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AMAC AEROSPACE

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A meeting of minds

IFPL and Cobalt Aerospace walk down the aisle together

Food for thought

Halal food: A recipe for success

Pure and Simple

Ideas for a confident and safe return to travel

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AMAC has the capabilities to build the cabin in-house from start to finish. Photo: AMAC

Nuts and bolts

After months of meetings, planning and looking at swatches, the time has come to start building the cabin. The green ACJ/BBJ has been accepted by the owner and is now about to arrive at a completion centre. Michael Doran continues our business aircraft educational series.

One of the world's leading completion centres is AMAC Aerospace, which utilises a team of more than 90 design engineers and 250 production people to take private jets, like the B737/747/777 and A319/320/350, all the way from design to some very happy new owners.

Inflight spoke with AMAC Chief Operating Officer Bernd Schramm to find out how that process works and how they transform a drawing into a masterpiece of form, fit and function.

He starts by explaining that the biggest challenges in building the cabin are not from intricate designs or unusual client requests but are simply "weight and time."

"The maximum range can only be reached with the minimum weight of the cabin but often designers do not consider in their design that weight is of the essence," he tells *Inflight*. "So the biggest challenge is to work in a team with the designer, the customers and with the expertise of our people to produce an interior with the minimum weight.

"We have been doing this for thirteen years, so in terms of technologies, layout and designs, we can do everything, and there are not many challenges on the technical side. Of course, you sometimes have new, interesting designs, indirect lighting or special features which require R&D work, but the main challenges are weight and delivering the aircraft in time or ahead of time."

Once the cabin specification is agreed and the reviews completed, the design is translated into engineering documents, and before the aircraft arrives, the process of building all of the components begins. Keeping track of all the moving parts is an art in itself, and Schramm points out there are always checkpoints and milestones where there is a review, often involving the designer, from start to finish.

"These projects are all prototypes, so you can never have a 100% defined project in the beginning because there are always elements that need to be verified, rechecked and addressed during the project," he explains. "I mean, at the end, it's a little bit like building a house – no floor plan is the same as another."

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>
> **Bernd Schramm, Chief Operating Officer, AMAC**

ALL CABINS GREAT AND SMALL

While AMAC does completions for many types of private jets, it is renowned for its cabins on larger aircraft, including the A350 and B787, where the use of composite materials by the OEMs requires a different approach in completion. Given the proprietary nature of these materials, the OEMs limit the amount of information they will disclose, and Schramm says this means the OEM is involved in some aspects of the completion project.

"The OEM puts an interface structure in the aircraft for proprietary data reasons and we do not get all the information needed to install against the carbon parts of the aircraft attachment, so this is done by the OEM or assisted by them. The techniques are a little different due to the materials, and there are also some limitations in what you can do and install.

"With carbon composite materials, the technique is different but it is something that is part of our capability, so we can work with these materials, drill holes and attach them," he points out. "The main difference is the limited availability of data and that's why we have to work with the OEMs in the beginning of a project."

In the quest for lighter components, AMAC has teamed up with sister company JCB Aero in France to develop lightweight honeycomb panels produced using 3D printing technology. Schramm says AMAC was an early adopter of 3D printing and that it's an excellent tool for producing prototypes and one-off pieces of furniture.

"It is something that is used more and more for small parts that used to be metallic but now with 3D printing we can use other lightweight materials that keep the cabin weight down," he says. "The material needed for the part is minimised because we can design and form any parts we like with the 3D printer."

AMAC is an EASA-approved design organisation with a team of verification engineers supported by 'spot-checks' and reviews by EASA. "There is trust in us from EASA, and once the ground and flight testing is completed and all the EASA requirements have been met, we send them the declaration of compliance."

From the completion managers perspective, Camber Aviation CEO Tom Chatfield says the process begins with a series of conferences that culminate with a final sign off when the design is frozen.

While the work is now in the hands of the completion centre (CC), Camber is heavily

AMAC workshops are outfitted with state-of-the-art upholstery capacity, among other proficiencies. Photo: AMAC

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Quick change artistry

Fitting out a new 787 is one thing, but what about when an owner wants their business jet's interior to look new again and be ready in as little as six to eight weeks while the aircraft is in for maintenance?

This is the speciality of AeroVisto, which partners with owners and MROs to take tired and dated seats, carpets, monuments and furniture from the aircraft to transform them using innovative techniques at its facility outside of Zurich.

"We have the full capability of surface modification for business jets in-house, including design, upholstery, stitching, wall panels, veneers, carpet replacement and all monuments," says Carsten Matthiesen, Executive Director Commercial. "The MRO does the maintenance and we take care of the interior modification from start to finish."

Innovation starts at the design and material selection stage, where AeroVisto has a mobile showroom containing samples of materials that it takes to the customer, often right by the aircraft to be refurbished.

"We invented a mobile showroom which we drive through Europe to the customers so they can see all our technologies and materials, take them on their aircraft and make a good selection," Hermann Bauer, Executive Director Operations, tells Inflight.

When the aircraft arrives at the MRO, the interior is removed and taken to AeroVisto, which does an assessment for the customer of what can be refurbished or needs to be replaced.

Two areas where AeroVisto employs novel approaches that save time and money are with wood veneers and leather replacement and conditioning. Bauer explains the typical approach with veneers was to sand them and apply new coatings, a laborious and prohibitively expensive task. To overcome this, he developed a solution using film and ceramic coating to refurbish veneers, spending more than a year perfecting it for use in business jets.

"We have a special method of preparation, and then we put the film on and apply the heat-resistant ceramic coating, which makes the part more durable," he says. "If you notice a scratch on part of the interior, you just change the film, and it's perfect again."

Seating and upholstery are a key part of most refurbishments, and AeroVisto has capabilities in replacing seat foams, stitching and leathers, including re-colouring and repairing existing coverings.

What sets AeroVisto apart is the partnership it has formed with Stahl to use its proprietary Stay Clean lifetime+ technology, which protects the surface from staining. "The trend is to have interiors with contrasts and bright leathers so, with Stay Clean, owners can choose even white seats without worrying about staining," says Matthiesen.

"We are always looking for new solutions that have never been done before, so when the customer goes into the aircraft, they love it and this is our passion," adds Bauer.

The Stahl Stay Clean lifetime+ technology protects even light coloured seats from staining. Photo: AeroVisto

involved with their staff onsite throughout the process. "Most of the time we have a meeting with the CC team every morning to see what is happening, and we're looking for the fit and the finish to identify any issues early on and collaboratively figure out a solution," he tells *Inflight*.

"As things get installed in the airplane, we go step by step through that so we can catch things early, rather than coming into the airplane when it's finished." As components arrive at the CC, Camber do a 'first article inspection' where, for example, the first seat to arrive is extensively scrutinised, thereby setting the acceptance standard for those that follow.

"That's important because basically you tear it apart and say 'this is great work but this and this has to be done better' and then the upholstery shop will redo it," explains Chatfield. "You can end up finding things you never thought about in the specification and we work collaboratively to make it work perfectly.

"Once we've got our first articles done, the work is being done and we're inspecting them before they go on to the airplane. And once everything is in the airplane, we start doing the testing, the ground testing and systems testing and all the measurements that have to be made."

GOES TO ELEVEN

As part of the testing process, Chatfield nominates the cabin acoustic level and the cold soak test as being two of the most critical. The acoustic test entails a third-party measuring the sound levels during a flight at specified altitude and power settings, where they go from room to room doing the readings.

The cold soak test involves taking the aircraft up to a prescribed altitude and flown to its maximum endurance to test that all the systems, such as water, toilets, showers and heating continue to work.

"That gives time for everything to get really cold. On a widebody, we don't turn on the shower until the tenth hour of flight and we start by flushing the toilets every few hours, then give it a break and do it again when it's really cold."

MSB designs, manufactures and tests inserts, tables and other customised products with a focus on business aircraft interiors,

BUSINESS AVIATION: PRIVATE JET OWNERSHIP

> "At MSB we do end-to-end, so we can be with the customer from engineering, stressing, manufacturing and qualification to supporting the installation of the product at the customer's facility."
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> **Mario Sévigny, Co-founder and VP, MSB**

operating from two locations in Canada and two in the US.

Respecting the design intent of the interior is the key goal for Co-founder and VP Mario Sévigny which can make his task of faithfully producing what the designer has conceived a very challenging process.

"They think outside the box and create amazing things, but we have to manage the manufacturability also because sometimes it's beautiful but will cost a lot," he tells *Inflight*. "So we come up with new ideas or changes that will be easier to certify and manufacture but still be very similar and sometimes this is the toughest part."

A key part of producing furniture for a cabin is ensuring it will continue to function perfectly for years after installation, and MSB has some interesting ways of ensuring its products achieve that.

This stress testing can involve things like a pull-out table specified to withstand 20,000 open-close cycles or 9G forces pulling on it and a drawer latch working for a minimum 100,000 cycles.

"We use a special latch and the OEM's requirement is we need to cycle the latch 100,000 times, so we have developed a kind of robot to do that automatically, because it doesn't make sense to have someone do that manually," he explains. "So when we develop a new product or mechanism, we plan ahead how we are going to evaluate and certify it from the start."

While he sees many applications for 3D printing in cabin interiors, Sévigny believes the industry is reluctant to embrace it, possibly because of certification issues. "The 3D printing is there and it's perfect for the low volumes we are into but, from my point of view, we are not using it enough, and I think we need to change that mindset."

MSB manufactures cabinets using composite materials, and while their light weight is an advantage, it comes at a higher cost. Also, depending on the aircraft configuration, there are differing flammability requirements that dictate the type of composite materials that can be used.

THE TOTAL PACKAGE

MSB sends products to the OEM or completion centre in either their finished form or as kits to meet customer's requirements. "It depends on the customer, and sometimes we are asked to send a green cabinet and they do the finishing and the installation so that the component will have the same finish to exactly match other pieces.

"Other times they might ask for a kit and we send a team to the facility to support the manufacturing and installation on the airplane," Sévigny says. "We have a local team at Bombardier and at Gulfstream we've sent some designers and assemblers to support installations.

"At MSB we do end-to-end, so we can be with the customer from engineering, stressing, manufacturing and qualification to supporting the installation of the product at the customer's facility. We have all those competencies in-house to serve our customers." ■

MSB stress tests its tables for more 20,000 open-close cycles and forces of 9G. Photo: MSB