

# printready?

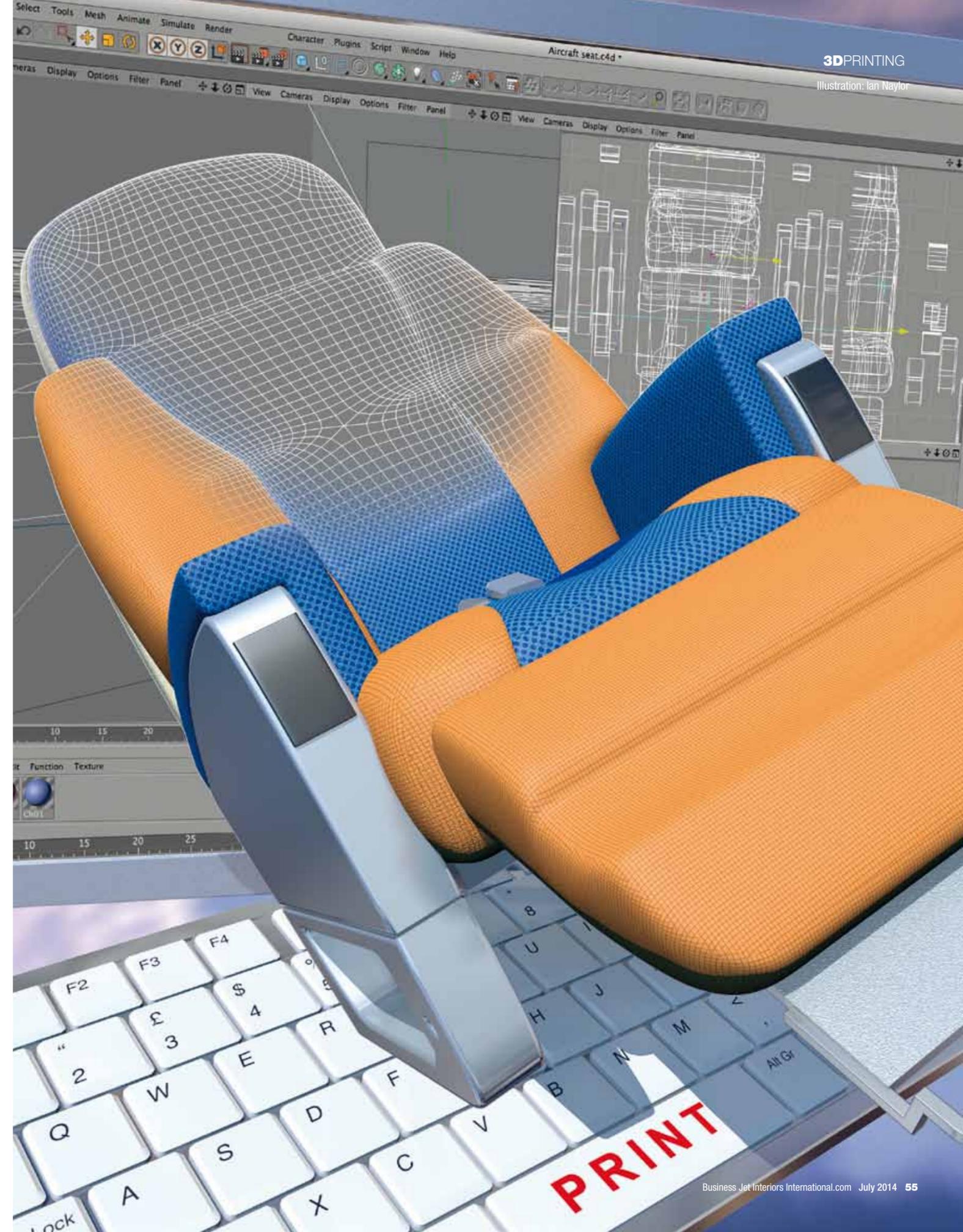
Although 3D printing isn't yet established as a way of making final parts for VIP interiors, some within the industry are already finding it useful for rapid prototyping and cabin visualization

Over the past decade, 3D printing – also known as additive manufacturing – has become a more useful tool, as the price of printers has decreased and the quality and versatility of their output has increased. The technology has not yet taken off for producing final parts in the business jet interiors industry, but many designers and completion centers use it for client visualization and rapid prototyping.

"We've been using 3D printing for 18 months and plan to continue," says Jason Dennis, director of interior completions at Flying Colours Corps' facility in St. Louis, Missouri, USA. "We've found it really helpful. So far we've used it for prototyping and R&D, but we're now in the process

of evaluating our existing engineering to see if and how 3D printing can fit into some of our traditional processes and perhaps replace some."

Flying Colours Corp has found the technique useful for reducing the amount of money, material and time spent on producing prototypes. "Instead of asking a machine shop to produce a prototype component and having to wait maybe 10 days, with 3D printing you can take the concept from the designer's or engineer's screen and send it directly to print," says Dennis. "The turnaround time can be very quick – recently I was quoted two hours for a part. It's useful for the more intricate pieces where you really want to see how they'll fit and you want more stakeholders to get involved and buy into the concept."





1. Aeria's 3D-printed BBJ model

## WE CAN GO STRAIGHT FROM CREATIVITY TO REALITY IN HOURS INSTEAD OF WEEKS



In essence, Flying Colours Corp is using 3D printing as a rapid and less expensive way of proving engineering solutions. “We can physically have the part and put it in the application it’s going to be used in, to validate and verify that the design concept and plan will work,” says Dennis.

**Breaking the mold** 3D printing can even save time and money when prototypes and parts need to be made in other materials, because it can be used to make molds. “Some parts made from resin or similar materials require an expensive mold,” says Dennis. “With 3D printing we save on curing time and the expense of creating the mold.”

And if the part proves unsuitable, instead of being left with a useless but expensive mold and having to start creating a new one from scratch, the completion center can revise a digital file on screen, potentially enabling the revised mold to be reprinted in a couple of hours.

Trev Ellis, head of design at Marshall Aviation Services’ site in Broughton, Cheshire, UK, cites similar cost and efficiency incentives for using 3D printing. The facility, acquired from Hawker Beechcraft in August 2013, has been using 3D printing (through an external supplier) for rapid prototyping for around five years, supporting cabin refurbishment and completion work.

**Creative freedom** Aeria Luxury Interiors, an ACJ and BBJ completion and refurbishment specialist based in San Antonio, Texas, USA, is another facility sold on the idea and has invested in an in-house 3D printer. “It would be hard to list everything you can do with this technology. We constantly find new ways to use it,” says Timothy O’Hara, manager of design at Aeria. “Imagine not being limited to conventional ways of building, eliminating tooling, long lead times and the endless number of technical drawings. We can go straight from creativity to reality in a matter of hours instead of weeks.”

O’Hara says the main barriers to wider implementation at the moment are surface quality and the size of parts that can be produced. “While you can have your part in hours instead of weeks, some of the parts take additional time to be production-ready,” he explains. “Another limitation is size – some splicing may be required to reach the intended size of the piece.”

Still, he believes the benefits greatly outweigh the drawbacks. “This is the future of production,” says O’Hara. “I think larger printers are in our future, and also printers with multiple heads that can lay down wiring while building a part so that the part is prewired. Being a designer, this is one of the very best tools in the box – whatever you can imagine you can

### Aeria prints a BBJ

At EBACE 2014, Aeria Luxury Interiors unveiled a 1:5 scale model of a BBJ that was produced in-house using Aeria’s 3D printer. Located in San Antonio, Texas, USA, Aeria specializes in the completion and refurbishment of ACJs and BBJs.

The model includes a lounge and dining room, complete with 1080i digital screens, RGB lighting and custom carpet. “I think this is a great way to be able to visualize what an interior arrangement is going to look like,” says Ron Soret, Aeria’s vice president and general manager of completions. “We will be using models similar to this for future presentations to our clients. This service ensures that the form, fit and function of the cabin is defined before a single component is purchased or fabricated.”

Everything included in the printed model was created digitally by Aeria’s design team using SolidWorks. “Using SolidWorks improves efficiency when design turns the project over to engineering, thus speeding up the production process,” says Soret. “Digital manufacturing offers many incentives, such as more customizable products at no additional cost and a quicker turnaround time.”

To complete the model, some of the interior pieces were hand painted, while others were finished with wood veneer, metal or leather. The valance and ceiling panels were covered with leather, while the deco panels and bulk heads were wrapped in fabric. In addition, the lamps and chandeliers were connected to the RGB control system. Using wi-fi emitters, the CMS can link up to a tablet device enabling users to modify the color temperature of the lighting, and adjust dimming to meet their preferences, just like in an actual VIP interior. Custom Control Concepts provided an iPad interface that controls the RGB lighting and IFE in the model.

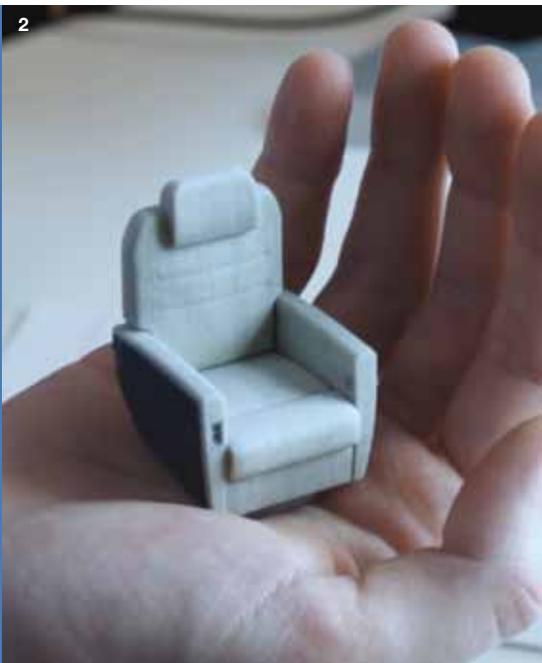
### Helping clients visualize cabins

Advanced Computer Art (ACA) is now offering 3D printed models, or 'doll's houses', to complement the 3D renderings it produces. "Renderings are useful for providing a photorealistic impression of the interior, but customers often lose their orientation, struggling to understand the viewing direction, if a room is located fore or aft, or which room is behind a closed door," says Tobias Melangré, CEO and owner of ACA. "By producing small scale models of the interior furniture, stowage units, etc, we can illustrate discussions while the needs of the customer are defined."

Melangré says 3D models are used to associate the views shown in the renderings with the layout. He contends they are a much better aid to understanding than 2D layouts. ACA also uses an iPad app loaded with its renderings and a digital 3D layout. The app allows the viewer to jump into rooms and

view them in panorama mode. Melangré says that the app is a fine complement to a touchable 3D print. The app provides better esthetic quality, and the 3D printed model shows every viewing angle.

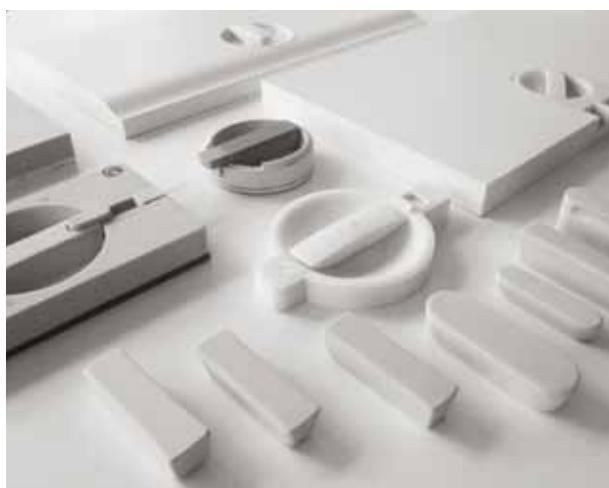
A 3D printed model of the cabin interior is therefore very desirable, but quality of surface finish has been a concern. "ACA is confident that progress in the 3D printing sector will lead to greater, affordable quality," Melangré comments. "We tested a color 3D printer and the quality of affordable 3D prints was acceptable, but not for the VIP sector. We concluded that 3D printing is a good starting point to ensure that the geometry of an interior is correct, but the enhancement of surface properties is crucial before a 3D-printed model could be used beyond this stage. We continue to test printing methods that could be useful for our designers."



print. Soon the only limitation will be your imagination."

**Fire wall** As well as surface finish, Ellis says that 3D printing is currently not used for final components because the plastics used are not suitable for installation in aircraft – there are flammability and toxic fume considerations. "These problems will be overcome very soon, and printed components will be made from appropriate materials with a finish to suit," he says. "The price of 3D printers is coming down and the materials employed for printing are becoming more usable, while finishes are improving all the time."

Meanwhile, 3D printing technology continues to develop rapidly. "Today the primary problems are the size of the print, the materials used and the finish, but the advantage is the speed with which you can hold the actual object in your hands, rather than relying



- 2. A 3D printed seat created by ACA
- 3. Galley latch prototypes made by Teague using 3D printing
- 4. Teague demonstrates the technology's ability to create 3D geometries

on a model on the screen," says Ellis. "Once the flammability, finish and size issues have been resolved, Marshall could start printing interior parts such as window panels and other pieces."

**Designers and suppliers** It isn't only completion centers that are using the technology. "We 3D print all manner of things," says Sarah Matheny, marketing director at design company Teague. "It's a huge part of our business with respect to prototyping and validation. We also do a lot of 3D printing as part of Teague labs, the exploratory side of our business."



**Ship shape**

It may be some time before we see 3D-printed seats installed as final parts in the business jet industry, but they've already been used in its sister sector. Wetzels Brown Partners (WBP), which designs interiors for yachts, aircraft and private residences, created 3D-printed dining chairs for a yacht called Chrisco in 2009.

"We were looking for something unique, high-performing, practical and very light," says Rob Wetzels, one of the founding partners of WBP. "We used a type of 3D printing called SLS after seeing a fruit bowl that had the very organic and beautiful structure we were looking for. We wondered whether we could make a chair using the same technique."

The project was developed in conjunction with Freedom of Creation, a design and research company specializing in 3D printing technologies. Additional suppliers were brought in for the white leather upholstery and white gloss paint finish.

The chair has a steel base that enables it to swivel and is pinned to the deck while the yacht is under way. The whole structure weighs about 18kg. "The latticework construction that provides the chair's integral strength and visual appeal recalls structures found in nature that would be impossible to reproduce using any other manufacturing method," says Wetzels. "These chairs are the largest single objects that could be manufactured on these machines in 2009."



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Some suppliers are also getting in on the act. "We use 3D printing for both production and prototype units," says Austin Campbell, marketing communications manager at Custom Control Concepts (CCC). "Our capabilities range from simple and small parts to more complex 3D fabrications." Campbell argues that compared with machined aluminum, 3D printing offers weight, performance and strength advantages.

CCC also offers 3D-printed mock-ups of components to customers to assist with fit checks as the interior is readied for installation, the aim being to reduce program and installation risk. "Given our production and prototype capabilities, we are able to support customer requests and changes in a timely fashion," says Campbell. He would like to see more aerospace-grade materials, and color and surface options in the future.

**Spare change** In the more distant future, 3D printing technology could revolutionize how spare parts are distributed. Companies could support overseas customers by emailing a 3D

5-6. 3D-printed chairs designed by Wetzels Brown Partners for a yacht  
7. Plus 33 and SELA validated the design of this lamp using 3D printing



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model of the spare part needed to a facility close to the client. There would be no shipping costs, no customs clearance procedures, no need to stock inventory and virtually no waiting time. Clearly the potential benefits are huge, but so are the hurdles in certification, quality control and copyright security.

The future for 3D printing is bright and potentially industry changing, but a huge amount of development work lies ahead before the 3D revolution can be fully realized. **END**

**WE ARE ABLE TO SUPPORT CUSTOMER REQUESTS AND CHANGES IN A TIMELY FASHION**



# Future of yacht design takes centre stage at Superyacht Design Symposium in Austria

6 March 2014 by Risa Merl

The 2014 Superyacht Design Symposium, hosted by Boat International Media, took to the slopes of Austria's Kitzbühel from 23-25 February hosting a international list yachting and luxury design delegates, yacht owners and superyacht industry professionals.



The Superyacht Design Symposium saw superyacht industry experts and owners debate the future of yacht design

The sold-out event focused on the future of superyacht design while affording yachting industry attendees with a dose of Alpine air for inspiration. The Symposium featured a selection of informative plenary sessions presented by an esteemed panel of experts including yacht owners and the industry's most influential figures. Stimulating presentations covered topics such as 'What Owners Want from Design', 'Managing Tonnage with Clever Design' and 'Defining Innovation in Design.' The large, open style symposium, expertly led by Chairman Nigel Campbell, prompted lively discussion within the forum.

This year's Symposium saw the introduction of Technical Sessions that provided small groups the opportunity to discuss more specific topics in a focused workshop. These highly interactive seminars proved popular with delegates who elected to deliberate topics as far reaching as 'Designing for the Asian Market' and 'Designing Helidecks.'