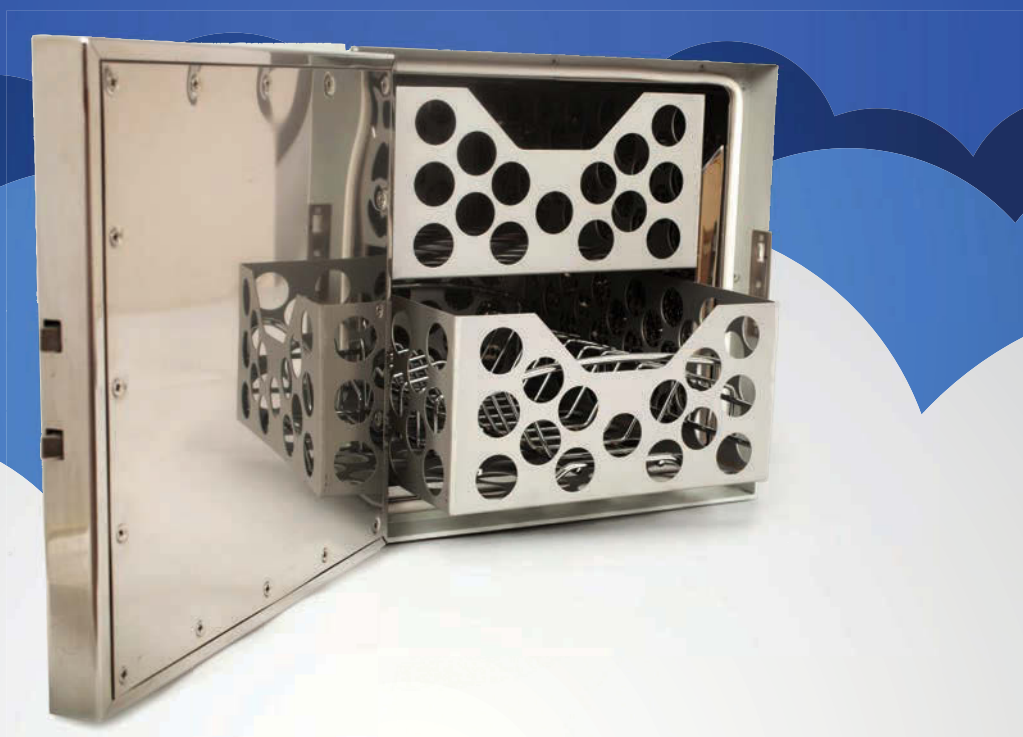
**Max altitude:** 51,000ft

**Price:** US\$54.5m

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This compact self-contained unit has been designed specifically for warming buns, bread rolls, croissants etc. Insulated to ensure a cool outer face temperature, the door decor trim can be provided to your needs.

The oven incorporates baskets and crumb tray and the baskets can have plate racks inserted for storage.



7. Gulfstream is aiming for a subtly elegant aesthetic, with nice touches such as floor-level spotlights
8. The G500 and G600 have a new seat design by the same supplier as the G650



eye on emerging IFE technologies such as foil screens, and Gay does not rule out incorporating such items into the final cabin designs.

When it comes to audio, for now the company has decided to stick with conventional speaker technology. Gay notes that sound from transducers can be impacted by wall coverings.

Overall, Crow emphasizes that the aircraft will offer the best of both worlds: the modular design enables manufacturing efficiency and thus an optimized price; while the cabin still offers ample opportunities for owners

to make it their own. “We want to capitalize on the modularity as much as we can, but we are also pushing flexibility as well,” he says.

The company has built a new production plant in Savannah to build the aircraft, taking advantage of the aircraft’s monolithic structures and modern assembly techniques.

Gulfstream anticipates that it will obtain FAA and EASA type certification for the G500 in 2017 and begin deliveries in 2018. Certification and service entry for the G600 are projected for 2019. **END**

## G500 AND G600 TIMELINE

### 2009

G500 and G600 development program begins

### 2014

G500 aircraft and G600 mock-up unveiled; Qatar Airways and Flexjet place orders for the G500

### 2015

First flight of G500 expected

### 2017

G500 type certification expected

### 2018

G500 service entry expected

### 2019

G600 type certification and service entry expected



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# gamechanger

The Athletes' Plane concept from Teague and Nike is designed to enable top-flight sports teams to arrive in peak condition for away matches







1. The main cabin in the Athletes' Plane

## ATHLETES' PLANE

2. The lavatory, which includes a shower
3. The recovery room, where players could receive medical treatment and massage
4. A social lounge is located away from the sleeping area, in the lower lobe



2



3

**T**op sports stars are paid millions to deliver results. They have to look after their bodies, hone and train to a state of peak physical fitness so that they can deliver the sporting goods – which hopefully translate into ticket and merchandising sales. But with only half of matches played at home, these athletes spend a lot of time in transit,

flowed from training ground to match and back again – and most US sports teams still rely on airline charters.

Design firm Teague noticed this, and concluded there is a market for a more tailored flight experience that could cancel out some of the away-game disadvantage. The company teamed with athletic apparel maker Nike, and spoke with team medics, coaches and sleep specialists. The result is a concept

designed to enable athletes to arrive at games feeling great, and get the post-game support they need quicker – on the flight home. It centers on enabling four key things – recovery, circulation, sleep and thinking.

**Performance art** “Air travel often hinders athletic performance because of its impact on physical, physiological and cognitive functions,” says Philipp Steiner, creative director of Teague’s aviation studio. “When professional athletes travel across multiple time zones, their team is statistically more likely to lose. The Athlete’s Plane essentially levels the playing field.”

The concept includes lie-flat seats that will accommodate athletic builds, plug-in compression and ice sleeves to relieve sore muscles, and biometric testing and analysis in flight that could even include urinalysis courtesy of smart toilets.

Teague started working on the concept in 2010. “We have a lot of





4



### Market forecast

While a select few billionaire sports team owners have provided their players with private aircraft – notably National Basketball Association (NBA) team the Dallas Mavericks, and National Football League (NFL) team the Seattle Seahawks – most teams use airline charters.

Some might argue that the economics of this situation no longer make sense. Teague calculates that some NFL franchises are now worth more than US\$1bn, not counting the US\$1-2bn stadia they play in, and other assets, such as practice facilities. Star players can make more than US\$20m a year. The Green Bay Packers play in the smallest market of all 32 NFL teams – Green Bay, Wisconsin, has a population of just 104,000 – but the team made US\$324m in 2013. By 2027, the NFL, as a league, expects to generate US\$25bn per year. Other professional sports in the USA – including baseball and basketball – have also become multibillion dollar affairs. Even college football is lucrative – college athletic programs at the University of Wisconsin alone generated US\$149.14m in 2013.

With such an economic backdrop, you might expect big teams to invest more in transport. Especially when you consider that a Major League Baseball (MLB) team plays 162 regular season games in a little more than six months; NBA teams play 82 regular season games in five and a half months; and the National Hockey League (NHL) teams play about the same. By any standards these schedules are grueling.

sports enthusiasts and former college athletes working here at Teague,” explains Steiner. “We have a natural passion for sports. Obviously an athlete is an extreme example of flyer. For us it presented an opportunity to identify benefits that could eventually be applied to the broader public. Surprisingly, the challenges of designing for athletes are not that much different than those of designing for the general population, especially old people. Issues such as low resting pulse and mobility when traveling are common to athletes and old people.”

## WE HAVE A LOT OF SPORTS ENTHUSIASTS AND FORMER COLLEGE ATHLETES WORKING HERE

Seats on the Athlete's Plane are spaced further apart than normal, to enable people who are likely to be 7ft tall to recline to lie flat. The seats feature expandable privacy screens that can be draped front and aft over the athletes. Stowage has been designed into each seat, to enable each person to stow personal items there instead of in overhead bins. Going without these

bins makes it easier for tall people to move about the cabin. The IFE system will facilitate private communication between players and coaches from their seats. Players can also access their personal performance information on the seatback monitors. This data would be collected by smart shoes, clothes and accessories (wearable technology) worn during games.

The seats have split leg rests that enable each to be raised individually. “That’s important for athletes in terms of treating injuries,” says Steiner. The seats also have pressure and cooling sleeves, and could be implemented with built-in heat, cooling, and rolling and vibration massage functions.

**Liquid assets** For players who need more hands-on therapy, the treatment room at the rear of the aircraft includes massage beds. Players can also enjoy cold and warm contrast treatments, electro-stimulation, and steam showers. “Sometimes athletes do not have a lot of time post-game, or after a massage, so it would be nice if they could refresh themselves on the aircraft,” says Steiner. He adds that smart spray/steam showers are water-efficient, so could enable each member of the team to take a shower. The amount of water needed would still be substantial, but Steiner says the relatively small number of passengers would mean gross weight and center-of-gravity issues would be “more forgiving”. However, “There isn’t going to be thousands of gallons of water for showers,” he concedes.



## THE CHALLENGE IS GREATER THAN SIMPLY FIGURING OUT HOW TO DESIGN A SEAT

### Scalable solution

While the Athletes' Plane concept is based on a modified wide-body airliner, Teague says it will also work in a narrow-body. "When we looked into this, we went through various scenarios," says Philipp Steiner, creative director of the aviation studio at Teague. "An NFL team and its entourage – coaches, technical and training staff – can easily number 100 people. But the size of the aircraft depends on how many of the features you want to incorporate, and if you want the entire staff to travel with the players or not."

The treatment room can also be used for medical procedures, such as the administration of intravenous fluids. "This enables treatment to be performed in a dedicated medical area, as opposed to laying a player across several rows of seats," says Steiner.

Steiner expects the environmental control system to be able to control cabin humidity. The aircraft would have the lowest pressurization possible to minimize travel fatigue.

**Nutritional information** Another vital factor in an athlete's performance is nutrition. The Athlete's Plane has a self-serve 'Nutrition Zone' rather than

5-6. The super-sized seats feature split leg rests, personal stowage, privacy screens, and pressure and cooling sleeves

a large galley. The refrigeration unit is adjacent to the main seating area, and can be stocked with items geared to each athlete's needs.

Steiner explains this setup by pointing out that many athletes recapture nutrition with liquid nutrient shakes as opposed to a traditional meal. "Shakes are also what they use to rehydrate," he says. "Dehydration is probably one of the most important things athletes have to work on after a game, especially when traveling."

However, the most important aspect of recovery, according to Steiner, is sleep. "The challenge is greater than simply figuring out how to design





a seat," he says. "You need to leverage adjacencies. Where do we put the athletes in relation to the lavatories or the recreation areas? Where do we put the medical staff in relation to the trainers so there isn't unnecessary foot traffic in the aircraft that would disturb the resting athletes?"

Teague believes it can keep peace and quiet in the main cabin by offering a separate social lounge, in the space

that would normally be a baggage hold in airliners.

"The lower lobe is an interesting area because it is a bit more secluded," explains Steiner. "This is a good place to create a space where athletes can socialize. Even though they are competing together all the time, some teams don't get to know each other very well. Our research showed that some of the athletes would actually

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## The perfect inflight menu for an athlete, by Heather Hibben

Traveling requires an athlete to eat even better than they normally would and to include foods and beverages that help prevent travel complications. Time of flight and type of sport or physical/mental demands will completely change an athlete's nutritional needs, but in general, the factors to eliminate include dehydration, fatigue and jet lag.

Dehydration can cause fatigue and headaches, increase the risk of catching an illness, and generally wreak havoc on athletic ability. To avoid it, consume 4oz of water or liquid from soups and fruits each hour of the flight. Eat foods that are high in potassium, such as oranges, sweet potato, mango, pears and melon.

Fatigue can be caused by lower circulation, air pressure and oxygen levels. Stave it off by eating foods that support healthy circulation, such as fish and garlic; keep hydrated; and walk at least a few minutes each hour.

To prevent jet lag, try to reset your internal clock faster by eating the foods that help you sleep (generally, complex carbohydrates) or to be alert (protein) as necessary.

### SAMPLE MENUS FOR NFL OR NBA PLAYERS

#### GOING TO WIN

*(day flight for an evening game)*

Mixed vegetable, beef and barley soup with turmeric and oregano

Roast rosemary chicken with garlic green beans and cinnamon sweet potatoes

Apples stuffed with walnuts, figs and goat's cheese

#### RECOVERING ON THE GO

*(afternoon flight home with training the following day)*

Minestrone (with meat instead of beans)

White fish with wholewheat spaghetti, served in an oregano, garlic and mushroom marinara

Chocolate and ricotta pudding with raspberries

#### WHIRLWIND WIN

*(night flight for a morning game)*

Thai cucumber salad

Mild chicken curry with extra vegetables and brown rice

Coconut milk custard with mango slices

Your circumstances may mean you have different needs. These suggestions are fairly general, so seek professional advice to ensure your needs are met.

*Heather Hibben is a nutritionist at Tastefully Yours Catering in Atlanta, Georgia, USA*

7. Rather than a galley, the Athletes' Plane concept features a self-serve refrigeration unit



appreciate an opportunity to get to know each other better.”

**Game plan** While acknowledging that individual sports teams had attempted similarly tailored aircraft, Steiner believes they did not have a very deliberate approach as to how they were zoned. “I don’t think that this level of understanding, this provision of specific features and thought-through configuration, has been attempted before,” he comments. “What has been done is the provision of bigger business class seats, laid out in a fairly traditional way.”

Steiner therefore believes Teague’s offering is a strong concept for an enterprising charter company, which could chart the aircraft to different teams in different seasons. “Sports go on year-round and you could fly the aircraft year-round,” he says. **END**



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1. As an Inmarsat distribution partner, Rockwell Collins' ARINCDirect offers various connectivity options for data, email, text messaging, voice service and VPN





# band of gold

Inmarsat and Honeywell believe Ka-band holds the key to revolutionizing the business jet connectivity experience

**F**rom mid-2015, Inmarsat and Honeywell expect to begin delivering high-speed broadband internet service to business aviation customers. They promise speed and quality comparable to those the developed world has become accustomed to in homes and offices.

“The business jet market is very demanding and has been disappointed by some of the solutions that have gone onto aircraft up to now,” contends John Broughton, director of marketing and product management for Ka-band satcom at Honeywell Aerospace.

The new Inmarsat service, called Jet ConneX (JX) in the business aviation

market, will operate in Ka-band, via a dedicated Inmarsat-5 (I-5) satellite constellation and using Honeywell’s JetWave hardware.

Inmarsat has deployed many satellites in the L-band range over the last 35 years, but according to Kurt Weidemeyer, vice president of business aviation at Inmarsat, delivering high-speed connections through L-band to multiple moving aircraft and ships is very difficult. He says that although Inmarsat’s customers are satisfied with the L-band SwiftBroadband (SBB) service – which delivers 432Kbps per channel – for the time being, in the future they would require multi-Mbps connection. “So Inmarsat looked at

**INMARSAT LOOKED  
AT BOTH KU-BAND AND  
KA-BAND AND CHOSE  
THE LATTER**



## A match made in the heavens

Just how did the cooperation between Inmarsat and Honeywell come about? “Honeywell was among the pioneers in the connectivity industry and its products are on several thousand airline and business aircraft,” explains Kurt Weidemeyer of Inmarsat. “We were looking for a company that had the in-house technical capability to deliver, which could take the hardware to market and get an audience with the OEMs, and that had an incredible customer service organization.”

Honeywell ticked all those boxes for Inmarsat. In addition, Honeywell’s acquisition in 2011 of EMS Technologies demonstrated that connectivity was going to be a major growth driver across all its markets, including aviation.

“We’ve been in this business since the onset of satellite communications in the early 1990s,” says John Broughton at Honeywell Aerospace. “The Ka-band program continues a line from early single-channel work, through dual-channel voice and SBB, to what JetConnex and JetWave will deliver.

both Ku-band and Ka-band and chose the latter,” he reports.

Panasonic, which is Inmarsat’s biggest competitor for connectivity in the airline market, uses Ku-band. Only Inmarsat and ViaSat have chosen to exploit Ka-band, where they say more spectrum for mobile use is available, but the technology required to manufacture affordable terminals has only just become available. Weidemeyer says the service promises to be of extremely high quality, but it was simply impossible 10 years ago.

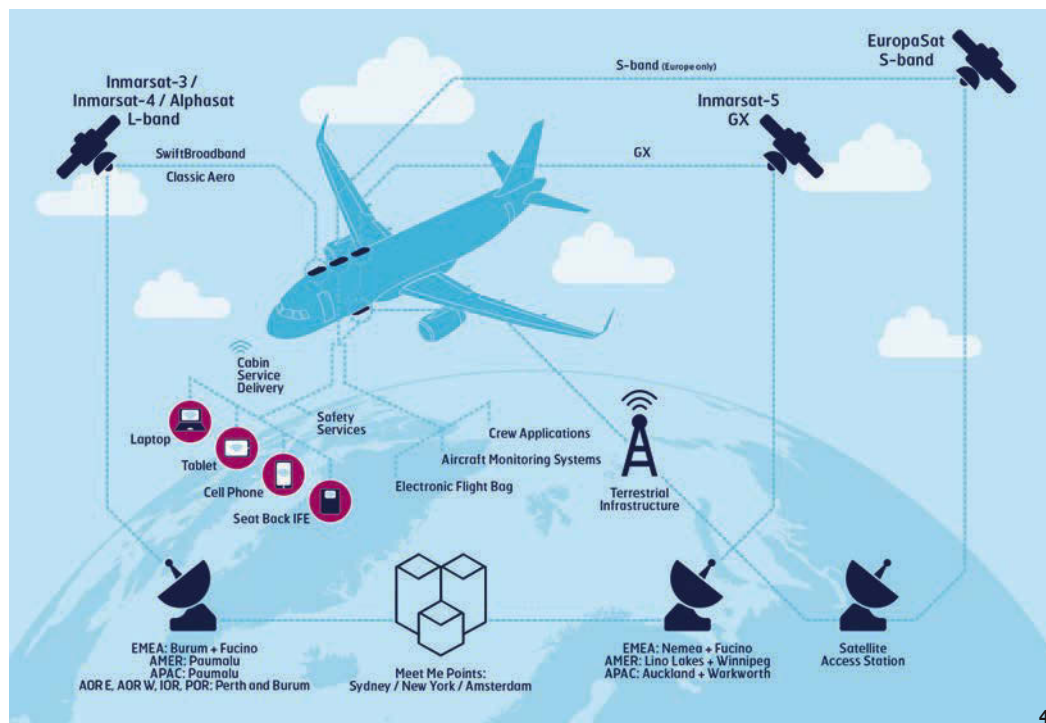
The I-5 constellation is small. “We need only three very large satellites for global coverage and we’re going to mirror what we do with our I-4 L-band

constellation that serves SBB,” says Weidemeyer. “Three make up the initial global footprint, but we’ve ordered a fourth satellite that could be used later to supply additional coverage.”

**Ensuring seamlessness** With global coverage from only three sources, many business jet flights will fall within the region of a single satellite, but Inmarsat says there will be no service dropout between satellites. The coverage map will be similar to that of the I-4s and, according to Weidemeyer, Inmarsat’s spot beam technology will ensure customers are unaware of the change from one spot beam to another, thanks to a ‘make before break’ system. “We’ve

2. Honeywell’s JetWave tail-mounted antenna
3. Inmarsat will use three satellites to provide the service initially; a fourth has been ordered
4. How Inmarsat’s various services are or will be deployed

## WE NEED ONLY THREE VERY LARGE SATELLITES FOR GLOBAL COVERAGE



### Key terminology

**Global Xpress:** Inmarsat’s Ka-band satellite network and infrastructure

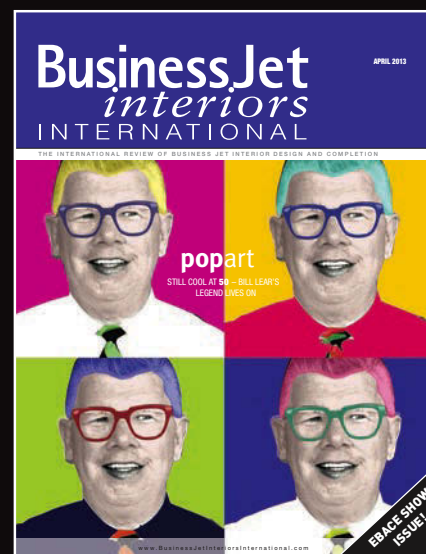
**GX Aviation:** Inmarsat’s Ka-band service for commercial aviation

**Jet ConneX (JX):** Inmarsat’s Ka-band service for business aviation

**JetWave:** Honeywell’s Ka-band hardware for business aviation

also pioneered satellite-to-satellite hand-offs, which we can do extremely quickly, since we run the network,” says Weidemeyer. “There’s a very minimal outage period, while some of our competitors who lease capacity on different networks have to do a network-to-network and satellite-to-satellite handover and it can take a couple of minutes.”

Having talked to aircraft OEMs, Inmarsat concluded that they intended



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### New content delivery

Richard Barsby of Skyline IFE, which specializes in licensing and producing IFE content, thinks JX could change the way content is delivered to business jets. “Fast broadband with an open connection to the internet will give business jet passengers the potential to stream content from their personal subscription services, such as Spotify and Netflix,” he says. “The critical factor is that the internet provider’s IP address must be approved by the subscription service, otherwise that service will block access based on locale. If the IP address is approved, then passengers can stream content from the ground to their devices. If not, they will be dependent on content they have preloaded or that’s provided by the aircraft operator. If subscription services approve Inmarsat’s IPs, then I believe the traditional IFE content business for business jets will be disrupted, since it depends on the disconnect between ground and air to deliver content through customized systems installed in the aircraft.”

to retain L-band terminals in their aircraft. The Inmarsat offering therefore includes SBB for safety services and as a back-up to JX for the cabin.

“We don’t intend to certify Ka-band for safety services,” says Weidemeyer. “You have to ensure the network has full redundancy and meets regulatory requirements for safety services – and our L-band service already has that certification. At the moment, aircraft use what we call our Classic network, which runs over our L-band satellites alongside SBB, to bring safety services into the cockpit, but we’re making enhancements to SBB so that it will meet all safety services requirements.”

**JetWave hardware** Customers buying into the JX system receive four Honeywell avionics modules, which are produced in line with the ARINC 791 standard, which defines box sizes and interconnect specifications. The four modules are the antenna, which is designed to fit underneath a regular Ku/L-band radome; the Kandu antenna steering unit; KRFU for high-power amplification and conversion to Ka-band; and Modman, which contains the satellite modem and interfaces to the aircraft’s Ethernet structure.

Bombardier will offer JetWave as a line-fit option across its Global range and Broughton expects other OEMs to follow suit, since Honeywell is talking to airframers across the industry. JetWave equipment is also available through retrofit – Honeywell says its

**1** OEM (Bombardier) currently on board to offer JetWave as a line-fit option

**4** satellites in the final I-5 constellation

**5** JX distribution partners: ARINC Direct, Gogo, Satcom1, OnAir and Satcom Direct

**50** Mbps offered by JX with a fuselage-mounted antenna

**33** Mbps offered by JX with a tail-mounted antenna

installation is no more complex than a similar L-band installation. “When we designed the antenna for the Ka-band service, a key decision was to ensure that it would fit under existing radomes – we didn’t want to change the aircraft aerodynamics,” explains Broughton. “We worked our system definition back from making installation as simple as possible for the customer. Meanwhile, feedback from Bombardier impacted the antenna design and other aspects.”

5-6. JetWave will be available as a line-fit option on Bombardier’s Global range





## Industry view

Suppliers across the industry are preparing for the advent of JX. One example is Satcom1, a long-term partner of Inmarsat's that has been appointed as a reseller of JX airtime. "Partnering with Inmarsat and Honeywell for their Ka-band solution was a natural choice, since we specialize in delivering airtime, airborne software and consultancy services to the highly demanding VVIP and head-of-state jet market and our clients are always requesting more bandwidth," says Karina Larsen, co-founder and vice president of partnerships at Satcom1. "We've also signed an agreement with Honeywell to be a JetWave reseller. Satcom1 has never been a reseller of aero hardware before, but we believe this is the right time to make it even easier for our customers to work with us. Our consultancy team is talking with several potential customers."

Broughton adds that Honeywell is now spooling up the installation infrastructure. "There are a number of MROs that have played a major role in the installation of L-band and we're talking to all of them," he says. "The Honeywell dealer network will support JetWave as it does L-band, and we've a number of conversations going on around individual STCs."

Among the leading MRO providers is Flying Colours Corp, which has a long association with Bombardier aircraft. Eric Gillespie, executive vice president of sales and marketing at Flying Colours Corp, confirms that the company has discussed JetWave at an introductory level and is considering it for the future. "Our customers want to stay connected and speed is important in today's environment," says Gillespie. "This new system will allow them to do everything, including streaming."

7-8. Satcom1 will be a reseller not only of JX airtime, but also of JetWave equipment



**Network availability** The first I-5 satellite is up and in service in the government market. The second and third should be airborne by the end of the first quarter of 2015. Earlier predictions were that two satellites would be in position by late 2014. "We're trying to get both satellites into the Proton launch schedule, after a failed mission earlier in 2014," says Weidemeyer. "The full launch manifest is being resumed and although we're still hoping to fly the second I-5 by the end of 2014, we're confident they will both be launched before the end of the first quarter of 2015."

So just how different will connectivity be in a business jet in mid-2015? "At the moment, business jets get two channels

of SBB, so around 1Mbps. Within a spot beam, using JX, they'll get 50Mbps with a fuselage-mounted antenna and 33Mbps with a tail-mounted antenna, which is what Bombardier is using on the Global," says Weidemeyer. "For a couple of passengers doing corporate emails, 1Mbps is fine, but if they're both trying to stream, they won't get a good HD signal. With JX, six or seven people can stream their own movie and watch it comfortably, while keeping up with email. JX also makes HD conferencing possible, in both directions, because transmission off the aircraft will be faster too. It finally brings true high-speed broadband into the cabin." **END**



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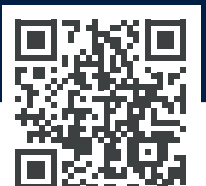
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1. Iacobucci HF Aerospace's Roma double seat
2. Venezia, Iacobucci HF Aerospace's 'super lounge' seat



# situp

Recent announcements indicate the business jet seating market is taking notice of customer demand for greater comfort and functionality

**N**ot so long ago a new private jet owner drove up for his first meeting with the interior design team in a Maybach and immediately made it clear what he expected in his BBJ. Not even waiting for a formal introduction, he pointed to the Maybach and said bluntly, "That's what I want."

According to Jacques Pierrejean of Pierrejean Design Studio, the business jet seating market is changing rapidly as a result of such demands. A growing number of seat suppliers are embracing the idea of offering a family of products rather than a lone model, and enabling much more choice in terms of comfort and aesthetics.

**Maximum comfort** When Iacobucci HF Aerospace of Italy announced its contract to provide VIP seats to

Altitude Aerospace Interiors for a BBJ completion, it referred to its wares not as seats, but as chairs, reflecting its focus on "maximum comfort and a perfect design".

The seats were developed with leg rest and backrest control, flex-wing headrest, lie-flat berthing functionality and single-lever track-and-swivel control. A heel-kick footrest extends to add 3in to the length. The seats come in widths of 21in and 23in, are finished in soft leather and are available with a choice of foams based on ergonomic standards.

More recently, Iacobucci seats were chosen for a BBJ 757 that will be operated by Four Seasons Hotels and Resorts and TCS Expeditions. The 26 seats for this aircraft are based on Iacobucci's 'super lounge' seat, Venezia. This seat features electromechanical articulation and convert to lie-flat





## AFTER DECADES IN WHICH VIP AND BUSINESS JET SEATS CHANGED ONLY IN TERMS OF SHAPE OR COLOR, PASSENGERS WANT SOMETHING NEW

### 3D printed parts



3T RPD, a UK-based metal and plastic additive manufacturing company, recently introduced PA2241 FR, a flame-retardant material that is targeted at the aviation market. The material contains a halogen-based flame retardant. The company says that in the event of a fire, an inert gas is released that starves the flames of oxygen, extinguishing

them. 3T RPD says the product has been tested to JAR/FAR Part 25 for flammability and smoke generation and meets the required specifications for toxic gas generation.

According to Ray Neal, head of plastics business development at the company, the flame-retardant qualities and tensile strength of PA2241 FR and the follow-on product PA2210 FR (which is now in development), make them ideal for aviation parts ranging from seat frames to ductwork. He says PA2210 FR may be the most suitable for seat frames. "The tensile strength is the main difference between this material and materials currently in use," elaborates Neal.

The 3D manufacturing process used by 3T, he says, makes the material a very good choice for one-off or limited-production parts, as it eliminates the need for tooling. He adds that it also enables various designs to be produced quickly. "From receipt of the original CAD image it takes about five days to produce the final product," says Neal. He adds that 3T can also make parts from materials other than plastic, including metals commonly used for aviation applications, such as aluminum. The largest chamber currently available for a plastic part is 700 x 580 x 380mm. The maximum chamber size for metal is 250 x 250 x 325mm.

3T has already reached an agreement with UK-based aircraft parts supplier BAE Systems to produce legacy parts that may no longer be in production or for which inventory is limited.

configuration. On this aircraft, each is equipped with a privacy divider, an ottoman with stowage, two PC power outlets, USB chargers, beverage holders and mood lighting.

Iacobucci introduced its first seat prototype in 2010 in partnership with BMW Group DesignworksUSA. As well as Venezia, Iacobucci's current range includes the Roma double seat (an electromechanically operated model with a full shell), the Alba single mechanical seat and the Portofino double mechanical seat. The company has also developed a model in collaboration with Piaggio Aero for the Avanti Evo, featuring electromechanical operation, flexible back and headrests and extendable leg rests.

**The chameleon** Completion and refurbishment specialist Lufthansa Technik has also been inspired by the idea of creating a chair as opposed to a seat. The company entered the business jet seat market in 2014 with a product actually called 'chair'. It is particularly notable for its ability to be configured in myriad ways.

"After decades in which VIP and business jet seats changed only in terms of shape or color, passengers want something new," says Andrew Muirhead, head of Lufthansa's new

- 3. Yasava's electrically articulated Aiana seat
- 4. Yasava also created a customizable wireless controller, ai-zen, to control the Aiana seat





Original Equipment Innovation product division.

Lufthansa Technik and Pierrejean Design Studio created the concept and took it to aviation interior components supplier Draxlmaier Aviation of Vilsbiburg, Germany. Draxlmaier was contracted to perform the final engineering design work and 80% of the production.

The foundation for the chair is a certified skeleton (a polymer pillar reinforced with carbon fiber) and a smaller pedestal. It can be tailored with individually sized and shaped ribs, upholstery of varying thicknesses and backrests in different heights. Customers can tailor the height by specifying how many back elements to include. Leg rests, armrests and options

such as a massage feature and a rocking mechanism combine to produce what Lufthansa Technik describes as “hitherto undreamed-of variability”. In fact, more than 9,000 configurations can be built around the basic structure. So whether the customer needs a stuffed armchair, a meeting room chair or a dining chair, it can be achieved from the same base. The concept also enables the model to work in aircraft of various sizes.

Dave Crossett, head of strategic sales and marketing for Lufthansa Technik's Innovation Center, recalls showing the initial prototype at EBACE 2014. One visitor, Crossett says, was shown the new chair and had one final question: “Can I buy one of these right now, for my office?”

### Three-piece suites

Ipeco is perhaps best known for its pilot seats, but the company has a considerable following for its cabin products as well. The UK- and US-based supplier provides a range of executive seating for Cessna and Bombardier and is currently making deliveries to the new Bombardier Challenger 350 program. The new seats feature an extended leg rest that provides an extra 5in of length with a seat pan that adjusts to provide a full-flat berth.

The company also recently developed a 16g, three-place divan. Each of the sections can be pulled out individually. “With two sections pulled out, it becomes a berth for a child, while the third section remains a seat,” explains Rick Martin, sales manager for aviation seating at Ipeco.

Ipeco prides itself on being a “one-stop shop” according to Martin. The company provides the frame and all other parts for its products, then assembles these parts and applies the foam build-up and upholstery cover in whatever color or material the customer demands.

**Astral chic** Another relatively new name in the business jet seating industry is Yasava of Switzerland. As part of its Astral cabin design, launched in 2013, it created the electrically articulated, 16g Aiana seat.

While Aiana was originally created for ultra-long-range aircraft such as Gulfstream's G650 and Bombardier's Global line, Yasava's CEO and founder, Christopher Mbanefo notes that the most recent inquiries have come from ACJ and BBJ owners and completion centers. A new version of the seat will be unveiled at EBACE 2015, to be held in Geneva, Switzerland, on May 19-21, 2015. The seat will be manufactured by Optimares of Italy.

The original version is 28in wide and 79in long. The shell design provides a certain degree of privacy when in the full-flat configuration. In

5. Two variations on Lufthansa Technik's chair platform  
6-7. Iacobucci HF Aerospace's mechanical Alba seat



6

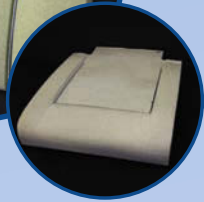


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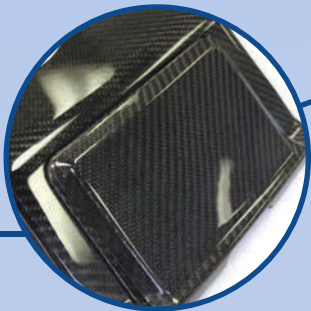
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## THE SYSTEM RESPONDS TO MORE THAN JUST THE BASS; YOU FEEL THE SOUND AS MUCH AS HEAR IT

8

the upright position, it offers full tracking and swivel. The company also put a great deal of thought into how the seat is actually controlled, the result being the ai-zen wireless control device. Fittingly for the luxury VIP market, each ai-zen is handcrafted individually and can be customized to the client's wishes.

**Move to the music** Aero Seating Technologies (AST) has also realized the importance of tailoring seat control to the lifestyles of end users. A major upgrade evident in its latest executive seating line is that there are now capacitive touch controls for track and

360° swivel, seat pan tilt, vertical lift and other functions.

The Next Generation range, which was launched in 2013, is also available with an optional audio response massage feature. Integrated with the IFE, the system picks up the audio feed and makes the seat vibrate in coordination with the sound.

This feature was first deployed in AST products in 2011, but the latest version is more sophisticated. "It is now cleaner and crisper," says Pete Perera, president and CEO at AST. "The system now responds to more than just the bass; you now feel the sound as much as hear it."

### Big iron brand

A BBJ 747-8 scheduled for delivery by the end of 2014 will be equipped with a range of seats from PAC Seating Systems of Florida, USA. The order, made in August 2011, includes executive seats, slouching seats, full-flat sleeper seats and divans. PAC says it has received entire shipset orders for seats on more than 50 big iron aircraft, including four BBJ 747-8s.

More recently, the company was picked to provide a range of electrically and manually articulated seats for a BBJ 787. All the seats were designed and certified to attach direct to the aircraft type's new seat tracks and all come with the composite back shell (pictured right) that PAC claims will facilitate easier upholstery repairs and maintenance access. To facilitate easy removal and reattachment of the seats, PAC has developed a keyhole seat pan locking system that uses only two screws. This has received a US patent.



8-9. An electric seat from AST's Next Generation range



9

### RCO offers poured foam

RCO Aerospace Products has been producing cushions for business jets for several years using CNC mills to shape block foam. Recently the company developed a foam formulation for seat cushions that can be poured into a mold. This eliminates the need to build up and shape the cushion – either manually or on a CNC machine – from blocks of foam.

The company says these foam pads can incorporate shapes that provide more comfort to the passenger than the typical flat surfaces found in aircraft today. It also believes the process saves money and time. The foam's firmness can be tailored to meet individual requirements. Trenches with hooks and loops can be molded right into the cushion, which RCO says also speeds up the assembly process.



10



11

## PASSENGERS REQUIRE NOT ONLY TASTEFUL, BUT ALSO COMFORTABLE AND USER-FRIENDLY ACCOMMODATION

The company is also developing voice-recognition software for the seat controls, and a wireless charger for smartphones and electronic tablets. “We expect to introduce those features in about a year,” says Perera.

The company has also introduced a track-and-swivel seat for which it has earned five US patents and has another five patents pending. Its features include removable upholstery, certified foam in a range of densities, color-coded cables that can be disconnected quickly, and adjustable width between the arms.

Perera comments that the recent introductions reflect growing customer demand for seats that mirror the styling, comfort and features of those in high-end automobiles.

**Wireless wonder** Meanwhile, UTC Aerospace Systems plans to incorporate Bluetooth connectivity on its upcoming Model 1 VIP seat, which is nearing final approval. The technology would

enable wireless control of seat functions through a passenger’s tablet or smartphone. There is also a wireless charger for personal devices. For comfort reasons, the Model 1 incorporates a patented environmental control system. Deliveries are expected to begin later in 2014.

“Our new Model 1 executive seat combines the best of style and comfort while also incorporating wireless technology to run electronic devices,” comments Daphne Falletti, president of UTC Aerospace Systems’ interiors business. “Today’s executive business travelers are on the road and in aircraft now more than ever. While traveling passengers require not only tasteful, but also comfortable and user-friendly accommodation, including around-the-clock connectivity for work and relaxation purposes.”

At NBAA 2014, the company also unveiled Hybrid, a concept that involves replacing levers and wires in manual seats with full electronic

10. UTC Aerospace Systems’ Model 1 VIP seat

11. The Hybrid seat concept by UTC Aerospace Systems

systems. It means that models that were manual can be upgraded to offer electronic control of whatever features the customer desires, including the leg rest, backrest recline, track and swivel, and upper/lower lumbar.

The company says that replacing manual controls improves reliability and ease of use, in addition to freeing up a lot of space in seat arms, enabling them to be redesigned or even removed. As with many of the seats now coming to market, the overriding concerns are to offer a more luxurious experience and enable a lot more flexibility for customization. **END**

### Bubble of silence

For those who find noise-canceling headphones uncomfortable, Silentium has an answer it has dubbed Quiet Bubble. Launched in 2013, the patented noise-cancellation technology is installed in the seat’s headrest. It is designed to cancel out ambient noise, creating a quiet zone around the passenger’s head.

Israel-based Silentium, a specialist in spatial active noise-control technology, claims Quiet Bubble can reduce noise across the entire audio spectrum by more than 10dBA. It works by producing opposing signals with the same amplitude but the opposite phase as the noise it is trying to cancel out.

Quiet Bubble was originally developed for the automotive sector and was recently introduced to the commercial airline industry.



# MORE TECHNOLOGIES. MORE LUXURY.



UTC Aerospace Systems announces the Model 1 VIP seat.  
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# fastforward

The latest developments in the IFE industry include upgraded screen resolution and complete integration of PEDs

**T**he IFE industry is locked in a never-ending battle to keep up with advances in consumer electronics. Aircraft owners expect the technology that they enjoy in their homes and offices to be available in the air. Some of the technologies that are currently the focus for development for IFE suppliers include expanded wireless connectivity, ultra-high-definition (UHD) curved screens and wearables.

UHD is a term that embraces two new digital video formats – 4K and 8K. A couple of monitor suppliers are now advertising products compatible with the 4K format, which provides around four times the 1080 pixel resolution of an HD screen.

**Resolution solutions** One such supplier is Custom Control Concepts (CCC), which displayed a 65in 4K touchscreen at NBAA 2014. This screen uses optical imaging infrared radiation (IR) technology to ensure it senses touch precisely. CCC envisages this being an advantage in inflight meetings, where users can edit a presentation by drawing on the screen. The screen also features 3D modes and Dual-View, which enables two videos to be viewed on one screen with specialized glasses.

The touchscreen is part of the latest generation of CCC's IFE package, which is being developed to have a 4K backbone. The package also includes a Blu-ray player, native (uncompressed) 4K content streaming over fiber optics and upgraded audio. The company

1. Custom Control Concepts' 65in 4K touchscreen





1





2

2. TrueNorth Avionics recently launched Optelity Valet Handheld, a touchscreen device for controlling the cabin, accessing the internet and making voice calls
3. Flight Display Systems' 4K display

sees this IFE product line as being ideal for the BBJ 787.

Flight Display Systems is also promoting 4K video displays as an upgrade to its JetJukebox wireless hub. Its current prototypes measure 23.8in and 39in. The company says the 39in version can display 1.07 billion colors with a resolution of 3840 x 2160 pixels. Flight Display Systems believes 4K displays are likely to make their aircraft debut in special-mission applications.

**Ahead of the curve** A further step on from 4K screens would be the curved 4K display, currently being promoted by terrestrial equipment giants Sony, Samsung and LG. The response of business jet suppliers to this technology is mixed. Those who like



4





# THERE WILL BE 10 BILLION SMART DEVICES GLOBALLY BY 2016

## Wearable technology

International Data Corporation forecasts that shipments of wearable technology worldwide will total more than 19 million units by the end of 2014, and the market is expected to top 110 million by 2018. Several IFE companies are now working on bringing this technology into business jet cabins.

For example, Flight Display Systems unveiled its prototype wristwatch-styled cabin controller at NBAA 2014. The company described the device – which contains a processor with built-in wi-fi capabilities – as an extension of its wireless CMS strategy. Combined with the company's JetJukebox, it can be used to view flight data such as speed, altitude and estimated time of arrival. Depending on the CMS, it could be used to control IFE.

"No one knows exactly how wearables can best benefit the aviation industry yet, so we are exploring a lot of technologies in this area and will be ready to provide our customers with the best options," says David Gray, president at Flight Display Systems.

Meanwhile, Honeywell has developed an app for the Google Glass, which is worn as a pair of glasses. The app enables control over Honeywell's Ovation Select CMS via voice commands. "As people get used to wearable technology at the retail level, they're going to be demanding it on the aircraft," says Justin Dye, product manager at Honeywell.

There are also applications for wearable technology in the cockpit, as Garmin has demonstrated with its D2 Pilot Watch. This comes with a high-sensitivity WAAS GPS receiver, altimeter with an adjustable barometer setting, and three-axis compass. It gives quick access to data such as current GPS ground speed, GPS track, distance from waypoints/airports, estimated time en route, bearing, and even glide ratio.



5



6

the technology argue that the curve of the screen is similar to the curve of the human eyeball, so that the viewer's peripheral vision is used, giving a greater feeling of involvement. They also say there is a sense of greater sharpness at the edges of the screen and greater depth.

Those on the other side of the argument contend that the viewer may have to have a choice position to appreciate the advantages fully, and that they may be more likely to notice on-screen reflections.

The question is whether there will be sufficient demand from customers to entice business aviation suppliers to absorb the costs of adapting the technology to the aircraft cabin and obtaining aviation authority approvals.

**Personal devices** One undoubted demand is for passengers to be able to use their PEDs as part of the IFE and CMS experience. Jack Jacobs, vice president of marketing and product management at Honeywell, sees the PED as "leading the aircraft cabin of the future". He estimates that there will be 10 billion smart devices globally by 2016, but only 7.3 billion people.

Wireless connectivity solutions are used not only to provide internet access on passengers' laptops, tablets and smartphones in the air, but also to enable their PEDs to be used as cabin controllers, and for media content to be shared between PEDs and screens installed in the cabin.

For example, Lufthansa Technik's nice HD CMS and IFE package offers

4. A new cross-browser app on Lufthansa Technik's nice IFE system provides remote control functionalities and wireless playback on mobile devices
5. A prototype wearable CMS controller from Flight Display Systems
6. The D2 Pilot Watch by Garmin
7. Flight Display Systems' JetJukebox wireless hub

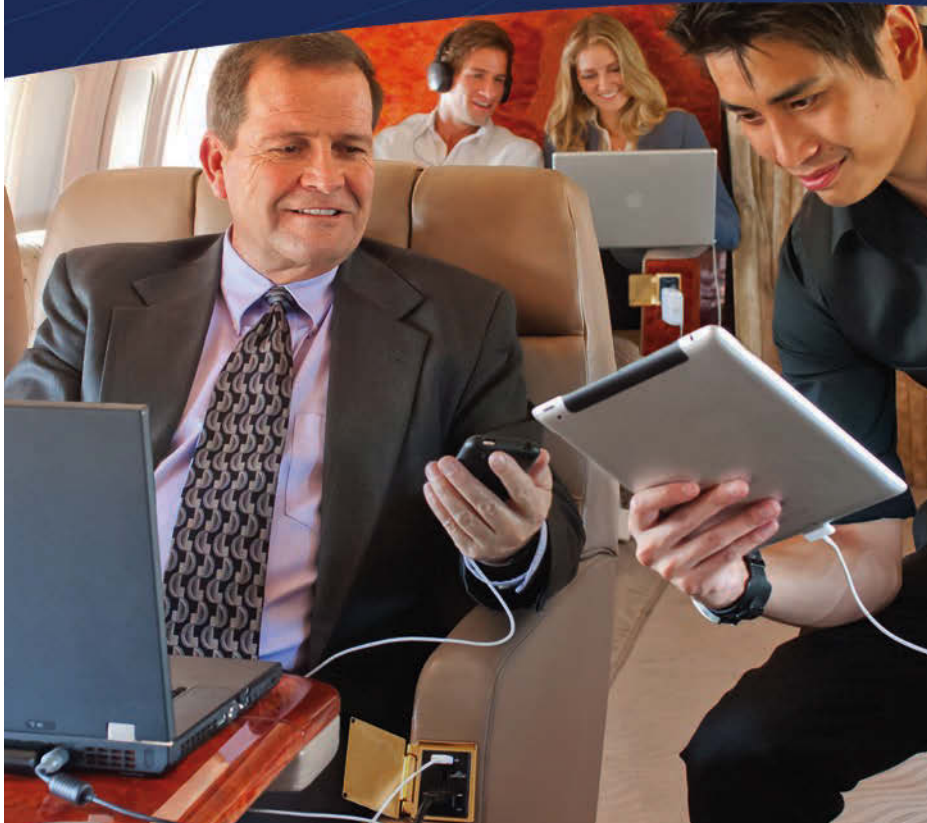
AVOD, Bluetooth integration and PED control of the cabin. It also enables HD content to be streamed legally in the cabin from the IFE system to PEDs – through an "absolutely secure" digital rights management (DRM) solution. Furthermore, the nice HD system has an encoded HDMI interface, which



7

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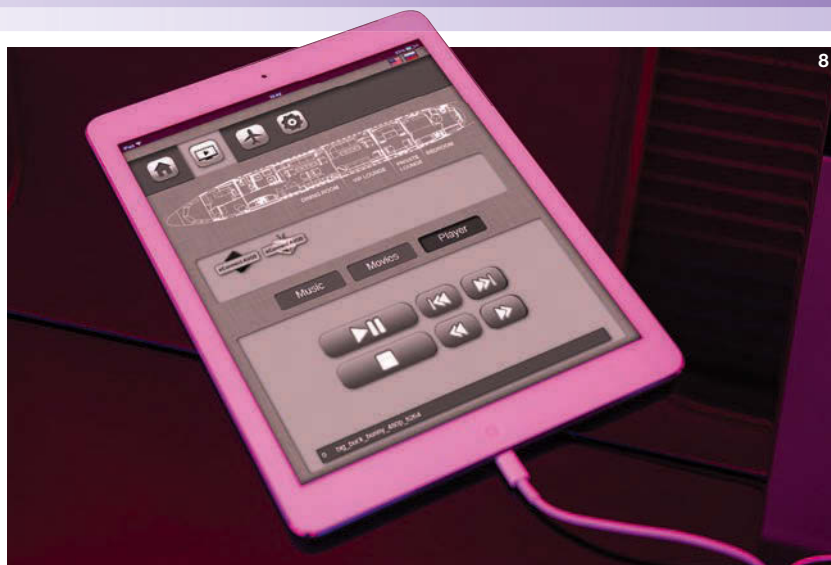
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8

## Large libraries

Despite passengers bringing their own content on board, AVOD continues to be popular. SkyTheater recently introduced SkyPlex, a movie library that is in essence a digital cabin entertainment 'mega-server'. It is also 4K capable, says SkyTheater's Gregg Launer, and it allows users to download DVDs, Blu-rays and CDs directly into the system.

Meanwhile, Esoteric has introduced its SkyPad system as a response to what it describes as "the inevitable obsolescence of CDs and DVDs". SkyPad video facilitates streaming services such as Netflix and Amazon video-on-demand for use with Ku-band and eventually, Ka-band. It also offers a large library of classic movie content from non-US studios, as well as TV series and non-English productions.

# DLNA TECHNOLOGY IS A CONDUIT MECHANISM FOR CONTENT SHARING

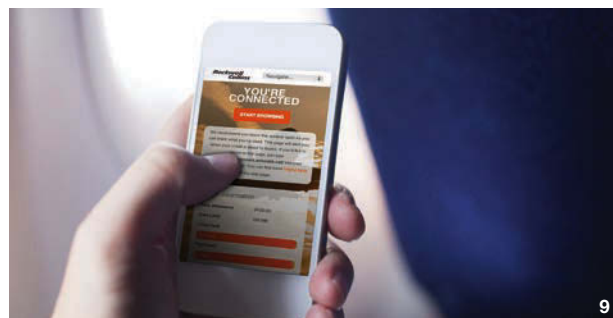
enables PEDs to push content to networked embedded system displays via numerous consumer technologies, including Miracast and AirPlay.

DRM technology is designed to protect copyrighted digital content from illegal copying and sharing. It places the content's usage control in the domain of the IFE/CMS system. It is needed for all streaming in the cabin – not only that involving a PED.

Rockwell Collins' Skybox enables legal streaming of digitally protected

movies and TV shows in both directions – from PEDs to a cabin display, and from the system's Apple iTunes library to PEDs.

**Early-window content** PGA Electronic has developed a full IP CMS and AVOD IFE system based on Ethernet architecture. The system offers early-window content that is approved by major studios, as well as games and wireless connectivity. Content can be streamed to PGA's own range of



9

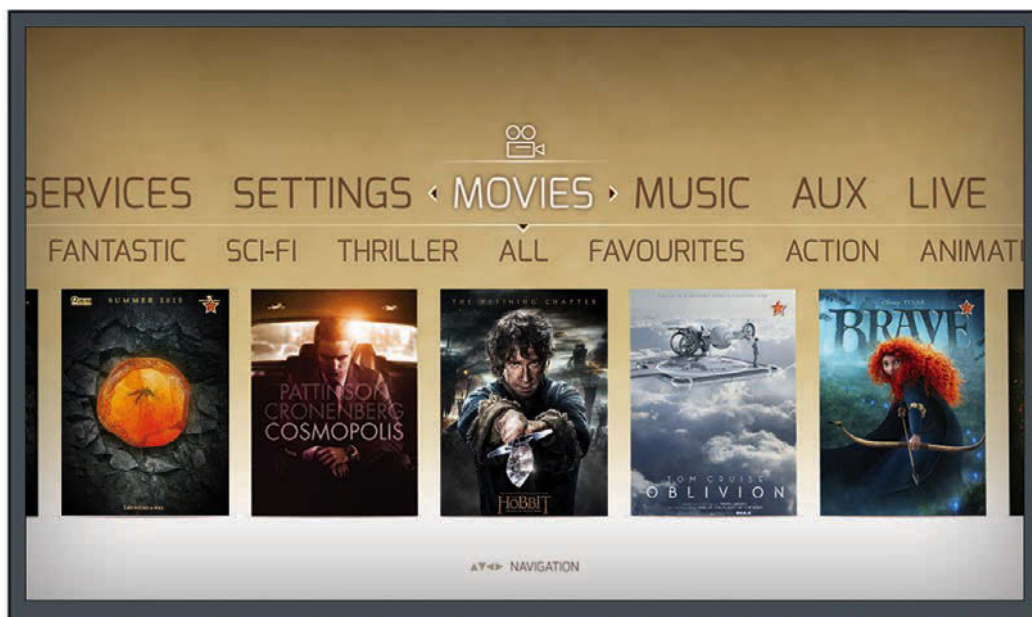
8. Emtec's Wireless IFE by eConnect
9. ARINC CabinConnect, Rockwell Collins' connectivity platform
10. PGA's Smart Cabin Player GUI
11. A media server from UTC

monitors, and also to and from PEDs. The CMS also integrates with PEDs, enabling their use as remote controls for lighting, doors, power management and IFE equipment.

Likewise, UTC Aerospace Systems' SVRH-100-x media server enables photos, music and HD 1080 pixel movies to be streamed to monitors and to and from (Android and Apple) PEDs. "Our server supports DLNA technology, which is a conduit mechanism for content sharing between the IFE/CMS system and smart devices," says Marcus Garrett, sales manager, cabin electronic systems at UTC Aerospace Systems.

**Partnership approach** Honeywell's solution to the DRM challenge is

10



11



## Data rates

As IFE technology increasingly relies on high-speed internet connectivity, there is a growing emphasis on data transfer rates.

The quest for increased bandwidth recently led to a partnership between Ruag Aviation, Satcom1 and Emteq. Together they are now offering an aftermarket add-on connectivity solution for the Dassault Falcon 7X that they say offers 432kbps data streaming, as well as enhanced wireless IFE abilities.

Features include AVOD, a virtual private network, user profile management, and “seamless” inflight use of PEDs. Ruag will provide installation of the necessary hardware and subsequent aviation authority approvals at the same time as the aircraft is in for maintenance or a cabin upgrade.

Meanwhile, ViaSat recently announced an expansion of its Exede In The Air to include business and private aviation. The service, claims ViaSat, offers even better performance (higher capacity) than the current ViaSat Yonder package. The company says flight tests have shown multiple devices can use high-bandwidth applications at the same time.

# IT'S NOT AN EMPTY SERVER WITH A 'BRING YOUR OWN' APPROACH; CONTENT IS STORED ON A SERVER AND STREAMED TO PEDs

a partnership with airline content management company IFP and inflight software development company DTI, which are owned by Advanced Inflight Alliance. IFP/DTI software is licensed to acquire and distribute studio content, and the partnership extends this permission to Honeywell's customers. This enables passengers to watch early-window content on PEDs via wireless streaming, with digital rights protection.



Similarly, Heads Up Technologies has announced an audio and video agreement with Red Touch Media, which runs a digital media content management platform. The agreement gives Heads Up's customers access to Red Touch Media's library of digital content through Heads Up's fiber optic Lumin CMS and wireless media server. “Our customers are used to selecting and streaming exceptional content to their personal smartphones and tablets at home – and now they have that capability while in their aircraft,” says Robert Harshaw, president and CEO of Heads Up Technologies. “Best of all, it is certified and in service already.”

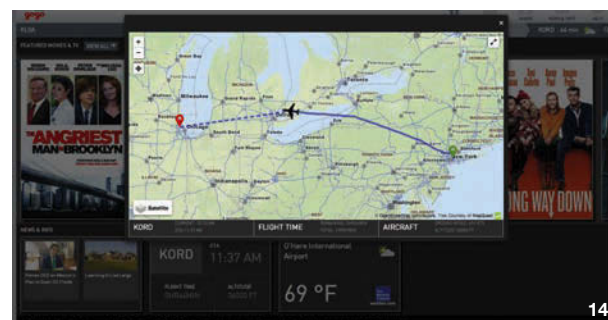
Emteq's eConnect is another system to enable control of cabin systems, including IFE, plus the ability to stream videos and other entertainment content to PEDs wirelessly.

Flight Display Systems' JetStreamer is a bit different in that it is an entry-

12. ViaSat now offers its Exede In The Air service to business aviation customers
13. Innovative Advantage's Streaming Media Player
14. Gogo Business Aviation has added moving maps to its Gogo Vision on-demand IFE service

level IFE system designed to stream movies, music and other content to PEDs without an internet connection. The technology makes use of a separate wi-fi router, which creates a local area network within the cabin. This enables wireless streaming of content, including the company's moving map, to as many as eight passengers.

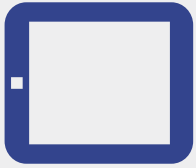
Moving maps also now play a part in Gogo Business Aviation's Gogo Vision on-demand IFE service – which also offers a library of movies and TV episodes along with news and weather information. “Gogo Vision stands out as it's not an empty server with a ‘bring your own content’ approach,” says John Wade, executive vice president and general manager at Gogo Business Aviation. “Content is stored on an onboard server and streamed to PEDs. Customers also have the option of automatic content updates at select Signature Flight Support FBOs.” **END**





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# goconfigure

The latest green BBJ to be completed by Comlux America has an extremely flexible interior with two quick-change compartments

It might not have been the first green BBJ design and completion project for Comlux America, but the company says this was one of its most complex to date. This is because the cabin has two compartments that can be changed in terms of layout – so the aircraft has four possible configurations.

1. This BBJ was completed by Comlux America in July 2014

This was not stipulated in the initial brief, but evolved as the best possible solution to the client's need for flexibility to offer different charter operations. "We had a client with a need they couldn't quite put their finger on, but we helped them get there before and after contract," explains Scott Meyer, chief operating officer at Comlux America. "If it's a long-range VIP flight on which passengers are likely to want to sleep, you can change one or two of the areas to be more supportive of sleeping arrangements. Or you can have a mixture, with a corporate meeting venue in one part of the cabin, and other areas for resting. The original design offered two possible configurations – all for sleeping or all for corporate use – and that didn't give the client the options they needed. We needed to be able to give them four configurations."

In one configuration, the main compartment at the front of the aircraft has five seats – two on the side, plus a principal seat with two forward-facing pod seats in front of it. In the second configuration, the two forward-facing pod seats are swapped for aft-facing VIP doubles and a table is

2. Iacobucci HF Aerospace made all the seats on the BBJ
3. The main cabin, which can be adapted to include more or less seating



3



4



added. The compartment that follows can be either an office or a bedroom.

**Quick smart** A key part of the brief was to ensure configuration changes could be achieved quickly between aircraft missions. Meyer admits this was challenging on a narrow-body aircraft. "In Boeing 747s and other wide-body aircraft, modular elements are common because those aircraft have big doors and plenty of room for loading," he says. "But in narrow-body aircraft, the extra work required to enable the modular elements to be loaded adds costs that typically scare clients away. For this project, we needed to ensure the seats could pass through the BBJ 737's narrow passages. So pod seats,

bulkheads and monuments that would need to be removed in the field to enable a conversion, were designed to be capable of breaking down into smaller sub-components, so that they could be loaded and removed easily, connected, checked and made ready for a mission in less than three days."

Of course, modular elements are nothing new. "There are VIP aircraft where you can replace the bed with a table, and others where the bedroom changes into an office, or the lounge converts into sleeping quarters," says Meyer. "The concept is not new, but what is unusual about this aircraft is that there are two options each for two of the rooms, which can be mixed and matched to produce four floorplans.

4. Maple and anigre veneers were implemented using various techniques
5. Care was taken to enable seats to be loaded and unloaded through the BBJ's passageways

## COMPLETION TIMELINE

### January 2012

Design and completion contract signed

### February-April 2012

Design review conducted

### April 2013

Green aircraft inducted at Comlux America

### July 2014

Aircraft redelivery



**Q&A:** Lucio Iacobucci,  
president and CEO, Iacobucci HF Aerospace



How did you secure the seat contract for this aircraft?

Our seat structures perfectly matched the customer's needs in terms of quality, flexibility and reliability. We were mainly chosen for our attention to detail, our ability to deliver tailor-made solutions, and the passion we put into the work. Although Iacobucci HF

Aerospace only entered the seating market with its first prototype in 2010, the company has swiftly gained recognition as a reference point for sophisticated business jet seat design. Ours is a solid family business, with more than 40 years of experience, fueled by passion, and able to face the most challenging needs of an increasingly demanding market.

What was the brief?

The brief was very clear and demanding. The end customer was looking for state-of-the-art customized VIP seats for a very exclusive corporate aircraft. Three of our seat families provided the starting point for this project – double and single powered models with privacy shells, a crew seat and a Super Lounge Seat with an adjustable partition/surround.

How have your seats been customized for this project?

The degree of customization requested for this program was very challenging. We created new designs for the three seat families, used top-end aviation materials and buyer-furnished equipment. In addition, our engineering team performed many tests and worked with pressure mapping to investigate various foam densities and cushion forms, to achieve best-in-class comfort in all positions from upright to fully flat. The seats are tailored to the point that in some cases the same seat model has been configured with different cushion foam densities and leg rest lengths in different parts of the cabin.

To provide flexible and smooth articulation, the seats are equipped with five actuators that work independently of each other. The seats are also equipped with IFE equipment, switch control panels, in-arm tables and in-arm monitors, cup holders, reading lights, life vest compartments, USB ports, PCU and audio jacks, and more.

Which details are you most pleased with?

Details such as nickel-plate finishing, veneer inserts and automotive-inspired stitching contribute to creating a luxurious and exclusive flying experience. Details are our passion.



5

## WE NEEDED TO ENSURE THE SEATS COULD PASS THROUGH THE BBJ 737'S PASSAGES

I haven't seen a single-aisle aircraft completed with this level of modularity – I think it's a first."

**Complex program** The completion took longer than is typical. The contract was signed in January 2012 and the green aircraft was delivered to Comlux America's facility (in Indianapolis, Indiana, USA) in April 2013. The completed jet was presented in July 2014. "The long lead time was because new seats were developed for the project, which was a whole mini-program in itself," says Meyer.

The seats were supplied by Italian firm Iacobucci HF Aerospace. It was



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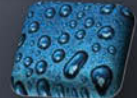
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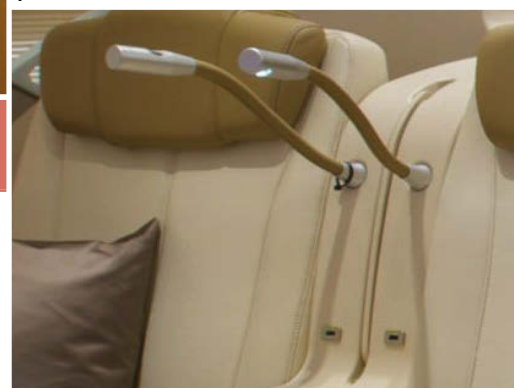


# ALL OF THE SEATS PASSED THE 16G SLED TEST AT THE FIRST ATTEMPT



6

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the company's second seat contract, having delivered seats to Altitude Aerospace Interiors in November 2013.

"The seats developed for our BBJ completion project were pretty much ground-up designs," Meyer explains. "Some of the mechanisms for the seat pouch and pan were reused, but we devised five new unique part numbers – double and single pod seats, a super pod seat and double and single VIP seats – all of which had never been delivered before. They were new designs, but all of the seats passed the 16g sled test at the first attempt. It was a remarkable achievement for the supplier and justified the risk we took in going down that route."

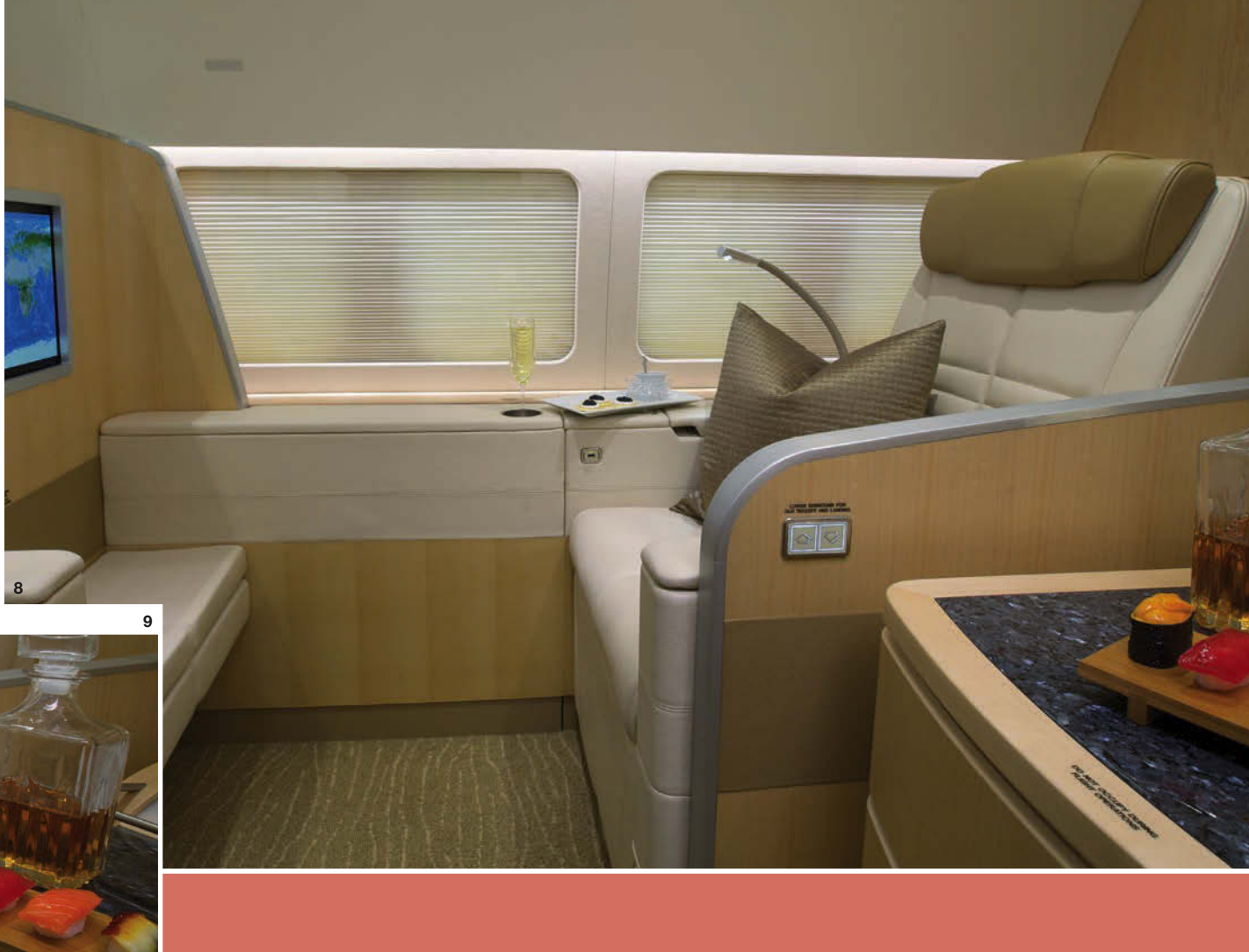
In terms of fit and finish, the brief for the aircraft was "luxury corporate",

6. This space can be either an office or a bedroom

7. Seat equipment includes reading lights, cup holders, IFE equipment, control panels, tables, life vest compartments, USB ports, PCU and audio jacks and more

according to Natalie Lin, a designer at Comlux America. "The aircraft is intended primarily for corporate use, but the client wanted it to be top end," she explains. The client is a charter operator based in Asia. "There were definitely elements of the client's cultural and corporate background that we needed to leverage," says Meyer. "For example, the color of the wood veneer is unique. I haven't completed any other aircraft like it. The interior is very bright, but sensitive to what appeals to this particular Asian VIP."

- 8. A neutral color palette was used to prevent the design dating quickly
- 9. The bar monument, which incorporates a humidifier



### The winning formula

Comlux America won this green BBJ contract after a competitive tender involving many companies. Scott Meyer, chief operating officer at Comlux America, believes a technical proposal that included calculations for range, sound and other aspects was key. "This kind of analysis is typically reserved for critical design reviews, post-contract, but we were ready and willing to be transparent," he says. "I think that convinced the client we were the right center to give a VIP experience and pay attention to the details at the front end."

Meyer believes that Comlux America's position – as the completion center arm of a global group that also has extensive experience as a business jet charter operator – also played in its favor. "We empathize with the end user's needs because we're an end user too," he says. "We operate a very large VIP fleet so we get a lot of feedback from charter clients, flight crews and owners for whom we operate aircraft. We understand operators' challenges because we're in their shoes."

The company also markets itself as a boutique service. "If you're going to spend US\$50-60m on an aircraft and a further US\$30m on a cabin, you really want a personal service," says Meyer. "You need to be engaged at senior management level, not just by sales and technical people, and before the contract is signed as well as after. It should be a long-term relationship that continues after the aircraft enters service. We limit ourselves to three or four ACJ and BBJ aircraft a year, depending on associated work scope, so we can ensure a true-to-business-model boutique experience."

## THE CLIENT WAS HEAVILY INVOLVED IN HOW THE VENEERS MATCHED UP

The main veneer used is maple, complemented by accents of anigre, an African hardwood. Lin says the client was particularly interested in how the veneers would work together. "The client was heavily involved in how the veneers matched up," she says. "That was definitely a new and interesting experience for us."

A couple of application techniques were used for the veneer – including book matching, whereby the veneer is sliced horizontally and opened up like a book for symmetry; and slip-matching, whereby sheets are cut from the top and then laid in a row with the same side facing upward. "So the same wood species look different in different areas," says Lin.

**Gastronomic display** Another unusual installation in this cabin is the bar/cabinet monument. The top of the unit is designed to offer a display space for

food. It is finished in an extremely thin real granite veneer and has a retainer bar. Moreover, there is additional storage inside. However, Lin believes the most unusual aspect of this monument is that it integrates a humidifier. Lin says this was a very important feature for the client, perhaps because they fly to and from areas of high humidity. Comlux America's engineers worked very closely with the client to get it right.

Overall, the end result achieved by Comlux is a combination of nice details, crisp lighting and a non-controversial color palette of beiges and creams. "The design had to have longevity," says Lin. "The client didn't want colors that are trendy or popular right now, but might look dated in 10 years." After all, the aircraft's flexible configuration should enable it to cater for a wide variety of exacting customers for a long time to come. **END**



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# comfortable position

RCO Aerospace Products offers various ways of personalizing seats in terms of comfort – ranging from pouring foam to shape, to the geometric replication of favorite chairs

1. A seat cushion created from pouring foam into a mold
2. Robostand is used to map the geometry of existing seats, so they can be replicated

RCO Engineering and RCO Aerospace Products have been involved in the transportation seating business for more than 40 years. RCO is involved at all stages of the seat development cycle – from the design and engineering of concepts, to the production and testing of complete seat systems.

In 2008, RCO was awarded the seat contract for the Gulfstream G650 aircraft. This was followed up recently by contracts for Gulfstream's new G500 and G600 platforms. "The seats used in these aircraft are unlike anything else available," says Norm Starr, general manager at RCO Aerospace Products. RCO worked closely with Gulfstream to develop a unique seat to meet the very high expectations of this market segment.

"It is very difficult for a seat to be comfortable for all intended uses," comments Starr. "There is a demand for a seat to be an office seat for meetings, a dining seat, a lounge seat and even a flat surface for sleeping."

An additional challenge is the fact that comfort is very subjective. "Cushion contours and firmness determine comfort, but ultimately, comfort can only be defined by the individual – one size does not fit all," says Starr.

To address these challenges, RCO's latest seats incorporate a cushion support system that the company says can be changed easily, even in flight, to accommodate the varying firmnesses desired by different travelers. "This flexible system is being certified for all ranges of firmness and shape to the latest 16g requirements," says Starr.

Other capabilities that RCO offers the business jet seat market are the use of

composites and poured-to-shape cushions.

"Composite parts can be used for cosmetic panels and even for structural components," explains Starr. "The advantages of using composites are that they can be formed quickly into complex shapes, reducing the amount of post-processing associated with other commonly used materials. They also offer weight savings."

Starr says that foam cushions are typically built up by adding multiple layers of various foams. RCO can machine contours into the foam, utilizing its CNC mills, to provide bolsters and body support. "This is a feature more commonly used for comfortable automotive seats," says Starr. "The use of CNC mills means the contours are consistent and can be achieved rapidly."

For applications where seat shapes are not altered from aircraft to aircraft, such as fleet orders, RCO has developed a foam formulation that can be poured to the precise shape desired, eliminating the need to shape the seat foam manually.

For individuals who desire a very specific seat shape, perhaps to match a favorite car or household seat, RCO employs Robostand. This equipment maps the shape and firmness of an existing seat. "The data can then be used to replicate the seat for use on an aircraft, providing the passenger with an identical comfort experience," says Starr.



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The immersive IMAX experience is being translated on to a 150m superyacht



Yacht Intelligence, a supplier of custom audiovisual and control systems for superyachts, is collaborating with Ken Freivokh Design, Genesis Technologies and IMAX Corporation to create the first IMAX private theater on a 150m superyacht.

The Nemo Room would not only be used to watch blockbusters, but would also project live underwater CCTV images from outside the yacht onto the walls of the theater. It is anticipated that the theater could also be used for Blu-ray, streaming live content, gaming and video conferencing. The client will enter the theater via sliding walls instead of doors, thus creating a seamless surround screen and completing the IMAX immersive effect.

Several specialist pieces of equipment have to be incorporated to create the IMAX experience, including an image enhancer that enables real-time adjustments; a dual 4K projection system; and a microphone system that collects data from each channel in the speaker system and performs daily tuning calibrations. Other challenges include securing sufficient bandwidth to enable IMAX movies (which can be up to 60Gb) to be downloaded in a practical timeframe.

### OTHER EYE-CATCHING DESIGNS FROM VARIOUS INDUSTRIES...



Eurostar teamed up with Pininfarina to create its new e320 train, which includes this buffet car.



Thales and B/E Aerospace, with design partner BMW Group DesignworksUSA, have created a business-class seat designed to offer an immersive experience.



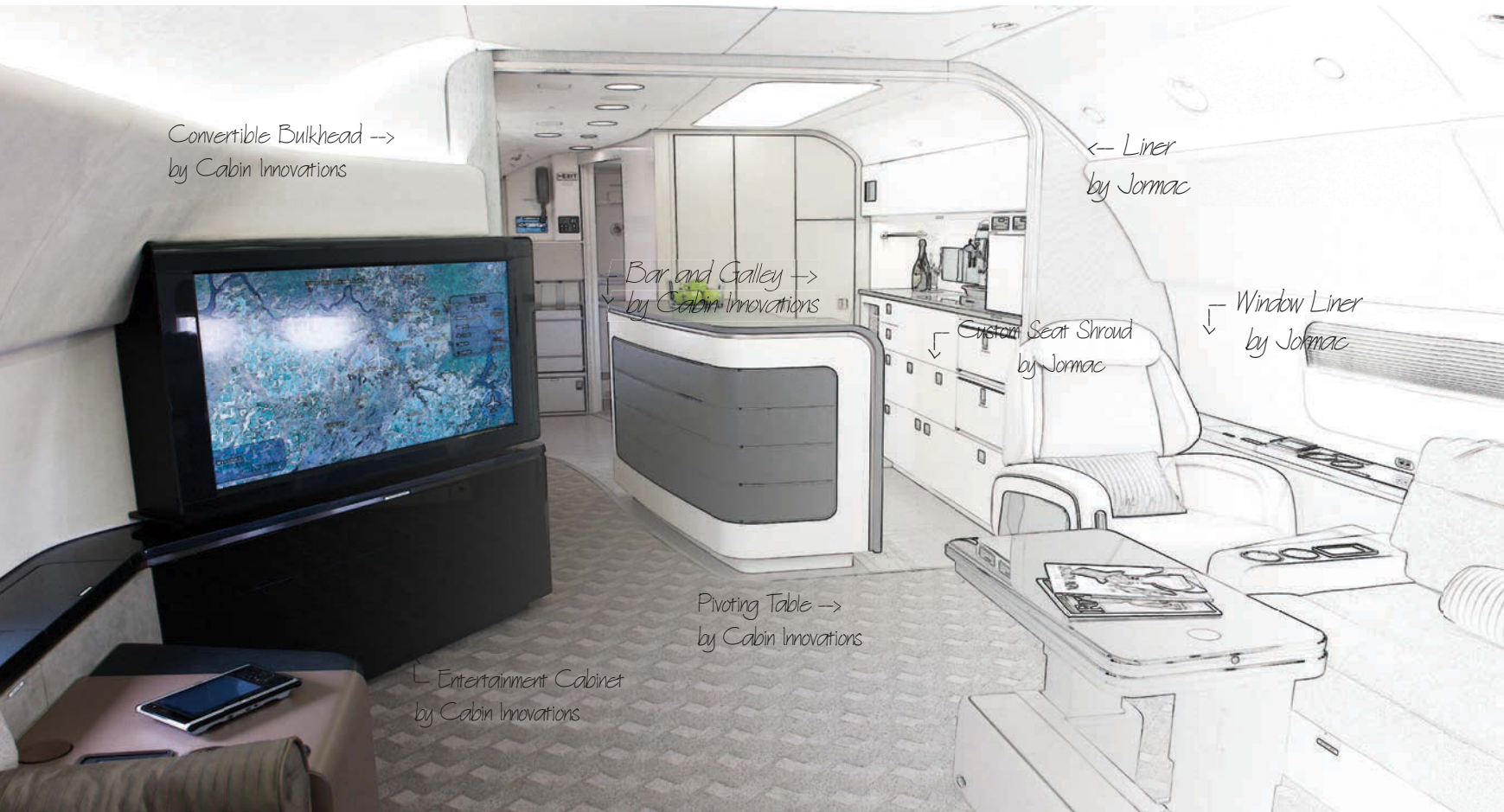
With designer Kinney Chan of KCA Associates, Plaza Premium Lounge Management has redesigned its 4,500ft<sup>2</sup> Al Reem lounge at Abu Dhabi International Airport, UAE.



Lexani Motorcars' Andalucia coach, a Mercedes-Benz Sprinter conversion. It comes with two sofas that can be transformed into a full-size bed. There are many customization options.



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