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Bombardier shows off new interior in relatively no time

21-Apr-2009

Prototypes of the Learjet 85's passenger service units, which house LEDs and oxygen masks, were created using Objet's rapid-prototype equipment.

As the **National Business Aviation Association** conference neared last fall, one of the last items Bombardier designers sketched out was the passenger service unit (PSU). It is important in both styling and service, housing the LEDs that light up the passenger's space while also holding air vents and oxygen masks.

When designers at the **ID Group**, a contract design house, received the drawings, time was running short. "We had to finish the prototype in two weeks, and it had to support the weight of the lights and other products," said Jeremy Wilkens, ID Group's Design Manager.

As is often the case in rush projects, details were not complete. "We were given a 2-D sketch, and we did multiple iterations for it, working closely with **C&D Zodiac**," Wilkens said. C&D Zodiac is the cabin integrator for the Learjet 85. The ID Group used equipment from **Objet**, one of the largest suppliers of rapid-prototyping equipment, to create the PSU. It is a large component, and the Objet machine builds parts measuring up to 15 x 9 in, so the PSU was created in sections and assembled.

Those prototype sections were used to create molds so a single urethane part could be used in the mock-up interior. Five units were built using cast urethane. Four were installed, with one held as a backup in case something happened during shipping or installation. Creating the silicone molds using the Objet equipment was much faster than creating molds by hand. "It took two days to build the molds, then things went to production quickly," said Wilkens.

Getting the molds ready was fairly straightforward. Shapes were defined using CAD models that could be fed directly into the Objet system. Using models made it simple to develop complex stylistic elements. "A lot of these shapes would have been unachievable by hand," said Wilkens. "We couldn't have met the time frame without 3-D modeling and rapid prototyping."

Going beyond the PSU, ID Group also produced a few other test parts for the presentation. Before some metal parts were produced using CNC equipment, rapid-prototype models were tested. "A lot of little things like hinges that are machined from aluminum were made on the Objet system to validate the engineering and see if they worked," said Wilkens.

Using rapid-prototyping equipment is not new in aerospace. Aircraft designers were among the early adopters of these systems, and a growing number of companies are making complex low-volume parts using them.

"Aerospace companies have been among the pioneers in using additive fabrication for both mock-ups and in production," said Terry Wohlers, Senior Researcher at **Wohlers Associates**. "All F-18s have some air ducts made this way, and the International Space Station has more than 300 parts made with these machines."