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Getting the green light to install Greenpoint's Aeroloft on the BBJ 747-8 required close coordination between the supplier, installer, integrator and regulators

The new BBJ 747-8 is a giant. It can carry 100 passengers 8,820 nautical miles non-stop in a 4,786ft² cabin at a cruising speed of 492kts. All these impressive stats have a price to match: US\$330m for one of the green goliaths. If you add a head-of-state cabin interior with opulent finishes, secure communications and anti-missile countermeasures, the price easily reaches US\$500-600m. BBJ 747-8 customers can also add another feature if they need still more sleeping space for their entourage – Greenpoint Technologies' Aeroloft.

Aeroloft incorporates a cabin attendant station, lounge, bunks, wardrobe and a changing room for the principal's staff. On paper, installing it looked like an easy exercise. It is designed to slot in front of the in-ceiling crew rest module, ahead of door five, adding another 393ft² of usable room.

The modular Aeroloft system is constructed from honeycomb panels that are bonded with aluminium edge reinforcements using commercial aircraft manufacturing techniques. It uses new structural attachments to fix it to the airframe.

The Aeroloft contains eight curtained-off lie-flat bunks connected by a 20in-wide aisle. Each of these bunks has its own storage shelf, passenger control unit, drop-down oxygen, light, gasper, no smoking and fasten seatbelt signs, mirror and coat hook. It is a nice-looking and comfortable space that for the first installation generated much paperwork and took considerable coordination between Greenpoint, EASA, Boeing,

1. Greenpoint's Aeroloft installation for the BBJ 747-8



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- 2. Greenpoint's design team created the AeroLoft concept
- 3. AeroLoft's amenities include a wardrobe and changing room



the customer's completion centre and certification organisation, SWS Certification Services. In other words, multiple layers of company protocol and myriad considerations had to be negotiated – not least among them, the need to safeguard proprietary data.

Dramatis personae The AeroLoft was designed by Greenpoint, based near Seattle, Washington, USA, and won its

first order in 2010. At this point SWS, based in Bristol, UK, was charged with obtaining an EASA STC for the design and installation and therefore had to coordinate the certification effort. Greenpoint subsidiary Greenpoint Products and Services (GPS) was tasked with the procurement and manufacture of the AeroLoft's parts, and assembling the kit. The green BBJ 747-8 airframe was built by Boeing in Everett, Washington, then flown to Greenpoint's subcontracted installation facility, Boeing in Wichita, Kansas, USA. There Boeing had to install and test the AeroLoft, and SWS and Greenpoint had to complete the initial phase one certification process, resulting in the EASA STC.

The aircraft then had to obtain a Certificate of Airworthiness from the country of registry (which required Phase I STC approval of the AeroLoft

installation) and fly to the customer's designated completion centre, in Europe. This transfer was completed in August 2012. There the aircraft is now being completed under a separate STC.

Once the customer's completion centre has finished installing the main cabin, it will re-establish electrical, smoke detection, communication, oxygen and ECS connections to the AeroLoft. The AeroLoft has to be fully integrated with all the aircraft's systems and certified for inflight occupancy with final STC approval.

International cooperation The transatlantic nature of the project added a further layer of complexity to the task of certification. "When we first started this in 2010 there was no bilateral agreement between EASA and the FAA," says Nigel Smith, managing director at SWS. "So it was purely an

Lift off

Another option on the BBJ 747-8 is a lift. Greenpoint Technologies and L-3 have both designed lifts for the BBJ 747-8, although no orders have been announced. Greenpoint's AeroLift would transport up to four passengers (or one passenger in a wheelchair and their attendant) from the ground to the main deck.

Meanwhile L-3 says its lift can be used between the ground and the main deck for boarding, and between the cargo deck and the main deck in flight.



AeroLoft orders

Greenpoint Technologies has delivered three BBJ 747-8 AeroLoft kits and has announced orders for two more. Although the first three installations were performed at Boeing's facility in Wichita, Kansas, the latest customer has chosen to install the AeroLoft at another – undisclosed – facility.

Greenpoint Products and Services plans to deliver the fourth BBJ 747-8 AeroLoft kit in May 2013. The company recently boosted its offering by acquiring a five-axis CNC router and expanding its in-house engineering.

4. Greenpoint's AeroLoft features eight bunks

EASA STC. We weren't in a position to work easily with the US companies with assistance from the FAA at that time. So the biggest challenge for us was to coordinate with EASA, Greenpoint, Boeing and the operator to work out how to get the parts manufactured, conformed and delivered to Boeing in Wichita for installation. All of this activity had to happen while complying with the regulatory requirements and ensuring manufacturing conformity and configuration control, in order to gain final approval. Boeing and Greenpoint worked wherever possible within their existing FAA procedures."

There was need for diplomacy in this dance. "With our EASA Part 21 Design Organization Approval we have certain procedures, but we didn't want to disrupt Greenpoint's or Boeing's working procedures too much," Smith comments. "So part of our task was the harmonisation of all three organisations' procedures and processes and making sure the end result was EASA compliant. Boeing is an EASA Part 145 maintenance organisation and has to comply with its procedures. So in the beginning we had

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to establish and coordinate the conformity process and get it approved by EASA."

An EASA/FAA bilateral agreement came into force about halfway through the programme, creating additional challenges for GPS in securing the near-completed EASA Production Organisation Approval. Product conformity was the biggest issue in this, because under the bilateral agreement GPS was required to utilise an FAA Request for Conformity process that had yet to be used with regard to EASA STCs.

The AeroLoft was the first STC on the BBJ 747-8 and was subject to special regulatory conditions because of its unique design and application, as well as being subject to the bilateral agreement. This was also the first installation for Boeing under its EASA Part 145 approval. EASA imposed

additional requirements concerning the size of the blowout aperture and the effects of AeroLoft on the local aircraft structure. Other details of analysis, data and rationale were restricted to EASA and Boeing to protect the latter's proprietary information.

Proprietary data "Decompression was substantiated by Greenpoint and SWS analysis and testing," Smith says. "We then submitted our analysis to Boeing for approval. Eventually, everything was agreed between Boeing and EASA. Because of the issue of protection of proprietary data, we had to get Boeing and EASA working together directly and then wait for the outcome."

The STC was applied for under EASA CS-25 and the AeroLoft programme had to wait for the issuance of the aircraft's type certificates from EASA and the FAA. The BBJ 747-8 was



NUMBER CRUNCHING

8 green BBJ 747-8s were delivered by Boeing Business Jets to completion centres in 2012

6 completion centres are known to have secured BBJ 747-8 cabin completion contracts – AMAC Aerospace, Associated Air Center, Greenpoint Technologies, Jet Aviation Basel, L-3 and Lufthansa Technik

2 completion centres have confirmed two BBJ 747-8 contracts each – L-3 and Lufthansa Technik

18-24 months is Boeing Business Jets' estimate for a BBJ 747-8 cabin completion

subject to change revisions, all of which had to be reviewed and considered by SWS and Greenpoint to demonstrate compliance with the airworthiness requirements. There were no direct FAA regulatory requirements for AeroLoft because it was an EASA STC, except indirectly through the involvement of Boeing experts and their type certificate requirements and company procedures.

Safety briefing The STC came with special terms and conditions for use of the AeroLoft. It is restricted to inflight use only – as with lavatories and cabin crew rest compartments – and passengers can occupy it only when a member of the cabin crew is present. The crew must conduct a separate briefing on emergency procedures and equipment for passengers staying in sleeping compartments.

“It’s a safety requirement,” explains Smith. “Passengers who occupy the AeroLoft have a separate safety briefing. Greenpoint and SWS have developed an amended crew manual supplement and an amendment to the aircraft flight

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5. Nigel Smith, MD and head of design (left) and Phil Williams, director and head of aircraft electrical systems (right) at SWS

manual to advise the crew that there has to be a separate briefing for AeroLoft users; that is one of the reasons we have a small cabin attendant station up there.”

In emergencies the AeroLoft can be accessed or vacated through the adjacent crew rest lounge. However, under normal operations it is accessed via its own staircase. “There’s plenty of room up there, you can easily stand up straight,” says Smith.

The AeroLoft received its EASA STC in August 2012. Smith says that the FAA could be involved with subsequent installations. “Generally what the FAA would do is validate the compliance data, as it is an EASA STC. We would initially make an application to EASA, which sets everything up and

starts the validation process and any other FAA requests. If they have questions they come back to EASA or us. If they have any compliance issues, this is addressed regulator to regulator, as EASA has already approved it. Once they are satisfied they will issue the FAA STC.”

Although the aircraft is still in completion (it is due to enter service in 2014), for Greenpoint, SWS and the rest of the team that worked together in Seattle, Wichita and Europe, the hardest part is over. “An installation as unique as AeroLoft has not been done before,” Smith concludes. **END**

Web www.boeing.com;
www.greenpnt.com;
www.swscertification.com