

THE FIRST VIP BBJ
787 DESIGN AND
COMPLETION TOOK
SEVEN YEARS OF
HARD WORK TO
OVERCOME
CHALLENGES
RELATING TO DATA,
ELECTRIC SYSTEMS
AND THE CARBON-
FIBER FUSELAGE

Words by Izzy Kington

pioneer spirit



The overall cabin area is 2,415ft²

LEFT: THE TEAM AIMED FOR ORGANIC, SMOOTH, ROUNDED AND FLOWING AESTHETICS, SOFT COLORS AND TACTILE SURFACES TO PRODUCE A STATE OF CALM

IFE AND CMS

All the seats have power and USB outlets, plus an inductive charging station for tablets. These 7in tablets control the CMS and IFE. "When you sit down, the tablet will show the aircraft's layout and you select your seat," says Stephen Vella of KAM. "Then you can stream music wirelessly to the wireless headphones at that seat, and you can stream videos to the tablet or the screen in front of you."

The aircraft also has a GSM phone pico network so passengers and crew can use their own cell phones to make and receive calls.

with Boeing to make sure that we would not cause interference with the existing electrical systems."

"Engineering faced a few challenges in developing the 787 interior, especially with regard to the electrical system," says Bruce Kay, vice president of engineering at Greenpoint. "Our engineers conducted extensive research to learn the unique features inherent in making changes to this complex aircraft. Examples of areas posing the most challenge were integration with the power distribution system, ensuring that the current return requirements were properly addressed, defining system logic, wire routing, termination, and shielding for the thousands of wire bundles installed for the VIP interior and systems."

Greenpoint spent many hours in collaboration with its team of FAA designees to determine the correct methodology for design and substantiation of these systems. "The engineering team worked closely with interior design, fabrication and installation teams to validate the system functions requested by our client and dictated by FAA requirements," says Kay.

NO FIXED ABODE

The 787 also diverges from the norm with its fuselage, which consists of five barrels, each made from carbon fiber woven by a robot and then baked. "Each barrel has structural reinforcement inside, in most cases also made out of carbon fiber and bonded to the barrel," says Vella. Boeing insets a metallic mesh into the carbon fiber to conduct electricity. "Structural pieces are bonded together, and some are reinforced to take structural members that translate the load of the airliner equipment, including galleys, overhead baggage racks, etc," says Vella.

parts built by a multitude of subcontractors, which are then integrated by Boeing; it's a fundamentally different method of building an aircraft," says Vella. "When we started the project, Boeing hadn't finished the outfitters data package. There were a lot of obstacles to us accessing the information we needed."

The parties also had to work on a specification for the BBJ 787 type. "There were an awful lot of meetings where we had to develop what parts of the 787 specification would be used for the BBJ, and that took a long while," comments Vella.

ELECTRIC DREAMS

Then there are the 787's electrical systems. "The electrical complexity of this aircraft – which is almost all-electric – is challenging for cabin outfitters," says Vella. "We added kilometers of additional wiring for the wi-fi, CMS, lighting, sensors, the GSM system, etc. There was a lot of fundamental stuff to design that wasn't in the airliner specification. Every time we did this, we had to interface

The aircraft accommodates 40 passengers and seven cabin crew



MAIN: THE MAIN LOUNGE, LOOKING TOWARD THE AFT

ABOVE, FROM LEFT TO RIGHT: JACQUES PIERREJEAN, THE CABIN CO-DESIGNER; TOM CHATFIELD, THE TECHNICAL MANAGER; STEPHEN VELLA, CEO OF KAM, THE PROJECT MANAGER; AND STEPHAN THEIS AND HAMID SAYYAR, INSPECTORS

has taken longer because the wait for the Boeing 787 is longer and we also had to develop the BBJ 787 specification with Boeing, as it didn't exist previously," he says. It was a long road that required close cooperation between KAM, Boeing, Pierrejean Design Studio (the cabin co-designer) and Greenpoint Technologies (the completion center). Greenpoint launched a major corporate initiative in 2013 focusing on the 787 type, having recognized that these completions would be very different. The company worked with Boeing early on to gain the knowledge and information needed to win the contract with KAM.

BIG DATA

Vella says the first big challenge was obtaining data on the structure and electrical architecture. "Everything has an intellectual property stamp on it, because there are many

All the way back in 2009, a brave investor decided to buy a Boeing 787 and turn it into a VIP jet – something that had never been done before – then sell it on to someone seeking to fly 40 passengers non-stop anywhere in the world, in style.

The investor turned to Kestrel Aviation Management (KAM) to provide turnkey management of the project from airframe manufacture to entry into service. The company has similarly managed 10 other wide-body and 10 narrow-body aircraft – all Airbus and Boeing types – as well as Bombardier and Gulfstream jets. Stephen Vella, CEO at KAM, also has a lot of airline experience, and has been involved with the Boeing 787 program since its inception in 2004. This experience of the airframe and its systems proved vital on the complex seven-year project.

Vella says Airbus and Boeing projects can take two and a half years or more – including at least a year's lead time for the airframe to be built, during which time the design and engineering is finalized, and then a year and a half of installation and certification work. "This project

THROUGH THE ROOF

Stephen Vella of KAM is proud of the spacious feel in the cabin, and in particular the ceiling. "The 787 has very little wasted space for electrical cabling and ducting in the ceiling," he says. "We've exploited that even more by pushing the ceiling as far up and out as we can. From the floor up the sidewall panel and into the ceiling, it's totally bespoke. It's in various pieces, but to the eye it is one piece."

The cabin ceiling integrates a lot of equipment – oxygen boxes, speakers, decompression slats and lighting. "There's a lot of complexity in the design and yet, as a passenger, all you see is a homogeneous ceiling with no breaks, other than the porthole-like downlighting," says Vella. "The lighting involved a lot of work to avoid generating shadows."



"These load-bearing members are only in specific areas of the aircraft, and we need to use them to distribute the load of the VIP elements we're installing. You can't drill holes or rivet things together, so we had to adapt the structural hard points to the monuments."

Greenpoint created a patent-pending floor attachment system for seats, monuments and bulkheads. The monuments are attached to pallets that are themselves attached to the seat rails. Sidewall and ceiling panels are attached to a structural grid that is fixed to the airliner's hard points.

Annika Svore Wicklund, design director at Greenpoint, says that after the chief initial challenges of decompression and floor structure attachment, other challenges surfaced, including perfecting stitching details for leather panels and removing hardwood banding on cabinetry.

WHAT'S ON BOARD?

The deckplan is the intellectual property of the original owner. Passengers enter the aircraft at Door 2, into a rotunda with wooden floors and leather-bound walls. From here, they can enter the master suite or take a right down a 'wavy' corridor into the main lounge.

The master suite is at the front of the cabin and includes a bedroom, bathroom and large dressing room. "This aircraft can

fly for nearly 18 hours, so it is essential to provide a lot of space for clothes, shoes, bags and other sartorial accessories," says Vella. "Heads of state may also need to change from western to traditional dress."

This is the first aircraft KAM has worked on for an undefined end-user. "We had to develop a cabin that would be of interest to people of various cultures," says Vella. "It had to appeal primarily to the two major markets for large corporate aircraft – the Middle East and Asia."

CULTURAL SENSITIVITY

The master bathroom has a double-sized shower, his and her wash basins, a toilet, and is finished with lots of marble. The bathroom, bedroom and dressing room can be segregated with sliding doors, bearing in mind possible cultural preferences for men and women not to change in sight of each other.

The main lounge has two sections, the forward-most of which features a 55in screen and a translating, electrically actuated day-bed that opens into two divans. "In both Middle Eastern and Asian culture, there is a tendency to sit cross-legged with your friends or spouse, so we wanted an area where this could be done in a cozy manner," says Vella.

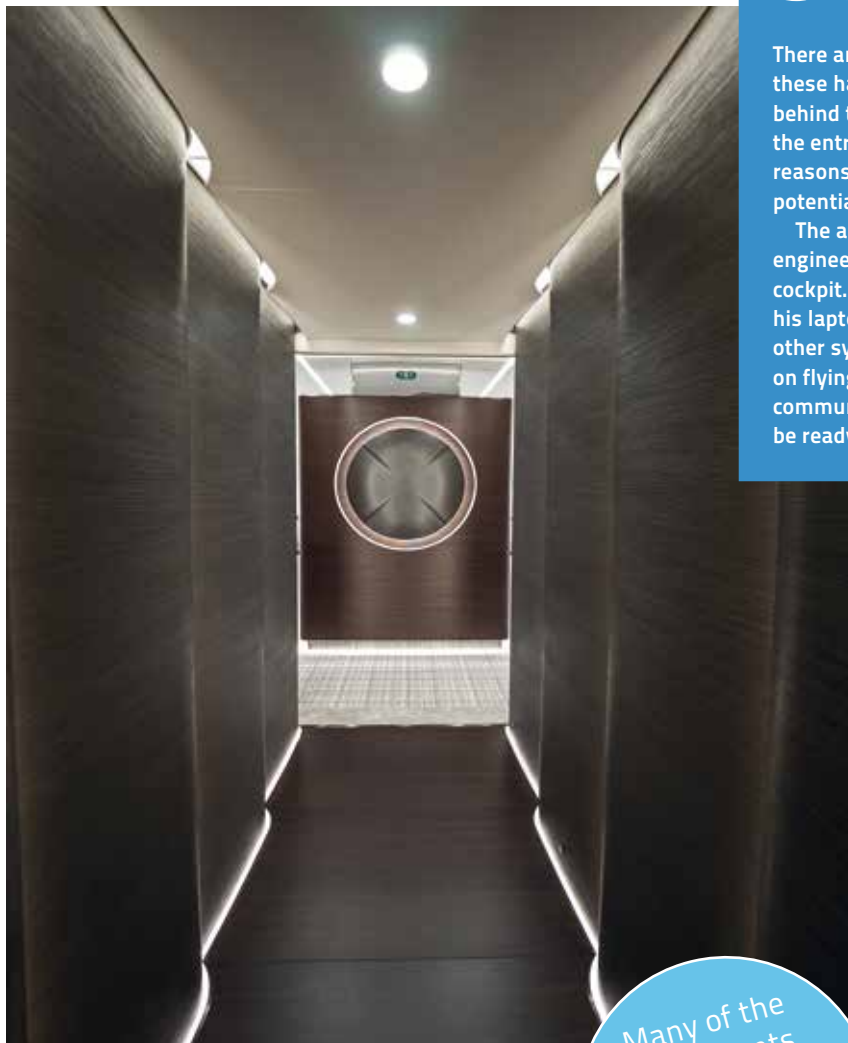
On each side of the cabin there are two single berthable seats that can either face forward or be moved into club-two position. The two credenzas

BELOW: THE AIRCRAFT FEATURES TWO VIP BATHROOMS



This BBJ 787 has a range of 8,500 nautical miles with 40 passengers and reserves

BELOW: AT THE ENTRANCE TO THE MAIN LOUNGE IS A MONUMENT REMINISCENT OF AN ASIAN GONG OR MIDDLE EASTERN SHIELD



in the middle of the cabin sport a finish that looks like metal. "They're actually made from a composite sprayed with a proprietary metallic coating by Metal Composites," says Vella. "There are a lot of metal-effect objects in this aircraft that are done in the same way, because it makes them incredibly light."

FINE DINING

The rear of the lounge features two four-place divans and four individual seats. There is an electrical table that raises and extends from a low coffee table into a full dining table for six, with one side unencumbered by seats, easing service.

After the lounge is a circular monument that houses a VIP rest room. Around it there is a self-service

STAFF ROOM

There are pilot and crew rest cabins on board. Stephen Vella says these had to be positioned carefully – the pilot rest immediately behind the cockpit, and the crew rest tucked away to the right of the entrance – and 'solid' rather than curtained off, for acoustic reasons. "The 787 has a bowing overhead crest, so there was the potential to create noise in the master suite," he explains.

The aircraft is crewed by two pilots, six cabin staff and an engineer. The latter is catered for with a single rest behind the cockpit. "This aircraft is very complex, so this engineer is on his laptop during the flight, making sure that all the cabin and other systems are functioning, so the pilots can concentrate on flying," says Vella. "If any parts need to be replaced, he can communicate through the satcom to the ground and the part will be ready at the destination."

refreshment and buffet area, with a refrigerator and coffee maker, plus wardrobe space. Next is the guest cabin, which has 18 lie-flat seats adapted from Zodiac Aerospace's Aura model. Kestrel brought in automotive stalwart Dräxlmaier to change the upholstery, and asked Zodiac to replace some plastic components with metal pieces. There is also one row of premium economy seats, for nannies, security guards and other staff, separated from the guest cabin by closets. Behind that is a standard galley fitted with B/E Aerospace's Essence inserts. There is another galley at the front of the aircraft.

SHARED EXPERTISE

Vella says the key to success was collaboration. "The reason we chose Pierrejean is that they have great artistic talent but they're not arrogant – they recognize what they don't know about technology and we recognize what we don't know about design; it's a true partnership," he explains. "Some other designers out there produce wonderful concepts that are totally out of touch with the reality of the 787. For example, the floor has different load-bearing strength from front to back, so there are areas that are actually quite delicate. Only by working with someone that knows the 787 can the designer steer away from those areas."

So is everybody happy with the outcome? For Greenpoint, this program was an integral part of the 787 learning process, and lessons from it are already being put to use on its second 787 completion.

Vella says the mammoth project was a little stressful, "but what I'm proud of is, we're all still friends". As for the original investor? Vella says the investment proved to be "not a bad deal".

Many of the monuments integrate floor-level lighting to give a floating effect