



Thinking smart

As aerospace manufacturers and suppliers continually look for new ways to improve passenger safety and comfort, an increasing emphasis is being placed on the role of advanced, 'smart' interiors.

by **Matthew Newton**

Take a look at some of the forward-thinking aircraft interiors in today's commercial and business jets, and you begin to understand just how far the industry has advanced in a relatively short time. Gone are the days when a headphone jack integrated in an armrest, or a bulkhead video monitor, were considered high-tech. Those types of fundamental technologies merely opened the door for more comprehensive in-flight entertainment systems and a wealth of other innovations. Today, features such as advanced LED lighting, in-flight Wi-Fi access, modular seating and stowage systems, and sus-

tainable materials (e.g. wool, leather, natural fibers) represent only a handful of the "smart" interiors applications that aerospace manufacturers and suppliers are using to differentiate themselves from competitors.

With increasing frequency, companies from **Airbus**, **Boeing**, and **Bombardier** to **Hawker Beechcraft**, **Gulfstream Aerospace**, and **Embraer** are facing similar sets of challenges: how to elevate the quality and content of their aircraft interiors while doing so with diminishing budgets. Not only are aerospace companies leveraging new interiors technologies to help increase fuel

In a developmental design project commissioned by Boeing Business Jets, BMWDesignworksUSA was tapped to envision what the not-so-distant future of aircraft interiors might look like.

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efficiency, safety, and improve noise reduction, among other targets, they are striving to enhance passengers' overall flight experience. These benchmarks are being achieved, as always, through strategic partnerships with a vast assortment of firms such as **Emteq**, **PPG Aerospace**, **SABIC Innovative Plastics**, and **BMW DesignworksUSA**, to name a few.

Designing an intelligent environment

In the quest to provide passengers with the best possible flight experience, many aerospace companies are taking a progressive approach to the design and implementation of interiors applications. In 2007, for example, BMW DesignworksUSA was

commissioned by Boeing Business Jets for a development project designed to foreshadow the future of individual travel in long-range aircraft. With Boeing's 787 Dreamliner as the foundation for this exercise, BMW designers took a detailed look at a host of possibilities, one that saw liberal use of bright, high-grade materials, state-of-the-art technology, and architecturally sophisticated details. Though what the firm envisioned was a lavish 19-passenger, mobile working and living space, the design served as a looking glass for Boeing—a well of ideas primed to attract the attention of potential clients to the benefits of its fleet of wide-bodied aircraft models 777, 787 Dreamliner, and 747-800.



Embraer's Legacy 450 business jets demonstrate the trend toward customization in aircraft interiors applications: refreshment center, flat floor/stand-up cabin (top), minimalist lavatory (right), and in-flight accessible baggage compartment.

“The design proposals were permitted to deliberately extend beyond traditional regulated limitations,” BMW said. “Traveling on board an aircraft boasting such a design would no longer be simply a phase on the way to a certain destination, but an experience during which all senses are activated.”

This idea, the notion of engaging passengers’ senses, is important. And suppliers are doing so with a host of subtle yet innovative products. One example is PPG Aerospace’s electrochromic technology and electrochromic cabin window shades. The first application of this technology was on the 787; the second is being launched on the Hawker Beechcraft King Air.

“It’s pretty cool how some of

the airplane manufacturers are starting to integrate this into their cabin management system,” said Mark Cancilla, Global Director, Commercial Aerospace Transparencies at PPG Aerospace. “Boeing wanted to have just a switch so at each window there will be a push button that will allow you to change the shading of the window in five different levels, from full-clear to full-dark and three steps in between. And then flight attendants can control the whole bank of windows.”

On Hawker Beechcraft’s King Air, Cancilla explained, the company has integrated electrochromic technology into its entire interior system. For example, when movie mode is switched on in the airplane, video screens

deploy and the cabin windows gradually darken.

PPG’s electrochromic cabin shades, which were developed in cooperation with **Gentex Corp.**, are intended to replace traditional pull-down opaque shades widely used in today’s aircraft. What makes the shade novel is that it works via an electronically dimmable panel installed between the inboard dust cover and outboard structural cabin window system. This provides “tunable” light transmission in the cabin, according to PPG,

and the system can be configured for control by passenger or flight crew.

Some OEMs have even expressed interest in using the technology in cockpit windows, according to Cancilla. “They obviously don’t want the windows to go completely dark,” he said. “But the pilots we talk to would like to see them as active sunglasses, eventually. So we’re seeing interest. Not quite the same level of interest across the board as we’re seeing for the cabin windows, but we are



By partitioning the interior of Boeing's 787 into different horizontal levels, and even using part of the cargo hold, the BMW designers were able to provide an expansive space for passengers.

working with some folks in helping to better define the application.”

Another ‘smart’ technology finding wider application in aircraft interiors is advanced LED lighting. Over the past decade, LEDs have gradually replaced fluorescent tube and ballast lights, and, as a result, altered the overall look and feel of the passenger cabin. And as the technology continues to evolve, not only are LED suppliers able to produce more light from these components, but color consistency has improved as well.

“We’ve got better predictability, more predictability, more control over the tone of the light that you put in the airplane,” said Scott Sweet, Senior Business Development Manager—Airframes for Emteq, a global supplier of avionics and LED lighting. “And then as electronics get smaller and smaller, we’re

able to put the LED light assembly in a smaller package.”

Until Emteq hits a certain plateau with the technology, Sweet said, they will continue to shrink the packages until they can’t go any smaller. Then the focus will be placed on providing more features in that small package. And since Emteq currently supplies exclusively to business jet OEMs, the development and implementation of the latest technology is fairly quick. Whereas supplying larger commercial OEMs with the latest technology can be more challenging due to volume numbers and production time frame. Though, as the company continues to grow, it hopes its technology will soon begin appearing on Airbus and Boeing aircraft.

One example from Emteq’s advanced lighting portfolio is the company’s 115 VAC interior wash light. Designed for wide-body aircraft applications, the

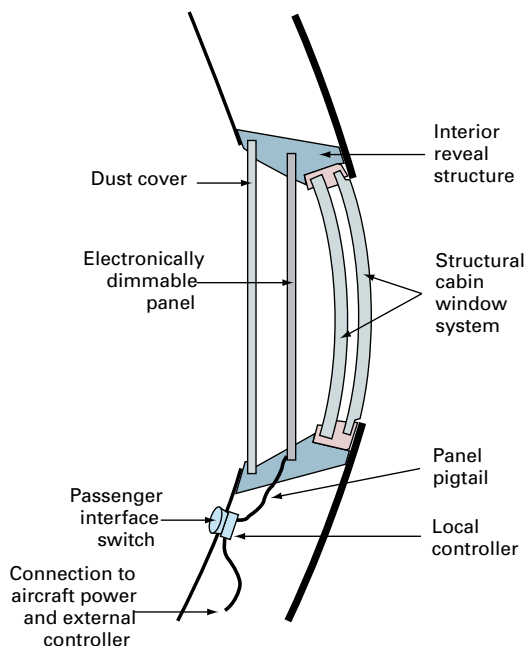
lights can be integrated with an aircraft’s existing power systems, draw less current than legacy lighting, and feature built-in step-dimming capability. Another new product the company has launched is its Quasar Mood Lighting System, or ELW71 Quasar LED, for corporate and business jet applications. What makes this system special, Emteq said, is its advanced chip-on-board (COB) technology, which helps provide a selection of color and brightness properties: sunrise/sunset and dynamic effect modes; a high color-rendering index to provide true bright white light; and white-color control in 50 K increments within the warm to cool spectrum.

As the interior design of passenger cabins, and even cockpits, continues to change, aircraft manufacturers are looking for materials that can be used across multiple applications.

Specifically, lightweight materials that can be adapted to meet a variety of shape and contour requirements. For example, SABIC Innovative Plastics is currently leveraging its lightweight foam, Ultem, to expand beyond its usual applications.

“Ultem is a polyetherimide resin,” said Sean O’Brien, Product Marketing Manager, New Markets and Technologies, SABIC Innovative Plastics. “For injection-molded applications for aircraft interiors, it’s been used for a long time—most predominantly for the low flame, smoke, and toxicity. So meeting the OSU 6565 standards, it actually can meet lower standards than that. [Until now], it’s been used in things like personal service units and different injection-molded interior applications.”

But what O’Brien and his counterpart at SABIC, Paul DiSciullo, Industry Manager,



PPG Aerospace's electrochromic cabin window shades, which are used on Boeing's 787 Dreamliner, use a dimmable panel installed between the inboard dust cover and outboard structural cabin window system.

Electrochromic cabin window shades are assembled at PPG Aerospace's application support center in Woodinville, WA.



Emteq's 115 VAC interior wash light is designed for wide-body aircraft applications. The lights can be integrated with existing power systems, draw less current than legacy lighting, and feature built-in step-dimming capability.

SABIC Innovative Plastics is leveraging its Ultem foam (below) as a lightweight core material for aircraft luggage bins, galleys, and lower-wall panels.



Transportation, Specialty Film & Sheet, are doing is developing Ultem for new uses in luggage bins, galleys, and lower-wall panels. As a core material for these structures, the company hopes to build on the foam's proven flame, smoke, and toxicity performance while providing aircraft makers with a viable option to further reduce cabin weight.

"There's secondary processes that the material can help with, too," DiSciullo added. "Because of its slow moisture uptake feature, there is no need to edge fill the material to prevent moisture uptake, so from a processing standpoint there's been some [additional] benefits identified."

Future directions

"Depending on the customer, I see the trends going a couple different ways," said Emteq's Sweet. "In the case of Embraer's corporate aircraft, what we're seeing from them is moderniza-

tion. It's not only technology but also styling. They're trending toward some unique cabin concepts. On the other side, you've got players in the market trending more toward simplicity and practical functionality."

With design advances in aerospace interiors becoming more focused on the notion of customization in recent years, many new aircraft are serving as proof of application—from the oft-mentioned Airbus A380 and Boeing 787 Dreamliner, to Hawker Beechcraft's Hawker 4000 and 4000XP lines and Embraer's Legacy 450 and 500 business jets. The latter example, Embraer's Legacy line, demonstrates the trend toward customization with its refreshment center, flat floor/stand-up cabin, minimalist lavatory, and in-flight accessible baggage compartment.

And while these design advances and new smart technolo-

gies are seeing more widespread use in both commercial aircraft and business jets, aerospace manufacturers and suppliers are more cost-sensitive than ever before.

"[Aircraft makers] are more savvy about the technology than in the past, and they are, on the whole, trending toward practical function in ease-of-use, ease-of-installation, and cost of ownership," Sweet said. "But by the same token, they don't want to sacrifice technology in order to get that." So the trick that Emteq, and other suppliers of advanced interiors applications, have to pull off is finding the perfect balance between providing smart and affordable technology.

And suppliers are not alone. With the current economic forecast still bleak, OEMs must manage to design interiors that improve passengers' overall flight experience—both in safety

and comfort—without dangerously overextending themselves in the process.

"The primary challenge is to keep moving ahead despite the current global economic slowdown," said Jennifer Clay, a consultant to the aerospace industry and author of the book "Jetliner Cabins" (J. Wiley & Sons). "Increasingly, manufacturers and suppliers of interior components are being asked to offer additional sales incentives, extend credit lines, and guarantee higher-level warranty status on the goods and services they provide. But the manufacturing and supply sectors face problems of their own—e.g. deferrals and cancellation of orders, labor-force downsizing, more stringent safety standard requirements, and escalating environmental mandates." ■