Aircraft interiors INTERNATIONAL

NOVEMBER 2018

Materials special issue:

AIRBUS AMERICAS
Amanda Simpson, VP of R&T, discusses materials innovation, the value of sharing ideas, and the growing role of women in aerospace

THE LATEST MATERIALS
Materials developments that cabin designers need to know about, from 2018's trim and finish launches, to advances coming in the next decade

TRENDS FORECAST
Color, material and finish experts from the world's leading design houses share observations that could influence the next generation of cabin schemes

How to protect your ideas

WITH SO MUCH INNOVATION IN DESIGN AND MATERIALS, THE CABIN HAS BECOME A MINEFIELD FOR INTELLECTUAL PROPERTY RIGHTS. EXPERTS DISCUSS IF, AND HOW, ASSETS SHOULD BE PROTECTED

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SENSE OF WONDER

The aircraft cabin is a highly innovative environment, packed with impressive designs, technologies, engineering and inventions. Indeed, you'll find many examples of impressive innovation packed into the pages of this issue. These ideas require legal protection to prevent rivals benefiting from the creator's art, but it is not always that simple.

For example, in this issue we spoke to Amanda Simpson, VP for research and technology at Airbus Americas, who, when asked about best practice with regard to intellectual property law, advises against being too protective.

"I'm quite positive that if someone did a thorough investigation through the archives of the patent office, they would probably come across many good ideas, real innovation that never went anywhere because people didn't know how to share it and how to make it a reality," she says.

Clearly some level of protection is essential, to ensure that the creator is properly rewarded for good ideas, investment and risk, but Simpson is not alone in believing a 'protect everything' approach is not always optimal. Also in this issue we speak to experts at intellectual property law firm Keltie, who advise that the potential payback on the expensive patent process needs to be assessed. If the financial return is not there, it becomes a decision of how much the inventor wants their design to be exclusive and whether they wish to remove it from the industry's wider innovation pool.

The creator would also have to pass a legal test of whether an idea can be registered as a design, which is usually an assessment of the degree of novelty. This can be difficult in the case of cabin materials, but many of the latest trim and finish materials, which you can see in our roundup on p88, would pass that test of novelty. Many more unusual and innovative materials being developed in institutions around the world, which could form part of the next generation of aircraft cabins (see p76), would also certainly pass.

Legal protection is a complex field of risk versus reward, right versus wrong, and personal gain versus the greater good. But coming from someone who has been an innovator in aerospace for more than 30 years, Simpson's view of sharing good ideas to help advance the sector does have some appeal.

Simpson is a remarkable figure in aerospace. Her personal courage has been an inspiration to many, with a notable moment being when she became the first openly transgender woman political appointee of any administration, joining President Obama's administration in 2009. Her career path has been equally inspiring, with a stellar 30 years spanning senior roles in the US Army and Department of Defense, and expertise including a master's degree in science, qualifications as pilot, test pilot and flight instructor, and aerospace engineering and political experience too extensive to list here. When she joined Airbus Americas in June, we were very keen to hear her views on the future of aerospace, and I'm proud to say that we secured a fantastic interview.

Throughout a complex and challenging career, Simpson has retained the sense of wonder she felt when watching the US space program as a child in the 1960s, a sense of wonder that led her to pursue a career in aerospace, and an emotion that she believes is critical to inspiring girls and boys to embark on a journey to become the next generation of aerospace professionals.

I believe this could be a fantastic design goal. If a child looks at a design and says 'wow', it's a success for the designer, and for the future of aerospace.

Adam Gavine, editor

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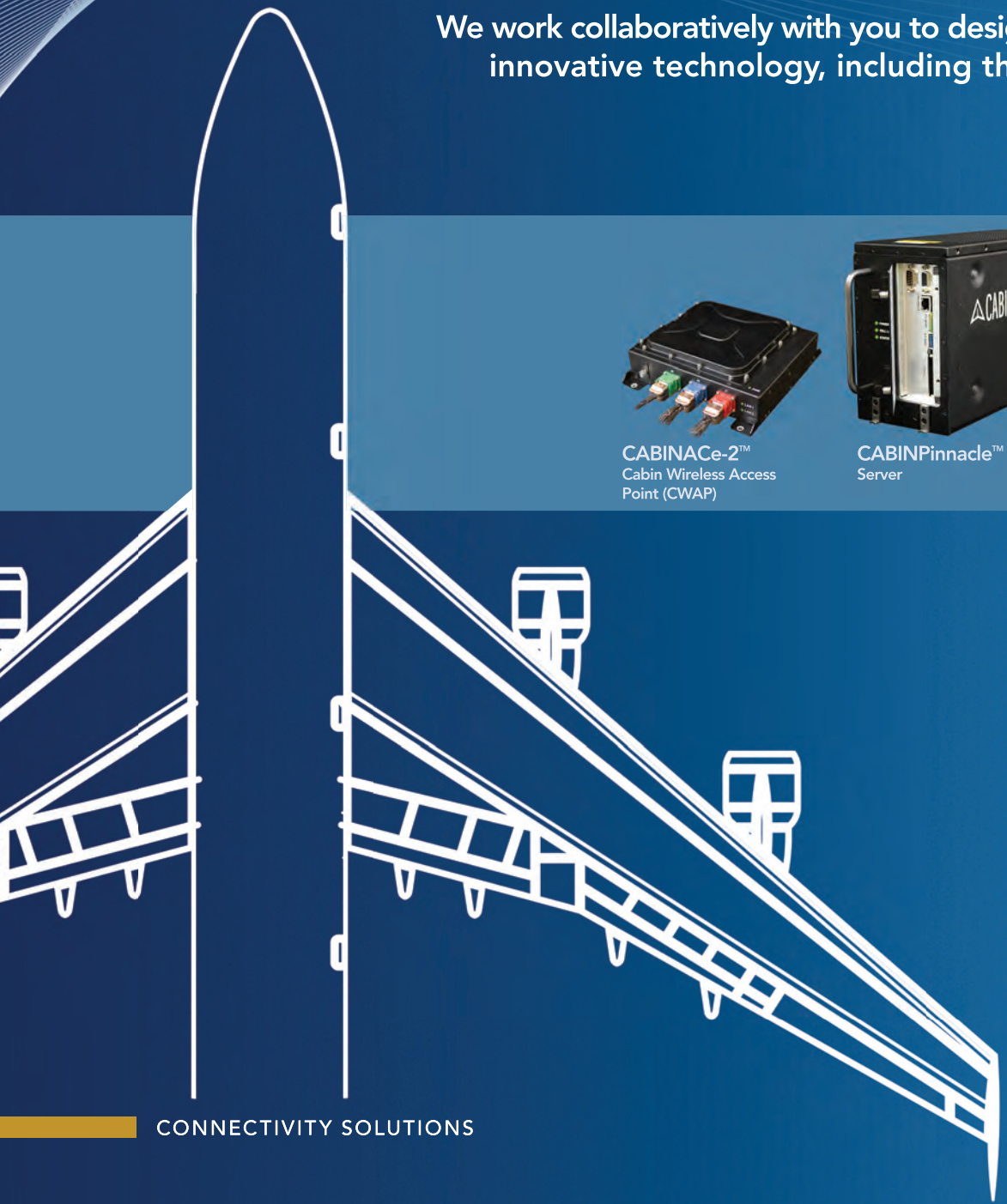

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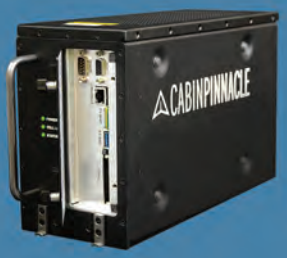

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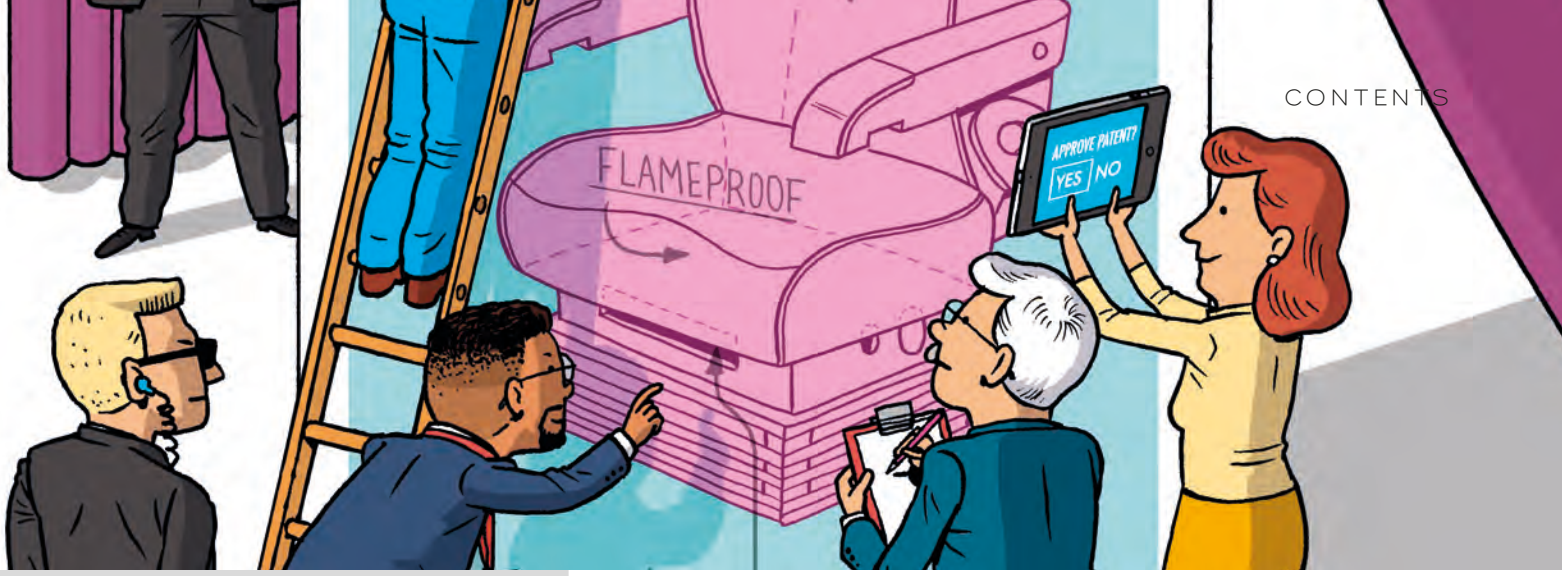

Up front

A selection of the latest technologies, trends and developments entering the cabin space

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THE TEAM

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Panasonic

Panasonic Avionics Corporation

IMAGINE WHAT **NEW BUSINESSES** ARE RIGHT AROUND THE CORNER

MIND AND BODY

Panasonic Avionics is collaborating with several health experts around the world to expand its NEXT ecosystem to improve passenger well-being

Cabin lighting can also enhance passenger well-being. See p48 to read expert views on next-generation technologies

IFE is a highly important part of the inflight experience, especially on the super long-haul routes now being enabled by modern aircraft such as the A350-900ULR. The role of IFE can go beyond entertainment though, as recognized by Panasonic Avionics (Panasonic) with its new Wellness program, a range of options for the NEXT platform that has been developed to improve the comfort, health and wellbeing of passengers. This range of services fits with Panasonic's declared aims for the platform, which was launched last year at Aircraft Interiors Expo, as a modular and scalable IFEC solution that blends the latest in IFE technology, connectivity services and consumer technologies to create an 'Internet of Me' experience for passengers.

Panasonic took advantage of the wide expertise of its parent company, developing the Wellness options alongside R&D teams from Panasonic Corporation in Japan. The first raft of options includes active noise canceling, premium seat lighting and Nanoe air quality technology, and launch customers have already been secured for each feature.

Looking at each feature in turn, active noise canceling enables airlines to reduce the ambient noise experienced around each seat to 15dB without the use of headphones. The technology used in Wellness operates at a frequency range of 80-400Hz and is adaptable to each seat configuration. It can also calibrate automatically to a passenger's seat during a flight, with the aim of reducing fatigue. The system includes in-seat controls, speakers and microphones, for seamless integration with each seat's individual IFE system.

Moving from audio to visual, the premium seat lighting option can tailor a passenger's lighting experience to the different phases of a flight. Specialized algorithms have been created to optimize sleeping and waking cycles to ensure passengers have the best possible rest inflight and awake refreshed and at their body's own pace. Examples include a lighting program scheduled for meal service that is optimized to improve food color saturation, while the reading lights are designed to reduce eye strain. The system can benefit passenger health and comfort, but has further advantages for airlines, as a range of accent lighting can highlight themes and branding in the cabin, with differentiation available for first and business class sections.

Finally, the Nanoe system is designed to cleanse the air in the cabin as a whole, as well as around a passenger's seating area, when required. Nanoe applies low voltage to any moisture, which will then burst into nano-sized electrostatic atomized particles at a rate of 480 billion particles per second. The result, says Panasonic, is the removal of viruses, bacteria, fungi and odors from the cabin.

David Bartlett, CTO of Panasonic Avionics, explains, "Our airline partners are researching new ways to enhance passenger well-being, especially on long-haul flights. These features are just the beginning of a wide range of technology, services and content that Panasonic will be rolling out in the near future. New features will draw from partners from the health, wellness and biometric industries, in addition to Panasonic's investment and offerings in consumer wellness."

These additions to Wellness will result from further Panasonic collaborations with experts including Detalytics, a provider of health-related AI services, which has created an integrated health advisory application integrated into seatback and passenger mobile screens; and Mimi Hearing Technologies, an audio enhancing algorithms specialist, which has created integrated personalized audio capabilities.

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A very special jumbo is due to take to the skies, delivering eyesight-saving expertise to improve quality of life and even economic growth in developing regions

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Around the world, 246 million people suffer from visual impairment – 75-80% of them with a treatable condition. Most of those people live in developing countries without access to the required expertise. Help could be delivered, however, by flying eye opticians, such as those on board the B747-400 being designed for non-profit organization Sight2Save.

The charity's founder, James Moon, as an owner of two aviation companies, is well aware that operating a jumbo is not a small undertaking.

"We are well aware of the costs of such an aircraft type, even when it's not flying," he states. "I have made sure the Sight2Save team is made up of experienced aviation and airline-related professionals, to help us make good decisions when it comes to aircraft selection."

Sight2Save is currently reviewing two B747-400 aircraft for suitability. Inspectors have already been sent to assess both airframes, and at the time of going to press, three further inspections were being lined up.

Whichever aircraft is chosen, extensive work will be required to fit it out as a sterile clinic. The charity has confirmed that both potential airframes are passenger-configured and have only ever flown with one operator.

Some 30 aviation-related businesses have volunteered to work on the interior fit-out with Sight2Save, including aircraft lessors, MRO companies, engine suppliers, cabin designers (Alexander McDiarmid Design in France) and parts trading companies. Moon says that all of the companies involved have "been very supportive and have gotten behind us, which is great to see from the aviation industry as a whole".

ABOVE: A RENDERING OF ONE OF THE FIVE TREATMENT ROOMS ON BOARD A SIGHT2SAVE AIRCRAFT. SEVERAL OPTICAL-RELATED BUSINESSES ARE INVOLVED WITH THE PROJECT, AND AROUND 90% OF THE MEDICAL EQUIPMENT THAT WILL BE USED ON BOARD WILL BE DONATED

The cabin layouts have been chosen to best suit the expected operations on the ground. The main deck will feature a 20-seat classroom in the nose, where experts can teach local medical professionals, a 26-seat patient screening area, five eye test rooms, five treatment rooms, three lavs, a 28-seat recovery area and a storage area for supplies and donated spectacles and sunglasses.

The upper deck, a crew zone, features a galley and dining area, a 22-seat lounge and a smaller six-seat lounge, a lav, a shower room and a further storage area. Again, it is still too early for Sight2Save to reveal specific details, as the team is working with a design team in the USA and with the FAA, to secure the STC.

So when will the aircraft be operational? One of the available B747-400s could be flying by March 2020, a timescale based on slot availability at the MRO and the estimated time required for the aircraft to be brought back to airworthiness. The other aircraft would take a little longer due to it having been in storage since 2012.

The Sight2Save B747 should be equally impressive in scale, capability and mission. As Moon says, this B747 will be a "flying icon of hope".

CONNECTING WITH INDUSTRY

Asked what is proving the biggest challenge in the project, rather than political issues or tricky certification requirements, James Moon says that he needs more support from aerospace. "The biggest challenge is connecting with the right people within the aviation industry. We have some fantastic contacts who are behind what we are going to be achieving through Sight2Save, and when we speak to people they love everything to do with Sight2Save and want to be involved. I feel that we haven't really connected with people within aviation that would want to be involved – and we want to connect with them. It's how we go about this and make sure we get in front of them."

If you would like to get involved in the project, or to donate, visit www.sight2save.org


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FEES FINDERS

Every airline wants to increase ancillary revenues, but not every airline achieves this. This is how four leading authorities in ancillary revenues boost their airlines' profits...

1

MARIKA PAULI, FINNAIR

With US$13.88 of ancillary revenue per passenger (5.6% of total revenue), global carrier Finnair's figures are impressive. This is how Marika Pauli, head of ancillary product development, tackles the à la carte approach.

"Our methods are based upon three criteria. First is visibility, so the customer knows what is available for sale. This is supported by rich content in primary distribution channels and touchpoints, which includes agency sales. Second is relevance and personalization, which makes offers based upon customer needs. Third is 'time and place', which replaces the method of bombarding customers with pre-departure emails. This places the offer where it makes most sense, such as the booking flow, during check-in, and even during the journey if the service will improve the overall travel experience."

For more insight into ancillary revenues, visit idearworks company.com

2

CATRIONA LARRITT, JETSTAR

There is no denying that Jetstar's ancillary revenue figures are impressive, making an average US$26.92 per customer – some 23.2% of total revenue. Jetstar Group's chief customer officer shares how this was achieved.

"Our low-cost model is built on choice, which enables customers to travel for less. By being simple, fair and transparent about our low-cost choice model, our customers can book with confidence and realize that travel doesn't have to be expensive. We deliver this through all our digital channels and marketing communications, using personalization and merchandising to ensure a customized experience based on customer needs and behaviors.

"Our booking path provides customers with information on the choice model and highlights the price advantages of adding a product at that time (e.g. bags are more expensive at the airport). We use fully automated post-booking emails to personalize communications and suggest ancillary products based on flight logic, booking type and history, to promote à la carte products after the initial purchase."

3

TONI FREEBERG, ALASKA AIRLINES

Ancillary revenue accounts for 16.9% of total revenue at Alaska Airlines, with an average US$30.42 extracted per passenger. So how does the airline's director of distribution and ancillary strategy introduce new customers to the à la carte approach?

Freeberg, who has 31 years of experience with the airline, explains: "As a traditional full-service airline, introducing à la carte products is almost more important for our existing customers, who are not used to seeing us unbundle our products. We use a multichannel approach, which includes the online booking path, pages on the website, and post-booking emails.

"Assigned seating is the primary à la carte product we promote prior to departure. Most other optional extras are offered during the check-in window. While customers are shopping for a flight, they get introduced to our Premium Class product on the seat map page. It's there that we describe the product benefits. This is supplemented by additional information about seat options in other areas of the website."

4

RAGNHILDUR GEIRSDÓTTIR, WOW AIR

With an average of US$48.87 per passenger, Wow Air really is putting the 'wow' into ancillary revenues, which account for some 28.5% of total revenues. The Icelandic LCC's COO explains how it's done: "Customers are getting used to the à la carte approach, meaning they expect it. Legacy carriers are also adopting the model. We try to keep the concept as simple as possible and display it clearly in the booking process.

"Our main challenges currently are on non-web channels and with some OTAs. In all cases, we want our customers to be aware of our à la carte approach and don't want to surprise them at the last minute."

Wow Air's staff must be pretty adept at sales, so how is this achieved? "The key is simple rules that are easily implemented. The more complicated the rules, the more difficult they are for staff to implement. Frequent communication and training is also very important, as well as a mix of incentives and motivation."

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See more science that could influence tomorrow's cabin interiors on p76

SQUID PRO QUO

Body temperature is an important factor in passenger comfort. Adopting inspiration from the squid could enable the development of seating materials tuned for thermal conductivity

Tuning materials for optimal optical and electrical properties is becoming a commonplace task in science. The next step is that materials may be able to be tuned for thermal conductivity, following the discovery of an unusual and highly useful DNA pattern in squid.

Controlling thermal conductivity in textiles and plastics is difficult; indeed many such materials are thermal insulators, a property that Melik Demirel, professor of engineering science at Penn State University, says is, "an unsolved problem". Searching for a solution, Demirel and his team found inspiration in squid ring teeth, in particular their proteins, which are made of multiple DNA repeats. They have identified potential in this genetic make-up and believe that applying squid-based biomaterials to various plastics and textiles could enable control of thermal conductivity.

The Penn State team has designed synthetic proteins patterned on the tandem repeating DNA sequences of squid ring teeth. The team can specify the number of repeats, and for each variant can investigate how the proteins react to various factors, such as moisture. The scale of increase in thermal conductivity is dependent on how many tandem repeats are in the protein, and the team has found that the increase can be 4.5 times larger than that seen in conventional plastics.

"These squid-based biomaterials that we are working on have low conductivity at ambient humidity, but they can be engineered so that their thermal conductivity increases dramatically," states Demirel.

The team has created a bioprotein film from these materials, one potential use of which might be as a fabric coating, with an initial proposed application being athletic wear, but aircraft seating materials and airline pajamas could also benefit. The treated material would be comfortable and warm in everyday use, but when its temperature rises, the sweat produced by the seat occupant or wearer could 'flip' the thermal switch and allow the fabric to remove heat from the wearer's body.

According to the researchers, under ambient conditions of less than 35% humidity, the thermal conductivity of these proteinaceous films does not depend on repeat units or molecular weight, and exhibits similar thermal conductivities to disordered polymers and water-insoluble proteins. However, when the films are engineered to have higher molecular topology, the thermal conductivity jumps when they become wetter, whether due to humidity, water or sweat. The team has also found that as the number of tandem repeats increases, so does thermal conductivity.

"Because the thermal conductivity when wet is linearly related to the number of repeats, we can program the amount of thermal conductivity into the material," explains Demirel. "So we could make better thermal switches, regulators and diodes similar to high-performance devices to solve problems in technologies such as data storage, electronics and textiles."

When the material returns to a level of normal ambient humidity or lower, the switch turns off and the protein no longer conducts heat as efficiently, keeping the user warm. And all the while the passenger would be unaware of all this activity, or its aquatic origins, only knowing that they feel comfortable.

Visit aircraftinteriorsinternational.com for materials science news

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FIGURE IT OUT

From billions of dollars, to inflight romance, to the surprising cost of a can of soda, our roundup of Q3 2018 statistics has some intriguing figures...

Soda diet?

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US$150

per year in fuel

Skúli Mogensen, WOW Air CEO

WI-FI SURVEY

An Inmarsat survey found...

55% of pax describe inflight wi-fi as crucial

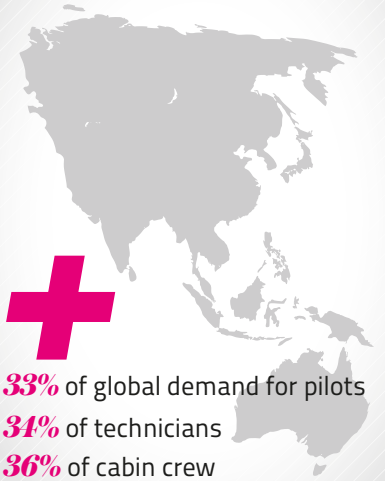
67% would be more likely to rebook with an airline if high-quality wi-fi was on offer

54% would choose wi-fi over an inflight meal

53% would give up their inflight alcoholic drink in exchange for access to wi-fi

54% say no wi-fi at all is better than a poor-quality service

Over the next 20 years, the Asia-Pacific region will account for...



33% of global demand for pilots

34% of technicians

36% of cabin crew

Boeing forecast

REFURB REVENUE

The aircraft refurbishing market will bring in annual revenues of more than

US$7bn

by 2026 – up from US$4bn today

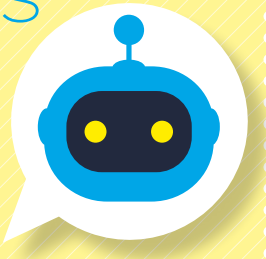
Research Report Insights

CHATBOTS

68%

of airlines will use AI-powered chatbots by 2020

SITA report

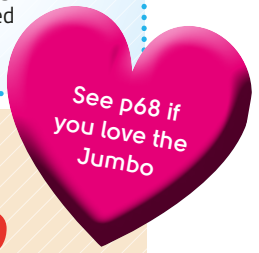


HAPPY 50TH

It is

50 years

since the Boeing 747 was unveiled to the world



The global airline industry had total revenues of

US$684bn

in 2017: a CAGR of 8.2% since 2013

MarketLine report

love is in the air

1 in 50 passengers meet the love of their life on board an aircraft

HSBC survey

38%

of airlines expect to spend at least US$1m per aircraft on connectivity by 2023; 27% of airlines expect a return on investment within 12-18 months, 28% want it within 19-36 months

Honeywell survey

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DISCREET CHARM

EVA Air's Dreamliner interiors give the airline a lot to shout about, but the custom hardware has been designed for quiet luxury

THIS FIRST B787-9 WILL FORM PART OF A 24-STRONG DREAMLINER FLEET FOR EVA AIR, INCLUDING A FURTHER THREE B787-9s AND TWO B787-10s ON LEASE, ALONG WITH 18 B787-10s ON ORDER FROM BOEING

See our site for details of the S2 seat, created by Designworks, Molon Labe and Panasonic

EVA Air has taken delivery of its first Boeing 787-9, an important aircraft for the Taiwanese international airline, as its fuel efficiency and cabin design are intended to elevate its passenger experience and play a key role in growing operations and revenues.

The 304-seat aircraft will be fitted with 26 seats in the business cabin, branded as Royal Laurel class. EVA Air selected the Vantage seat from Thompson Aero and enlisted the help of BMW's Designworks studio in LA to customize it to reflect its brand. These 23in wide, lie-flat seats are being altered to feature adjustable privacy panels, a little extra storage space, 18in IFE displays and a unique color scheme.

"At a time when consumer expectations continue to rise across daily brand interactions, mobility industries must constantly adapt to rapidly changing customer needs," explains Johannes Lampela, design director at Designworks. "For aviation this means balancing flexibility with a structured environment, providing privacy without isolation, as well as complete connectivity within a premium and relaxed setting."

According to Designworks, the team stepped away from conventional aircraft design for the project, instead focusing on concepts of space and brand to seamlessly integrate the seats into a bespoke cabin environment. The trim and finish schemes have been heavily influenced by architecture and furniture design, with the subtle and warm color palette used in the seat creating a relaxed backdrop against which the bright accents of the cabin service and amenities really shine.

More details of the EVA Air B787-9 passenger experience will follow in November when the aircraft enters service, but Royal Laurel passengers should expect a cabin service similar to the airline's B777-300ER flights, which include a full turn-down service by crew to optimize the bed for sleep. The luxury experience in the B777s begins on boarding, when passengers are offered a glass of cold-pressed pineapple juice and Godiva chocolates, while the dining experience is accompanied by a sommelier-style wine service.

In the economy class cabin of the B787-9, EVA Air partnered with Teague in Seattle to customize the 278 Recaro seats. The seats will be fitted with leather headrests with up to 6in of adjustment, as well as customized six-way neck supports and 12in HD IFE monitors. The color palette chosen complements the shades used in Royal Laurel class.

"Our goal was to take a proven seat platform and make it unique to EVA," adds Lampela.

BELOW: THE CABIN SCHEME FEATURES WOOL CARPETS, NATURAL LEATHER AND RICH CUSTOM TEXTILES, ALL FINISHED IN MATURE, MUTED COLORS

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THE *US$400bn* SKY ECONOMY

Enough people fly every day to populate a country – quite literally. Imagine if these 11,900,000 people were considered as a country... How strong would its economy be? What would its people be like? What would the rules be? Let's find out. Welcome to Flyland...

Research by banking giant HSBC has identified that the 11,900,000 people that take to the air every day represent a country-sized, thriving and cosmopolitan population. The bank's economists may have been daydreaming a little with this research, going so far as to name this airborne country Flyland, but there is no denying this nation's economic might. They do have a rather limited diet and some unusual habits though...

Big spenders

In total, Flyland citizens spend an average of US$91.90 per flight, including US$7.89 on food, US$3.10 on drink, US$3.43 on alcohol, US$3.28 on wi-fi and US$68.47 on duty free. Flylanders are well ahead with the global trend of moving toward a cashless society, with 70% of these purchases being credit card transactions.

THE ECONOMY

Flyland has an annual GDP (gross domestic product) of US$400.5bn – a little larger than that of Norway – and the only way, rather inevitably, is up. Indeed Flyland adds more than US$1.26bn to its value each day, calculated by taking into consideration the average amount of flights Flyland citizens take in a year, their average income, average spend, and the value of the average amount of work or business conducted in flight.

FRIENDLY FLYLAND

The people of Flyland may have some strong ideas of good behavior (see right), but obey the rules and you'll find them a friendly nation. In fact, 51% of Flylanders are happy to strike up a conversation with a stranger, 16% forge business connections in the air, 14% have made long-term friends, and singletons should keep an eye out in Flyland, as 1 in 50 have met the love of their life there.

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Work and play

Flyland is successful, but its people enjoy a good work/life balance. Business travelers average two hours of work per flight, while leisure travelers clock up 1.3 hours. Even this adds up to US$53.4bn worth of work being completed at 35,000ft.

So how do Flylanders like to relax after all this work? The average citizen of Flyland spends 2 hours 15 minutes sleeping, and 10 minutes working on personal admin (10 million emails per day are sent from Flyland).

However, what Flylanders really love is entertainment. With two hours spent enjoying the IFE systems, they spend almost as much time being entertained as they do sleeping.

Around 15.3 million movies are watched each day in Flyland, with action being the top genre at 26%, comedy close behind at 21%, and thrillers in third place at 13%. Flylanders are also TV buffs, with 9.2 million programs watched per day.

The population are also keen readers, with 16% favoring historical titles, 12% thrillers, 11% romance and 10% murder mysteries. Their favorite source of national news is *Aircraft Interiors International* (probably). They may even listen to music at the same time as reading, with on average 60.3 million songs listened to each day as the country glides above the clouds.

BUSINESS ACUMEN

Business travelers are the elite class in Flyland – but a common sight. They make up 25% of flights, with the typical business traveler flying 10.2 times per year. This is, on average, 54% more than the average Flyland citizen.

It is not just the destination that is important to these people: one in seven business travelers claim that they have made business connections while visiting Flyland, while another 12% have had an exciting business idea in the country.

A surprisingly hostile environment

The highly diverse and truly international population of Flyland brings a set of important cultural customs to ensure everyone gets along. However, there are some 3.1 million arguments on Flyland every day. So what are they bickering about?

When asked about their biggest gripe, 65% of Flylanders say that they find it annoying when people are rude to cabin crew. They're kind at heart but perhaps not that tolerant, with 57% saying they do not like children being allowed to kick seats and 47% saying they dislike it when children are allowed to run loose. Meanwhile, 48% object to people taking off smelly shoes in the confines of Flyland, 44% don't like seatbacks being reclined without asking, 37% don't like the overhead locker being overfilled, and 36% of Flyland citizens say they do not like it when people stand up as soon as the aircraft lands.

Some 20% do not like people complaining in the hope of receiving an upgrade, while 46% do not like their companions drinking too much alcohol – although Flylanders are fairly big drinkers (see The average Flylander).

THE AVERAGE FLYLANDER

The average Flylander spends 50 hours in the country per year, split between an average of 6.5 visits at an average of seven hours and 40 minutes. The average age is 45, they mostly speak English (Spanish is the second language), and they are a bright lot, with 69% having been educated to degree level or above.

Flylanders are pretty casual – 40% favor an outfit of jeans and a T-shirt. Their taste in food is simple too, with 37% favoring chicken, 16% beef and 11% fish. And 19% like to save their snacks to enjoy later, perhaps with an action movie, as many Flylanders love to do. Or indeed a gin and tonic, as three million are drunk each day in the nation.

We hope you enjoy your stay in Flyland. Come again soon!

FLYLAND

LABORATORY CONDITIONS

September saw an airborne innovation lab fly from Munich to Boston for APEX Expo, an amazing flight of discovery that focused on the future passenger experience

APEX Expo hosted the first 'Best Customer Journey Experience' category of the Crystal Cabin Awards

Thousands of aviation professionals and enthusiasts descended on Boston, Massachusetts, in September to visit APEX Expo, but around 300 enjoyed an extra-special aviation fix on their way. These lucky aviation enthusiasts took part not just in the joy of a flight, but in a flight that immersed them in the next generation of passenger experience technologies.

Lufthansa arranged this special event – named flyinglab – in cooperation with APEX and Lufthansa Systems, on an A350 flight from Munich, Germany, to Boston (LH424). A gate event in Munich set the mood and built excitement, as did an onboard conference as the captive and captivated audience enjoyed six 15-minute presentations discussing the passenger experience of the future as they crossed the Atlantic. These topics ranged from innovative lighting concepts to modern cabin designs, and new seating and communication options. A good passenger experience should be inclusive, and indeed this conference wasn't confined to those sitting in the premium seats, as videos of each presentation were live streamed via the cabin wi-fi to the passengers' own devices. Guests could also send questions to the speakers via their devices, which were answered live afterward.

ABOVE: IS IT A LAB? IS IT A PLANE? FOR FLYINGLAB THIS LUFTHANSA A350 WAS BOTH!

Once the more serious part of the eight-hour flight was over, guests could spend the remaining hours having a little fun with the technology demonstrations, which as the 'flyinglab' moniker suggests, turned the A350 into a veritable flying laboratory. Everything from VR glasses, to a smart temperature-regulating blanket with integrated neck pillow, were available to try in the ideal test environment.

As Joe Leader, CEO of APEX and the host and moderator of the event said of the flight, "What better place to present and test new trends for passengers than in a plane?"

THE SPEAKERS

The experts who shared insights during the flight:

- **Klaus Steinmeyer**, VP of strategy, products and programs, Recaro Aircraft Seating: The next-level seating experience
- **Dr Achim Leder**, co-founder and CEO of Jetlite: Human-centric lighting
- **Anaïs Marzo**, head of aircraft interiors marketing at Airbus: The A350 cabin experience
- **Daniel Schultz**, senior manager of inflight communication, Deutsche Telekom: The future of inflight communication
- **Anish Chand**, director of customer experience, Star Alliance Services: Know me... all the way
- **Juha Jarvinen**, CCO, Finnair: Consumer insights of Asian travelers impacting the inflight experience
- **Andrew Mohr**, head of innovation at Panasonic Avionics: Biometrics in the sky

A TASTE OF INNOVATION

Guests could try out a prototype of the Feeflight blanket, a rectangular piece of fabric transformed into a cape that the passenger can carry. The lightweight, natural fabric has functions such as individual temperature-controlled zones, which enable wearers to define their personal comfort via a graphical interface on their PED.

A silent alarm function is embedded inside the neck pillow of the blanket, which can wake passengers with gentle impulses, enabling them to adjust their sleep rhythm to the new time zone.

Among other items, guests could also try the AlloSky Cinematic VR headset from SkyLights, which enables users to escape to their own private movie theater and enjoy IFE content in 3D, 2D and 180° on a full HD, IMAX-style screen. The sleek design is tailored toward comfort and the viewing experience inflight.

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SPEAK EASY

THE BRIEF

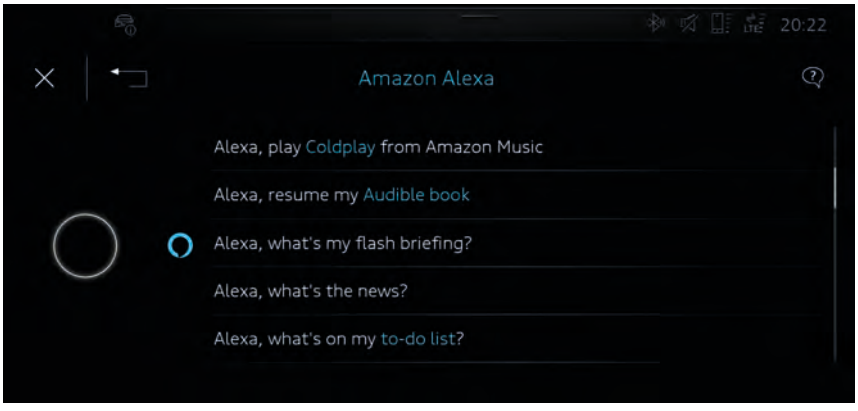
The world is becoming increasingly connected, with many people linked to various digital services throughout their everyday lives. Smart devices wake them up at the right time, inform, entertain and aid them throughout the day, and then go full circle and help them get back to sleep again. People are digitally connected with their homes and workplaces, public spaces, social spaces and public transportation. They are also increasingly connected within their personal vehicles, so how could this area influence a more connected personal inflight experience?

THE IDEA

One of the latest advances in connected cars is the Audi e-tron model, an electric-powered SUV that will feature Amazon's Alexa Voice Service on board, integrated into the car's MMI operating system. Drivers won't even need to access an app on their smartphone to use the system, nor will they have to pair their phone with the car. All users need do is link the car itself to their Amazon account.

Once linked, they can then activate the voice service via the onboard voice control system by saying the wake word – "Alexa" – and issuing vocal commands, with a self-learning dialog manager continually increasing the system's vocabulary and level of 'understanding'. With the command received, an LTE mobile data module in the MMI system then establishes a connection via an Audi back end and sends the query to Amazon's servers. The requested information or content, whether news, weather or sports scores or music streamed through services such as Amazon Music and Audible, is then played back through the audio system.

Audi's Alexa users can also use the system to perform tasks such as ordering groceries, adding items to to-do lists, locating points of interest and accessing a variety of Alexa skills. They can even access their smart home controls, which can enable them to lock their home doors, turn off the lights, and close the garage door directly from the vehicle – all they have to do is ask.



VERDICT

This e-tron system is clever and complex, yet couldn't be simpler to use. Of course, airline passengers can perform similar functions today on some systems, for example by connecting to the cabin wi-fi on their own device, accessing Amazon and streaming the content to their in-seat display. However, IFE is about more than just the display, and applying a system such as Audi's to an aircraft seat environment would create a cohesive service, with an individual's space connected and integrated with the Amazon powerhouse.

Voice commands could be suitable for business and first class seats, and could even provide a way for people with certain disabilities to adjust their seat. Voice command is clearly less suitable in economy, but having your seatback IFE connected to your life could prove useful. Did you remember to lock the back door before leaving the house? Did you turn the heating down? Just ask Alexa and worry no more.

As Thomas Müller, Audi's head of electronics, says, "The car as an intelligent conversationalist and digital voice services are nothing new. Integrating Alexa into our infotainment system was the next logical step."

People today don't just want a good user experience, they want a consistent user experience throughout their lives, and Audi's system is a great example of this thinking.

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ROLL UP, SCROLL UP

THE BRIEF

Tablet computers are found throughout the aircraft cabin today, whether they are crew tablets, passenger devices or untethered IFE displays. They are great designs: compact, lightweight, simple, affordable, and with high-quality displays. However, the form factor is a little predictable now, as well as a little rigid, whether for mounting in a seat or carrying around. We would like to see something new, something more flexible, something multifunctional...

THE SOLUTION

We all know that scientists love going back to the future for inspiration, and Dr Roel Vertegaal, director of the Human Media Lab at Queen's University in Ontario, Canada, is no exception. For his future ideas, Vertegaal's thoughts have gone right back to ancient Egypt, specifically the scrolls then used as a medium for information and images.

In Vertegaal's vision, the scroll form remains, but touchscreen replaces papyrus to create the world's first rollable tablet, offering the same seamless flexible real estate of those ancient scrolls. Named MagicScroll, the prototype device is comprised of a 7.5in 2K resolution flexible display that can be rolled or unrolled around a central, 3D-printed cylindrical body containing the device's computerized inner-workings. Rotary wheels at either end of the cylinder enable an infinite scroll action for quick browsing through long lists of information on the touchscreen, and when the user finds something of interest, the display can be unrolled for a full-screen view of the selected item.

The lightweight, pocket-sized body of the cylindrical device is easy to hold in one hand when rolled up, and the prototype also features a camera that enables users to employ the rolled-up MagicScroll as a gesture-based control device, similar to Nintendo's Wiimote. Robotic actuators in the rotary wheels also mean the device can physically move or spin in place in various scenarios, such as when it receives a notification, for example.

Vertegaal also imagines that other functions could be incorporated into the device, such as a cell phone, a dictation device, or a pointing device.

"IN THE NEAR FUTURE, A COMPUTER WILL HAVE ANY SHAPE OR FORM, AND FLEXIBLE COMPUTER DISPLAYS WILL START APPEARING ON ANY PRODUCT OF ANY FORM.," SAYS DR ROEL VERTEGAAL

VERDICT

All the benefits of today's tablet devices, but with a more flexible form factor – literally. Passengers could sit back with this slender cylinder, scrolling through IFE content options until they find something appealing, and once selected, they could expand the display into a full-size screen and slot it into a mounting on the seatback. This could enable simplified aircraft seat design, as well as simplified HIC tests. We already have this today with many PED-based IFE systems, but that flexibility adds a new aspect.

As well as seats, such displays could wrap around any shaped surfaces in the cabin. Just imagine creating the feel of sunshine or a starry night overhead. Or a budget carrier turning the cabin into a veritable Times Square of moving advertisements.

Vertegaal hopes to further refine the device so that it can roll into a form as small as a pen that could be carried in a shirt pocket. Whether his technology takes off or not, some of his principles are worth taking note of: namely 'screens don't have to be flat', 'anything can become a screen' and 'objects can become the apps'.

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Words by Marisa Garcia. Illustration by Scott Garrett


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"The key is to look to any areas where you have solved a problem"

Emily Weal is a chartered patent attorney and design attorney in the UK and Europe. She holds an MA, MSci in natural sciences and a PhD in material sciences from the University of Cambridge. Azhar Sadique is a trademark attorney and design attorney in the UK and Europe, with an LLB from the University of Derby. Both are attorneys at intellectual property firm Keltie, based in London, which specializes in handling IP protections for a variety of innovations, whether technological, commercial, material or aesthetic.

Weal views material science as an area rich for protection. "You see increasing innovation in that area," she says. "You see big patent battles emerging in terms of materials, material properties, lightweight materials… anything from metal alloy compositions to something softer. Nike has a big patent portfolio, for example. It has a patent for Flyknit, which is a lightweight knitted material for trainers. There have been huge patent battles between Nike, Adidas and Puma over the technology of how you knit together the materials. It's an area that people are paying a lot of attention to."

Weal says that there are two questions to consider when companies develop a material innovation that they think could be patented. One is to first determine whether the material is novel enough to be patented, and the other is to know whether a patent will be profitable enough to make the costs of the filing worthwhile.

"The key thing is to look to any areas where you have solved a problem, in any way. Say you thought, 'I want to achieve this outcome: I want to make a material that is 50% lighter than the previous one.' If you have to do anything more than just look it up in a book, if you have to do any sort of problem solving that requires you to work out the answer, then there is a potential for a patent there. Sometimes the change you make may be very small. In materials, you're looking at the composition of a polymer or a metal alloy, and it may be that you only changed the composition by a few percent of a particular component, or something like that.

"But, if it wasn't an obvious thing to make that change, then even a small change can be a patentable one. Have you solved a problem? Has there been some road block in

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the way to achieving what you wanted to achieve, and have you solved your way around that? That's usually a good indicator of potential patentability," Weal explains.

In materials, the problem solved could also be small – an innovation that saves weight or a treatment that improves fire-proofing or durability. It could also be a cost-saving innovation or it could be related not so much to the material as to the process of manufacturing it, Weal adds. Patenting a product, however, is not inexpensive and Weal recommends a sound business strategy.

"You need to make sure that you are going to get a return on the financial investment. Sometimes you find that you could get a patent on it, but it's perhaps not worth doing financially. There may be better methods and strategies. I would look at how important that innovation is to whether people will purchase the product. How important is it to the profit that you might make for this product? If you think the profit is significant enough that it's going to pay for the patent that you filed, then it's probably worth doing.

"An example where it might not be worthwhile is if you have a great idea, but the profit that you make on the particular component is one pence for each one that you sell – if you're not going to sell that many of them, then it's perhaps not worth patenting. There is a financial side. Another side is if a patent is something that stops someone else from being able to use that particular technology. It can be useful as a deterrent. If somebody sees that you have a patent, it might stop them from copying. But, if they do it anyway, in order to get them to stop you would need to enforce the patent. As a first phase, you want to try to resolve through communication with the patent infringer. Often that's how you resolve it. But if they keep doing it, you're going to have to go to court to get them to stop," Weal states.

"There is always a risk that the secret will leak out"

A patent can deter copycats, but because patents are published, they cannot keep an innovation secret indefinitely. Sometimes, Weal suggests, companies may opt to keep their innovations to themselves instead – if they feel they can secure them. This may be particularly relevant for manufacturing processes, but there is always a risk that the secret will leak out, or that a competitor will happen on an identical solution on their own and the opportunity to make the innovation exclusive is lost.

Another consideration is that patents themselves are assets. They can also enhance the value of a company during mergers and acquisitions negotiations. They can also be a source of revenue when sold or licensed. "If you developed a material – a leather, say – for the aircraft interiors market, and you get patent protection for your

ABOVE: ETIHAD'S A380 HAS A WEALTH OF IP. AS ADAM WHITE FROM FACTORYDESIGN, WHICH WORKED ON THE GALLEY AND LOUNGE AREAS SAYS, "FOR 18 MONTHS, WE HAD TO PROVE TO SUPPLIERS THAT WE KNEW WHAT WE WERE TALKING ABOUT. WE HAD TO WORK WITH THEM TO TAKE CONCEPTS ALL THE WAY THROUGH. THERE IS A HUGE AMOUNT OF IP ON THE PLANE FROM WHAT WE'VE DONE"

"The best protection for a material may be design registration"

market area so you can stop competitors in that market, you can license the product to people in different markets," Weal explains. "As they are not your competitors, you are quite happy for them to use your amazing leather in some other field and you can take the royalty fees for that. They are not competing with you directly. You can operate in your area and keep your competitors at bay, but you are really getting the most out of the IP that you developed."

In other cases, the best protection for a material innovation may be design registration, rather than a patent. Sadique says this might be a strategy to protect unique finishes and textures or color combinations.

"That could be something that would be covered under design protection," he says. "What can be protected from a texture or contour point of view differs slightly between the UK and the EU, but it is something that you can explore. It may be something that is not necessarily patentable, but there may be elements of its manufacturing process that are protectable. A design can be afforded protection as a registered design at any point from its creation. It's always best to first obtain the design protection. If someone out there starts to use something similar, it is much easier to wave a registration certificate in front of them."

The test of what can be registered as a design is usually the degree of novelty, but it is less detailed than the requirements for a patent. "I can get examination reports on whether a design is particularly novel or new, but the threshold is pretty low. The time period is also relatively quick. You can get a registration certificate in four to six months – providing the design hasn't been disclosed in a public domain for a period longer than 12 months," Sadique says. "Even if you may consider it to be a basic contour or texture, or whatever it may be, it can actually pass the test for a design application and a registration."

For some surfaces and finishes, the IP protection would be for the application of that finish to a part. For example, if a manufacturer developed a material finish that feels genuinely like wood or marble, there may not be a design protection because wood and marble are common materials in themselves. They are not inherently novel, although the application in aerospace would be.

"You could potentially get design protection, if you took the protection down a step and had each individual component made from those materials registered as designs. Say that you have an armrest that features the material that looks like wood in

Patents and Brexit

On September 24, 2018, the UK government published guidance papers explaining arrangements in progress to manage Brexit in the event of a no deal scenario in March 2019. Five papers have been published in respect of IP, and here Gordon Harris, co-head of IP at Gowling WLG, discusses the most notable take-homes from those papers.

The UK government's September 24, 2018 Brexit patents guidance contains no real surprises. Both of the existing patent systems – the national patent system and the European patent system – are largely outside the remit of EU law and will not be impacted by Brexit. Further, while the system for patent term extension in qualifying circumstances (supplementary protection certificates [SPCs]) derives from EU law, this has long been implemented into UK law. Combined with the planned preservation of the *acquis* (EU law) by the UK's EU Withdrawal Act 2018, the system for grant and enforcement of SPCs in the UK will not be impacted by Brexit.

The most notable take-home from the September 2018 guidance is that there will be no immediate change to the current system of requiring an applicant for a UK national patent to supply an address for service which is in the UK, another EEA state or the Channel Islands.

Although this is not noted in the September 2018 Brexit patents guidance, in a no deal scenario the present regimes governing service, jurisdiction and enforcement in the EU and the EEA will cease to cover the UK. Such matters will instead be governed, from the perspective of the UK courts, by common law. These well-established rules and procedures presently govern matters of this nature in UK proceedings in respect of parties in non-EU/EEA countries, such as the USA.

Whether the UK will be able to remain within the new Unified Patent Court and Unitary patent systems following a no deal remains unresolved.

Note that in the event a deal is reached on the terms of Brexit, it will likely include a transition period from March 29, 2019 until December 31, 2020. During such a period, the status quo would largely remain in place for IP. The September 2018 guidance does not address this scenario.

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it, or if it was the lining to the drop-down tray, then the actual armrest or tray could be registered as a design, and you could say that the design is made of this particular type of material. But you would have to accept that the protection afforded would be for the visual aspect of it being in the form of an armrest or tray," Sadique says.

"Your best way to protect that would be patenting, because you would have had to overcome a problem in working out how to create the look and feel of wood and marble," Weal says. "That would be a technical solution that could well be inventive and could be patentable."

Trademarking can be trickier, especially for colors and design elements used in liveries or décor that may be interpreted as fairly common for the industry. The key determination is whether a similar detail or logo could confuse consumers and trick them into buying a product other than what they intended to buy. For airlines, that's a high bar because consumers must make a series of conscious choices to book their tickets, which have nothing to do with livery or logos. But it is possible to pursue copyright violations for evident and intentional copies of iconographies and logos.

> ***"You have to break the cabin design down to key features that contribute to ambience"***

"If you decide to try to enforce a copyright and lose, it leaves you open for anyone to come up with similar logos and to try to rip you off," Weal warns. "I think that's something a company may want to keep in mind."

It is also possible to register ambience as a design – something that Apple has succeeded in doing with the 'feel' of its stores.

"If you have a full design for a cabin and decide that you want to protect it, you have to break it down to the key features that contribute to the ambience," Weal says. "Let's say that in a future cabin there is some sort of ceiling light that creates a galaxy effect, a seat layout that is unique, and a particular seat color combination, you can protect each of those as contributory elements. You can sketch out a cabin shape and show the ceiling and the separate design building blocks, protect them separately, and have a registration that protects various of these elements used together. Say, four or five different assets that all contribute to the general look and feel. It may add up to five different design protections all together – any one of the aspects individually, or all of the aspects together – you start building it up from key features."

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FROM AUGMENTED REALITY IN ENGINEERING, TO AUTOMATED PRODUCTION, TO AUTONOMOUS AIRCRAFT… AMANDA SIMPSON, AIRBUS AMERICAS’ VP OF R&T, SEES TECHNOLOGY PLAYING AN EVER-LARGER ROLE IN AEROSPACE. SHE ALSO PREDICTS WOMEN PLAYING A MUCH LARGER ROLE AT EVERY LEVEL OF THE INDUSTRY

Interview by Marisa Garcia. Photo by Mike Coppola/Staff

Amanda Simpson, vice president for research and technology at Airbus Americas, believes in having space to grow. She has a unique combination of experience that helps her recognize the potential in the simplest of innovations. She also possesses a unique enthusiasm for aerospace and an optimism for the future that is delightfully contagious. We spoke to her at length to hear her views on innovation and which developing aerospace technologies she’s most excited about.

“I define innovation as new ideas – hopefully good ones. Sometimes it’s about combining existing ideas in new and creative ways that create a new concept that no one has put together before. That’s how I define it,” she says.

“I’ve seen people come up with an idea and not recognize the value that it has because they don’t have the insight or the


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"It's not only about how you recognize an idea, but about how you mature an idea"

ABOVE: AMANDA SIMPSON IN 2015, WHEN SHE WAS EXECUTIVE DIRECTOR OF THE OFFICE OF ENERGY INITIATIVES IN THE US ARMY. HERE SHE IS DISCUSSING WITH USAID EMPLOYEES HER EXPERIENCES AS THE FIRST OPENLY TRANSGENDER WOMAN POLITICAL APPOINTEE OF ANY PRESIDENTIAL ADMINISTRATION. PHOTO BY ROBB HOHMANN, USAID

understanding of the greater impact that their concept has. It's not only about how you recognize an idea, but how you mature an idea so that it becomes reality – that's crucial. That's what the job is all about. It is about recognizing these ideas and implementing them. Infrequently am I the person who innovates – rather I make that innovation into reality or at least get it along that path."

Simpson counsels innovators not just to share their concepts, but to share them with people who have the knowledge and expertise to appreciate their value in a particular field.

"It may be a better concept, but you need to find someone who is familiar with the market – and I use 'market' in a very broad sense –in the context that they can say, 'this has already been tried' or 'that's really novel and I can see how it has a benefit for consumers or for customers, or for others,'" Simpson says.

She also advises against being too protective of creations and not sharing them for fear that they will be stolen. "I'm quite positive that if someone did a thorough investigation through the archives of the patent office, they would probably come across many good ideas, real innovation that never went anywhere because people didn't know how to share it and how to make it a reality," she says.

BELOW AND LEFT: THE WIVES OF THE GEMINI 4 ASTRONAUTS VISITED MISSION CONTROL IN HOUSTON TO SPEAK TO THEM ON THE COMMS. AS OF JULY 2016, OF THE 537 PEOPLE WHO HAVE TRAVELED IN SPACE, 61 HAVE BEEN WOMEN

Setting out

Simpson pursued a career in aerospace inspired by growing up as a child of the 1960s, tracking the developing space program. She believes that a sense of wonder is critical to inspiring the next generation of aerospace professionals, both men and women.

"I wasn't going to Woodstock; I was glued to the TV and the newspapers watching the build-up and our eventual success at our moonshot and the space program. I don't remember Mercury, but I do remember the Gemini missions and everything that went on with Apollo. Then, the build up to the space shuttle when I was in college. That excited me and I wanted to be part of that. Going into engineering and finding out how all of these things work, that all made sense to me. I said, 'This what I need to do'. I can't say that I had engineers or such in my family, but it was what intrigued me," she recalls.

The types of innovations that happen most often in aerospace, Simpson says, aren't big and flashy. "Sometimes they are small and incremental, and incorporated in ways that few ever notice. This is happening all of the time," she says.

Simpson believes that some of the innovations that will shape aerospace in the future are not so much in products but in processes – facilitated by automation and virtual or augmented reality.

"I worked at Douglas Aircraft in Long Beach, California, in the early 1980s and, quite frankly, we are building aircraft pretty much the same way we did almost 40 years ago. So there is real opportunity to leverage automation and information for how we build and support aircraft," she says.

"I think we're going to start seeing more and more robots and automation on the [factory] floor, changing how we build aircraft and how we move equipment around. We've recently started to see it. When I was at Douglas, you'd see people on three-wheeled bicycles with large baskets, maybe even pulling a trailer with some more parts on it, all around the production floor. We're going to start seeing more of that work handled by robots that navigate autonomously around the production floor."

Information processing is also due for change, according to Simpson. "We are designing aircraft with computers much more accurately than we did in the past – when I started, it was paper and vellum – but when you get to the production floor, where they are putting together the airplane or installing the interior, they are pulling up drawings from a computer usually sitting outside the aircraft or drawings with work instructions that they have to refer to, and going back and forth.

"I think we're going to start seeing opportunities with smart goggles or smart glasses whereby installers will actually be able to see the instructions in front of them while they are working on something. They'll have a diagram or a picture of how things should be fitted, and they can then actually move the pieces and parts into that exact position. I think that is going to be really important when we get into maintenance, where they can see where things are supposed to be versus trying to refer back and forth to a computer screen or PDA, or even a piece of paper."

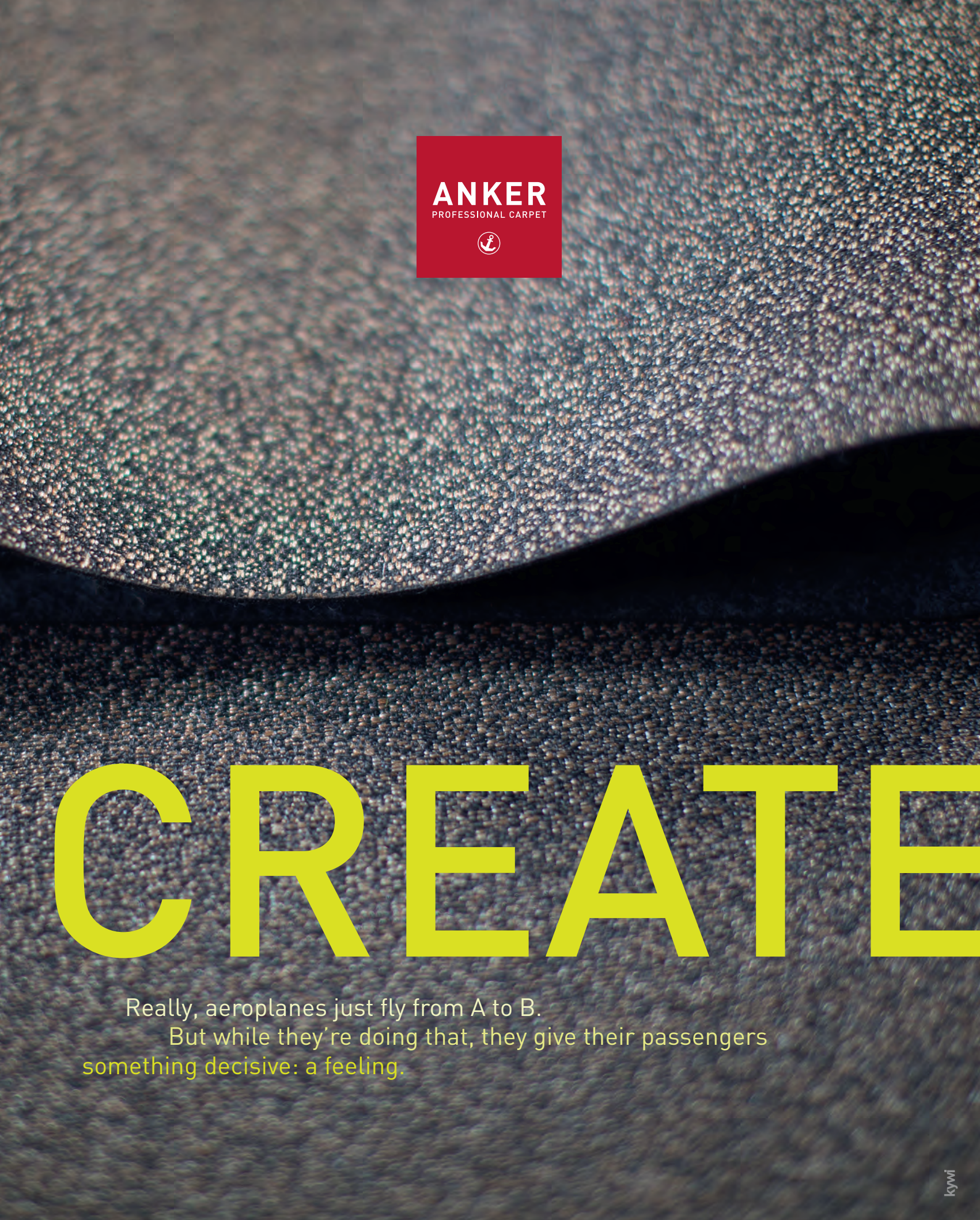
AUGMENTED REALITY TECHNOLOGY IS BEING USED TO ENHANCE DESIGN AND PRODUCTION PROCESSES AT AIRBUS

"We're seeing a lot of new materials coming into play that will impact interiors"

This virtual way of imparting information, Simpson believes, will also be used in the training of mechanics, maintenance crews and pilots. Virtual and augmented reality tools will enhance training, reducing the length of apprenticeships. "I was recently in a facility, wearing 3D glasses, and it felt like we were standing in the aircraft," she says. "You could walk around. You could look into corners and could see right down into the parts and how they were assembled. There wasn't an aircraft being built within 15 to 20 miles of where I was standing, but it was like I was there inside an aircraft. That ability to orient people to a work environment, to instructions, before having to tie up the actual hardware, is going to be a real game-changer."

But aerospace innovations will not be limited to digital tools or robotics – some will be very tactile. "We're seeing a lot of new materials coming into play that will impact interiors," Simpson says. "They're going to become lighter, stronger, they're going to require less prefabrication prior to installation. There's a real opportunity there. We are looking at that in great detail."

Looking further into the future, 20 years out, Simpson believes that the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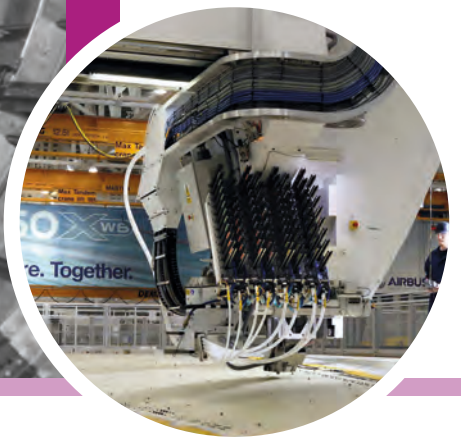
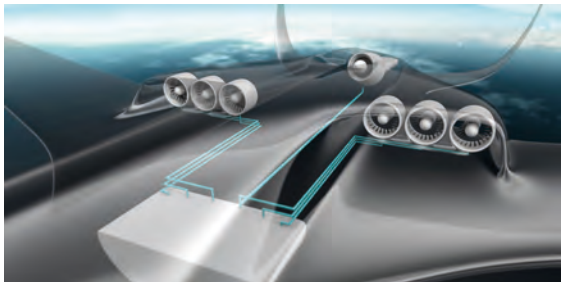
LEFT: SIMPSON WASN'T THE FIRST FEMALE ENGINEER AT DOUGLAS AIRCRAFT. IN THIS USAF ARCHIVE IMAGE FROM OCTOBER 1942, WORKERS INSTALL FIXTURES AND ASSEMBLIES TO THE TAIL FUSELAGE SECTION OF A B-17F FLYING FORTRESS BOMBER





"One of the least efficient decision-making machines in the sky: the human psyche"

electrification of aircraft and automation of aircraft operations are the most likely paradigm shifts.

"There is going to be a move, probably over the next decade, away from turbofan jets to electric propulsion. It's cleaner, it's quieter, and I think the traveling public is going to insist on it," Simpson says.

She acknowledges that there are still details to be worked out, such as the storage and distribution of electric power. But, she says, "Those things are being worked on, and once resolved, will have a huge impact."

There will also be advances in automation of personal point-to-point transportation, including on-demand UAV services, and electric propulsion and automation will help deliver these services. Simpson also believes that automation is coming to the flight deck. Despite pilots voicing concerns about single-pilot operations, Simpson believes it is both practically and economically inevitable.

"As things become more automated in the aircraft, there may not be a need for the redundancy of having two people [in the cockpit]. Keep in mind, we already have aircraft that are self-navigating. Pilots today are much more like systems managers – they input the information and the computer runs the flight. They may be manipulating the throttle and handling communication, but all of those things are going to start moving to computers in the near future. That's going to be a huge shift as we move more into automation," Simpson says.

"It's going to come down to economic issues, without compromising safety. Aerospace has an amazing safety record, and I don't believe anyone is going to compromise that. But, at the same time, we have to understand that there are other ways to achieve that level of safety other than having probably one of the least efficient decision-making machines in the sky: the human psyche."

ABOVE RIGHT: THE A350 XWB PRODUCTION LINE IS HIGHLY AUTOMATED

ABOVE LEFT: AIRBUS'S E-THRUST ELECTRICAL DISTRIBUTED PROPULSION SYSTEM CONCEPT IS PART OF SERIOUS RESEARCH

BELOW: AIRBUS IS COMMITTED TO ENSURING THAT AT LEAST 25% OF NEW RECRUITS ARE WOMEN. PICTURED HERE IS MARIE-LAURE ROUX, HEAD OF AIRBUS'S SAINT-ELOI PLANT IN TOULOUSE, FRANCE

DIVERSE THINKING

Simpson is an important figure in aerospace, and indeed an important woman in aerospace. She credits Airbus for developing mentorship programs designed to encourage underprivileged and minority students, including women, to explore careers ranging from defense to aviation, to aerospace. She also points out that Airbus has put women in charge in critical STEM roles including the current and previous chief

INSPIRING WOMEN

Simpson believes that mentoring and creating opportunities are critical for a diverse workplace that incorporates many talents.

"To get people inspired – particularly women – you have to expose them to role models. Show them women who excel or are participating in the aerospace industry. I cannot tell you the number of women that I meet at different corporations, or at airlines and small companies, that are incredible experts and are making massive impact on the aviation industry. But no one hears about it.

"It's so important for young girls to see that women are out there doing the job and participating. We could go back to the 1940s and Rosie the Riveter was able to pick up pretty much any job that the guys were doing. Today, we've lost some of that," she says. "Girls need to see the ordinary engineer or the pilot. It doesn't have to be the astronaut. Just the ordinary people who are making the difference and can tell their story.

"We have to encourage them. We have to mentor them. We have to give them those opportunities and promote them. But it's not just on the women, it's on the men. Men have to stand up and say, 'Jane is just as good as John and I rely on her to make the decisions on the product'. It can't just be women pushing women. It has to be men in industry who will stand up and support women. We need more women in leadership roles that are visible so that girls don't leave math and science in school, and that they realize that they can have a career and a family and be successful."

"That's the game-changer that women bring to the workplace... inspiring others"

ABOVE: SIMPSON IN 2015 AS EXECUTIVE DIRECTOR OF THE ARMY OFFICE OF ENERGY INITIATIVES. DURING THE LGBT PRIDE MONTH OBSERVANCE AT NAVAL SUPPORT FACILITY DAHLGREN, SHE DISCUSSED THE RELATIONSHIP BETWEEN THE WAY WE THINK AND THE WAY WE ACT. PHOTO: BARBARA WAGNER

BELOW: AIRBUS GROUP WORKS WITH ELLES BOUGENT, A FRENCH ASSOCIATION SET UP TO ENCOURAGE HIGH SCHOOL GIRLS AND YOUNG WOMEN INTO CAREERS IN TRANSPORTATION ENGINEERING. AT THE 2014 PARIS AIR SHOW, AIRBUS WELCOMED 150 YOUNG WOMEN TO HELP INSPIRE GIRLS TO CONSIDER TECHNICAL CAREERS IN THE AEROSPACE INDUSTRY

technology officers and the chief engineer of single-aisle airplane production in Hamburg. She considers herself fortunate to have had a unique career and a range of opportunities in different sectors of aerospace, both civilian and military. Simpson says it has helped her identify opportunities for innovation that others might miss.

"Tying all of those little bits together, and being a generalist, is sometimes a very valuable asset," she says. "I've spent almost 40 years becoming the best generalist I could. Because I have been a generalist and moved beyond the technical side of engineering, I learned how to talk to people, how to communicate with politicians, and how to develop and understand policy and regulations so that I am able to communicate at a high level and with detail, because of my technical background. I encourage people to develop skills beyond their technical focus or the degree that they pursue at university," she says. "I talk to people and share my ideas and my dreams and how I see the future, which inspires other people to put their faith and their trust in me. That's what brought me here. That's the game-changer that women bring to the workplace. That is a critical skill."

Simpson sees great things ahead for humanity, if we only give opportunities a chance to develop.

"I am very optimistic about the future," she says. "People want to be in the future that we envision. They don't truly want to stay where they are. They want to be the *Jetsons* and explore the stars and be able to move around the planet freely. All of the things that the future holds and promises are inspiring. That's what brings people into this industry. They want to build a future for themselves and for their children. That's what keeps me going, and that's what inspires a lot of people."

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BRING LIFE TO THE CABIN

LED technology is reaching maximum efficiency, posing the question of how can we better use the light itself. Matt Bell, chief electrical engineer at AIM Altitude, both broached and answered the question.

"This may be through better use of animated light sources – such as pixelated LED, washing onto new or adapted surfaces and textures. Or through backlighting, using new materials for hidden-to-lit features, creating more dramatic effects. Finnair's A350 Northern Lights lighting scenario is a great example of how lighting animation can be used.

"In the relatively short term, light washing will leap forward, with advances in projection technology as the most likely method to transform an internal space with not only color, but also moving images.

"Interactivity will be key: lighting will acknowledge physical actions via sensors or gestures. Greater use of li-fi [light fidelity – search for it on the *Aircraft Interiors International* website for details] will mean a cabin can become alive as the passenger walks through, allowing areas to be tailored, based on connection to the aircraft's lighting network."

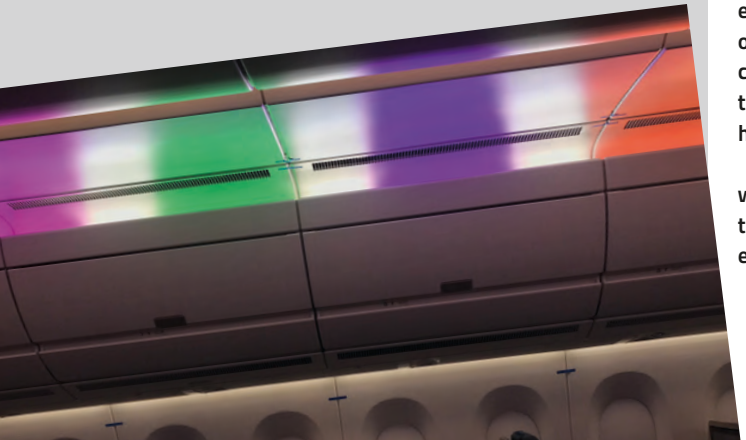
Mood lighting the world

Daniel Baron, owner of LIFT Strategic Design, considers mood lighting the next level of brand differentiation, not only in aircraft cabin lighting, but also in the wider world.

"Just as on-time performance is critical to perception of reliability, loyalty-driving passenger experience requires 'wow' factor with a fierce level of consistency," he says. "We need to shed the mindset of 'It's a small aircraft, so no fancy mood lighting'. The industry must take a holistic approach to mood lighting, with hardware and software capable of replicating the same colors and effects across all fleets.

"We must cast off the notion that a workspace requires a cold environment. We need to incorporate better lighting options, including mood lighting, into galleys. This is already being done on a BFE basis, but many airlines or lessors cannot or will not pay. A shift to the SFE side of the equation is necessary.

"The next frontier is partitions and other panels that illuminate without bulbs. Combinations of color, pattern, texture and illumination will forge new perceptions of 'wow'."



GERM-KILLING LIGHT

Boeing engineers and designers have developed a self-cleaning lavatory prototype that uses ultraviolet (UV) light to kill 99.99% of germs. The cleaning system can disinfect all surfaces after every use, in just three seconds. Boeing believes this self-cleaning technology, combined with touchless features, will enhance the passenger experience – and passenger health – on commercial flights.

The lavatory uses Far UV light that would be activated only when the lavatory is unoccupied. Far UV is different from the UVA or UVB light in tanning beds, and is not harmful to humans. Boeing engineers have shown through testing on their prototype that this innovation can minimize the growth and potential transmission of microorganisms. Boeing has filed for a patent on this concept.

"We're trying to alleviate the anxiety we all face when using a restroom that gets a workout during a flight," explains Jeanne Yu, Boeing's director of environmental performance. "In the prototype, we position the lights throughout the lavatory so that touch surfaces like the toilet seat, sink and countertops are flooded with the UV light once a person exits the lavatory. This even helps eliminate odors."

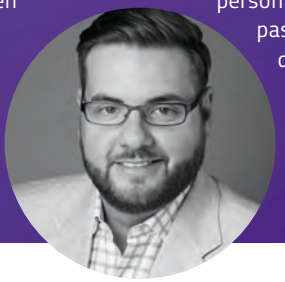
The system, which Boeing says will require further study before it can be offered to airlines, would lift and close the toilet seat by itself so that all surfaces are exposed during the cleaning cycle. The design also features a hands-free faucet, soap dispenser, trash flap, toilet lid and seat and a hand dryer. A hands-free door latch and a vacuum vent system for the floor are also under study, to keep the space as hygienic as possible between scheduled cleaning.

Schott Aviation's HelioCurve is a flexible contour lighting system for seats. The extremely narrow bending radius means that the system can be integrated virtually anywhere around the seat. It is also suitable for illuminating corridors and other surfaces.

LIGHT PROJECTION WILL BE BIG

"Mood lighting powered by LED systems has proven its value in delivering an enhanced passenger experience from a well-being standpoint for over a decade now," states Cristian Sutter, a cabin design specialist at British Airways. "Having said that, beyond lighting scenarios working with different phases of the flight, mood lighting has been a very one-dimensional affair.

"Light projection has the potential to become a game-changer in future cabin lighting and to change the way we currently conceive not only lighting, but also cabin design as a whole.



"Light projection could enormously simplify seats and cabin trim and finish; imagine a neutral scheme that comes to life by projecting new colors and textures, creating deeper and richer scenarios that could be updated seasonally.

"Light projection over entrance areas could project personalized welcoming messages to boarding passengers; social areas could display destination information and interactive content. Bulkheads, sidewalls and ceiling panels will become a dynamic canvas, creating endless branding touchpoints and customization possibilities."

A growing role for lighting

Diehl Aviation has a particular interest in the entrance area of passenger aircraft. "This is where the passenger experience begins," says Silvan Fiedler, senior manager of industrial design. "A personal welcome on board is important. Enjoying the environment, being guided to allocated seating, makes passengers feel in good hands."

The company is working to transform the entrance area. One idea is an integrated ceiling lining combined with state-of-the-art illumination technology. Ceiling projection could be used for differentiation, customizing and advertisements. It also works with specific cabin lighting scenarios. Besides the functional effect of brightness, lighting features such as ambient lights or smart surface illumination will increasingly dominate entrance areas.

"The appearance of the door area is a passenger's first and last impression of the cabin", adds Marc Renz, head of business development for cabin systems, Diehl Aerospace.

One promising technology Diehl Aviation is working on is projection systems that allow smart surface visualization. Virtual wall-paintings, static or moving pictures, advertising and branding will not only increase passenger comfort and flight experience, but will also open new revenue streams. Integrated lighting scenes and scenarios, along with cabin mood lighting and enriched by human-centric lighting, will soon accompany modern aircraft cabins, according to the company.

Besides lighting technologies, Diehl expects displays to play a bigger role. For example, each passenger may be greeted personally by screens integrated in the entrance area lining of an aircraft. Further displays in the overhead stowage compartments or cabin sidewalls may guide them to their seats and eventually even to their pre-reserved luggage storage.

TAKE A JET LAG DIET

We asked LYS Technologies, a London-based lifestyle and well-being technology design brand, for its take on future cabin lighting. The company has been working on helping users improve 'light-habits' for healthier urban living.

LYS Technologies' head of content, Shira Jeczmienat, says, "With our algorithm that combines light intake captured by our wearable device [pictured above and below], with age, gender and chronotype set in the accompanying app, the LYS 1.0 knows what type of light the user needs, according to the time of day, when they wake up and go to sleep, and their profile."

The company is also developing a Jet Lag Diet feature – three days before taking a long-haul flight, the app learns the user's 24-hour cycle and light habits and needs. On boarding, the app and wearable connect to the lighting system, translating the collected data and the app's knowledge of the user into the passenger's personal lighting, both in their seat and as they move around the aircraft, based on where each user is in their 24-hour cycle and what their body needs. The Jet Lag Diet will prepare users for preflight and post-flight adjustment, helping acclimatize them in their new location, to reduce the effects of jet lag.

Jet lag affects flyers for 2.2 days on average. LYS believes that the Jet Lag Diet can reduce this by at least 20%.

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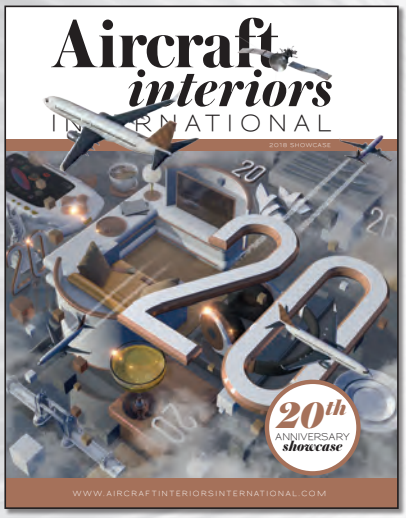

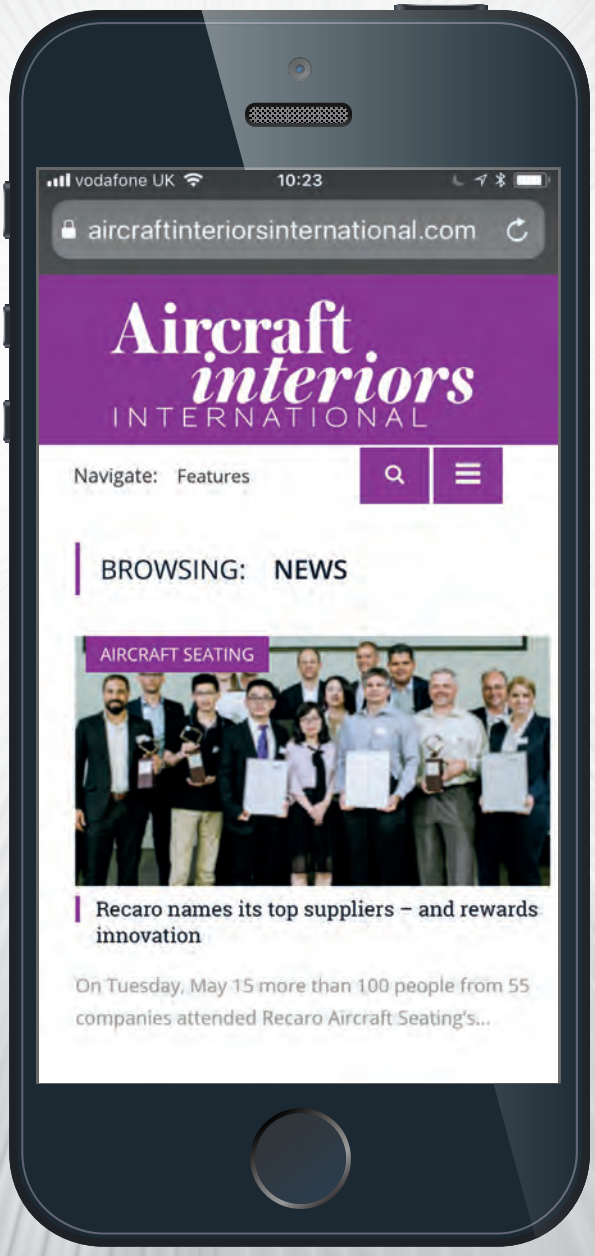

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SIGNS OF THE TIMES

Astronics Luminescent Systems Inc (LSI) is introducing new state-of-the art LED cabin lighting systems to the market, including seat-mounted floor path emergency exit marking, emergency exit signs, lavatory occupancy signs, and overhead emergency lighting. The Universal Exit Signs are claimed to considerably simplify configuration management by eliminating the requirement for multilanguage exit signs. The overhead emergency lighting embeds discreetly between ceiling panels to preserve cabin aesthetics and airline branding concepts. Meanwhile the lavatory occupancy signs feature automatic dimming to reduce the pictogram's brightness when the cabin lighting enters dark mode.

These innovations combine mandatory safety requirements with a focus on design and styling. These systems were recently certified on the Airbus A350 XWB, with more certifications pending.

FLEXIBLE THINKING

Astronics PGA has developed a new RGBW strip lighting system, the Nuancia, to provide ambient lighting that can be easily controlled by a lighting management system. The lighting can highlight cabin elements such as monuments, armrest compartments, footrest areas, cabin ceilings and lavatories. Ultra flexible with a 2in (5cm) bend radius, the Nuancia incorporates the latest LED technology in 50mm (2.1in) increments for a consistent and attractive illumination experience. The Nuancia can be ordered in any length and will be available in 2019.

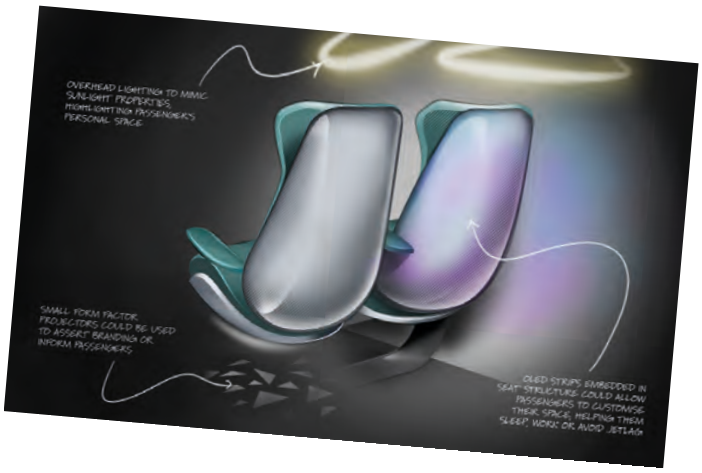
Telling stories with light

Light can play a key role in environmental comfort, affecting passengers' behavior and well-being. "We will expect to see dynamic color changing during each flight phase to create different ambiences," states Catarina Ferreira, a designer at Portugal-based studio Almadesign.

"Passengers experience boarding with bright, welcome brand colors and take off with a calm and soothing light spectrum. Imagine an intimate, appealing space during meals, as if you were having dinner in the city center. At night, passengers can experience a magical ambience, with comfortable dimmed light details.

"Cabin lighting is getting closer to what you find in nature, as lighting systems are getting smarter, more sophisticated, more flush, embedded and integrated into materials, but still capable of anticipating our movements, moods and expectations.

"Light will also continue to bring brand identity into cabin interiors. The TAP A330 NEO brings this idea to life with a 'welcome effect' ceiling, where a window of zenithal light is filtered through a pattern of Portuguese tiles. These elements contribute to defining the onboard experience and creating the first contact with the TAP brand while boarding the aircraft. Light will continue to enhance the cabin interior and contribute to a memorable flight experience."



Integrated thinking

"In recent years, cabin lighting has changed from a stark, white, clinical affair, to something dynamic that airlines are using to assert their brand and delight passengers," explains Nick Lendon, lead industrial designer at Madrid-based design consultancy Mormedi.

But how about personalized lighting? "Using lighting to create ambience is an established tool in premium cabins, but new projector and flexible OLED technology suggests that it might not be long before we have advanced lighting components integrated into seat architecture – even in economy.

"With the health benefits of lighting conditions well established, hopefully airlines will consider the illumination needs of the individual, not just the cabin. In future, lighting can be used to encourage hunger, tranquility, or even sleep."

INTRODUCING µLEDs

Rockwell Collins is working on the Secant Illumination Panel, a 2018 Crystal Cabin Award finalist which provides an alternative concept for lighting solutions within the cabin. The panel utilizes white, RGB or RGB+W µLED clusters to create a display that can be made integral to the aircraft structural panels.

When disabled or in general illumination mode, it looks like a standard panel. Rockwell Collins expects the Secant Luminous panel to be the first aircraft-mounted display panel to use µLEDs as pixels and as general lighting, seamlessly incorporated into structural panels.

LINEAR LIGHTING

The LED Linear Light from PWI uses cutting-edge technology to offer a product with unlimited application opportunities and lighting scenarios such as mood lighting, glare shield lighting, lavatory lighting, and more. The light is completely customizable, offering numerous selections in terms of length, application placement, LED color temperature, flexible dimming controller and cabin management system compatibility hook-ups.

The light comes in 2.56in (6.5cm) flexible printed circuit segments with a maximum length of 16ft (5m). Each foot of light features 1,000 lm output while maintaining a constant color temperature throughout the dimming range. Additionally, the controller offers pulse width modulation, analog and push button step-dimming options, with the potential to add customized dimming modes.

Research shows the way

Cabin lighting specialist STG Aerospace is taking a particular interest in the research into the physiological and psychological impact of light that is being undertaken in other areas, including automotive and healthcare, to see how these findings can be incorporated into its own product development ambitions – the creation of a truly human-centric, pan-aircraft, total cabin lighting solution.

The company's portfolio already features the photoluminescent saf-Tglo emergency floor path marking system and saf-Tsign informational signage range as well as liTeMood LED ambient cabin lighting systems – including a full color version for Airbus – and a square-beam reading light.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tren

CATHERINE BARBER

Acumen Design Associates

CATARINA FERREIRA

Almadesign

ALESSIA GIARDINO

JPA Design

ROSY HAZELWOOD

Tangerine

OUR PANEL OF TOP EXPERTS TRAWLED 2018'S MAJOR FASHION, FURNITURE AND AUTOMOTIVE SHOWS TO FIND THE TRENDS THAT WILL INFLUENCE FUTURE CONSUMER TASTES AND THE NEXT GENERATION OF AIRCRAFT TRIM AND FINISH. AND 2018'S KEY THEME SEEMS TO BE… SOFTNESS

trends forecast

MARIA KAFEL-BENTKOWSKA
PriestmanGoode

ELINA KOPOLA
TrendWorks

EMMA RICKARDS
West 6

CATHERINE BARBER
Acumen Design Associates

SOFTER, MORE WELCOMING FINISHES ARE COMING, SAYS CATHERINE BARBER, CMF CONSULTANT AT ACUMEN DESIGN ASSOCIATES

This year has seen more emphasis placed on tactility and texture in the aircraft cabin. Chunky knits and woven fabrics are being used to reflect earthy textures and create a softer look and feel for premium interiors.

At Salone Del Mobile in Milan, bouclé tweed was being used to cover not only furniture but also headboards, and in some cases, walls. We are keen to see even more textiles used on vertical surfaces, to improve both the tactile appeal and the acoustics of cabin interiors. Although it has not yet resulted in a product available on the market, Sekisui SPI's recent collaboration with Tapis, Anker and Rohi at Aircraft Interiors Expo is just one example of innovative thinking that can be achieved when there is collaboration in the supply chain. By creating a seamless junction between walls and floors, designers can bring fresh perspectives to entranceways.

As airlines place more importance on acoustics and soft-touch materials, acoustic panels in seat shrouds have increasing potential to become decorative, delivering unique 3D-formed patterns. MGRSoftWall panels – capable of being used on seat surrounds, bulkheads and monuments – have already made a positive impact in the aviation industry, and this trend looks set to continue. As the demand for soft-touch grows, we are seeing more customers requesting leather for more than just seat upholstery; it is also being adapted to create premium table top and anti-slip surfaces.

In recent years airlines have recognized the higher demand for luxury reception spaces aboard aircraft. As a result we also expect to see an increase in softer-looking, but still hard-wearing, carpet and non-textile flooring (NTF) panels being used in the industry. There has already been a good take up of woven plastic rattan-style flooring in the contract market, and this type of material would allow airlines to create more hospitable galley and entrance areas, replacing the industrial look used in some cabins today.

While these types of materials have the potential to bridge the gap between carpet and NTF, the challenge going forward will be making them easy to clean, as well as encouraging more airlines to repurpose materials to make cabin interiors more sustainable.

LEFT: SEKISUI SPI'S SEAMLESS COLLABORATION WITH TAPIS, ANKER AND ROHI

BOTTOM LEFT: BOUCLÉ TWEED ABOUNDED IN MILAN

BELOW: AIR FRANCE HAS FITTED MGRSOFTWALL IN ITS BUSINESS CLASS FOR A LUXURIOUS FEEL

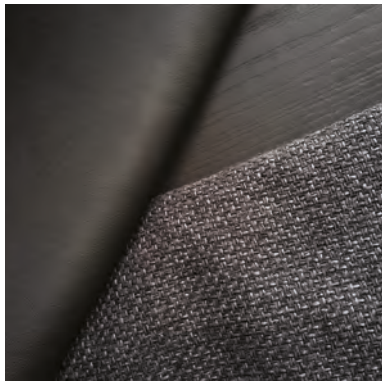
ALESSIA GIARDINO
JPA Design

SOFT AND SUSTAINABLE ARE 2018'S KEY TRENDS, SAYS ALESSIA GIARDINO, LEAD CMF DESIGNER AT JPA DESIGN

Exciting developments in fabrics and finishes over recent years have been met with great interest in a number of sectors, including automotive interiors, furniture, consumer electronics and sportswear concepts. The sensory and homey qualities of textiles help to ease the interaction with technology into our everyday lives.

Tactile, soft and approachable is the Google Daydream VR system that, along with other tech products, dominated this year's CES and Milan Design Week events. By bringing such 'textured' tech into lifestyle, Google and similar companies are embracing and elevating this growing trend.

Similarly Volvo has embraced fabric in its new 360c autonomous vehicle concept. Tapping into the trend of extending living space and style into the car, the result has been to recreate a domestic environment by using very tactile and emotional media. Whether woven in dark or light shades, twisted or melange yarns, deep or muted tones, the textile is layered onto other natural rich textures, such as leather and wood, and within a monochromatic palette, suggesting a calm and homogeneous look and feel.



Similarly in aviation, fabric is now expanding beyond its traditional application as simply a seat cover and stretching into the space around the passenger, particularly in the premium cabin. Textiles will increasingly be used on lateral walls for passengers to comfortably lean against, or to integrate tech features, without being intrusive for the users. This approach answers the double need for a space that feels more domestic and human, as well as having functional qualities such as sound absorbancy.

Leather is seen used in tonal combination with fabric for crafted upholstery, or to entirely define a product shape, like a lamp. This emphasizes the softness approach to make hardware products soft and human for the user.

Looking to the future, we see multinational businesses embracing sustainability, placing it at the heart of their business ethos and innovation strategies. Natural dyes, and renewable and recycled fibers, provide an additional quality and deeper story. Sustainably produced materials and novel techniques constitute a powerful and ambitious trend.

A unique 3D-printed flooring with terrazzo infill offers environmentally friendly production and a long-lasting quality. The first floor of this type will be implemented in Amsterdam's Schiphol Airport, an excellent example of meaningful material thinking that will undoubtedly influence aircraft cabin interiors of the future.

ABOVE: TONAL COMBINATIONS BY NORM ARCHITECTS

LEFT: THE TEXTURED TECH OF GOOGLE DAYDREAM

FAR LEFT: BOTH SHELLS IN THE FOGIA CHAIR BY NORM ARCHITECTS ARE INDIVIDUALLY UPHOLSTERED, MAKING IT EASIER TO CHANGE THE LOOK OVER TIME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ROSY HAZELWOOD
Tangerine

COLOR, TACTILITY AND TECHNOLOGY ARE KEY DRIVERS, OBSERVES ROSY HAZELWOOD, SENIOR CMF DESIGNER AT TANGERINE

Earlier this year, Tangerine's CMF and design team went to Milan's Salone del Mobile Design Festival. It was a fantastic opportunity to see design trends from around the world. We observed many inspiring objects and new ideas, but there seemed to be one overriding trend: trust in technology.

In the wake of countless data breaches and more recently the Cambridge Analytica scandal, there has been a reaction from consumer electronics companies in particular, to try and build new relationships with customers through CMF application. Large tech companies were reinventing how we interact with technology, aesthetically and haptically, by using materials and colors that are softer, friendlier and more domestic.

This shift in material and color application has potential to influence cabin interior design as it is challenging our expectations of how technology interacts with an environment in both tangible and intangible ways, forming a new relationship with consumers.

Of two major trends recognized, the first is hidden technology. At the Milan festival, technology was no longer being designed to stand out, but instead it sits seamlessly with domestic environments. Li Edelkoort, one of the world's most famous trend forecasters, curated an exhibition for Google, in which she set up small comfortable 'real-life' scenes in a house with a beautiful courtyard in the backstreets of the city. It felt very personal and quaint and not at all like an exhibition of a big technology company.

Technology was also increasingly playing with the senses, providing a more seamless and holistic user experience. By creating interactive installations in collaboration with artists and designers, brands such as Sony were able to articulate the benefit of their technologies in new and unexpected ways. The experience was engaging, exploratory and innovative, becoming more memorable in the minds of the consumers.

The second major trend is color families. At Milan we observed an unexpected use of color, with a lot of furniture displayed in families – the same color, while the shade and tone of the pieces varied. This color trend seemed to be on every big stand in the furniture fair and all around the city.

Mini Living used pairing of tonal colors to zone its exhibition, creating colorful worlds that you could step into. Nanimarquina, a Spanish rug company, produced beautiful color gradient rugs which perfectly encapsulate this trend.

Taking cues from the Mini Living exhibition, which created diverse personalized 'worlds' in the same space with only the use of color, got us thinking. Could the same theory be applied in the air? Personalization is a big trend in aviation and future consumers will increasingly want to be in control of their own individual experience.

Color could diversify the user experience in the air like in a boutique hotel, changing the feel of each suite. This will expand the experience for the traveler, offering unexpected delights rather than a homogenized experience.

ABOVE RIGHT: GOOGLE'S UNEXPECTEDLY LOW-TECH EXHIBIT

ABOVE: COLOR GRADIENT RUGS BY NANIMARQUINA

LEFT: SONY'S INNOVATIVE AND INTERACTIVE INSTALLATION

AIRLINES SHOULD BE LOOKING INTO MICRO PATTERNS, INNOVATIVE PRINTING AND TACTILE SURFACES, SAYS ELINA KOPOLA, TREND & CMF SPECIALIST AT TRENDWORKS

ELINA KOPOLA

TrendWorks

The British fashion industry is growing three-times faster than the rest of the UK economy, according to Justine Simons, deputy Mayor of London. Perhaps this is due to the approach to trends that the fashion industry has developed. We now see other industries, such as consumer electronics, home interiors and, increasingly, aviation, adopting emerging trends faster and more accurately for their specific customer markets with great economic success.

Recently TrendWorks has specified colors and patterns for the Asian premium market, where we have seen an increased interest in micro-geometric patterns applied as films to mobile devices in combination with high-gloss polished metallic surfaces to create a premium look, which can now be sourced for aviation.

At Salone del Mobile in Milan we observed the same trend of micro-geometric pattern, with a matt and tactile surface tuned for the eco-minded European consumer. Examples such as the recycled glass tiles by Mosaicomicro for Boffi bathroom, and at Domus Porcelain, the Frammenti and Phenomenon mosaic ranges, bring the precision of micro patterns to home interiors.

The 'home' has emerged as the hub that centralizes our lives and provides sanctuary. The collaboration of furniture company Hay, consumer electronic company Sonos and office space provider WeWork at their co-branded Milan exhibit Palazzo Clerici offered their vision of a European sanctuary, showing a strong influence of natural color, natural light, tactile surfaces and multipurpose functionality. How these parts of the sanctuary spaces are imagined in the travel context will be the battleground for operators and brands.

BOFFI'S BATHROOM TILES ARE A GOOD EXAMPLE OF MICRO GEOMETRICS

ABOVE: FLOORO'S WIDE RANGE OF COLOR ALLOWS ENDLESS DESIGN POSSIBILITIES AND DYNAMIC PATTERNS

Some exciting developments in materials are broadening the possibilities of cabin design. First is woven carpets, such as Anker's Flooro textile. Made from a high-tech flat weave, the material is incredibly light and thin, and the aesthetic really softens the look of the cabin. At London Design Festival, one trend was raised rugs, which could be used to zone areas of the cabin. Differentiation through materials could be a defining element.

Another development is in pleated fabrics, which Lantal is spearheading. While initially the remit of the more avant garde and adventurous sartorialists, as led by Issey Miyake, pleats have become a staple of style in recent years. Pleats elevate the most simple designs. Inspired by origami, they add form and dimension, and with color combinations and effects can add drama to everything from an A-line skirt to a cabin curtain. Lantal's development of steam-pleated fabrics adds a clean architectural edge, creating design focal points within the cabin, whether on curtains or soft panels.

Designers across all industries have become more progressive with the use of bold patterns and finishes, both on single objects and as statement elements of larger projects. As airlines continue to develop strong brand identities, I think we'll see more use of bold patterns and prints through elements of the cabin that are easier to implement such as soft products and graphic items.

We're nearing a tipping point. Many companies are working on materials with embedded lighting and technology, so the cabin of the future will be a high tech, highly performing environment, but with an integrated tactile luxurious look, rather than a clinical feel.

MARIA KAFEL-BENTKOWSKA

PriestmanGoode

PLEATS, WEAVES AND TRANSLUCENT MATERIALS OFFER ENDLESS DESIGN OPPORTUNITIES IN THE CABIN, SAYS MARIA KAFEL-BENTKOWSKA, CMF EXTERNAL LEAD AT PRIESTMANGOODE

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WE ARE IN THE MIDST OF AN UPRISING – A SOFT POWER UPRISING, SAYS CMF AND TEXTILE SPECIALIST, EMMA RICKARDS FROM WEST 6

EMMA RICKARDS
West 6

This millennium has seen aircraft cabin interiors expand from being a technical consideration, to becoming the main business of flying, dominated by high-specification requirements and engineering skills, into a popular culture channel watched and appraised by a whole world of increasingly design-aware travelers and non-travelers alike. It's a 'soft power' uprising.

Soft power embraces the whole cabin interior experience – good design and use of color, texture, trim and finish that will increase passenger satisfaction and influence passenger choice of airline, thereby increasing the profitability of those airlines that harness it best. The successful use of soft power should be a key focus of every airline's future strategy.

Understated glamor infuses every decision made concerning the successful cabin interior. For inspiration, take a look at fashion-guru Anna Wintour, editor of *Vogue* magazine for the last 30 years. This is soft power at its best. She's unapologetically high-end in her choices. She carries nothing but a phone, almost always wears leather slingbacks the color of milky coffee and says style should be "unique to yourself and yet identifiable to others". Of course, there are those trademark dark glasses too… It's an uncluttered and pared-down aesthetic that true alpha power-players use to differentiate themselves from the rank and file.

For tomorrow's material choices in cabin interiors it's a polished, glamorous version of power dressing. And it's a look built on three essentials. Excellence in your choice of textile design and color, innovation in your material treatments and embellishments, and the clever use of special finishes and accessories for that final detail. The aim is to create an interior that's unique to your brand yet identifiable to your customers. It's the softest way to win power!

LEFT: THE GIO PONTI D.153.1 ARMCHAIR, TRIMMED IN PUNTEGGIATO FABRIC DESIGNED IN 1934, STILL LOOKS CONTEMPORARY

RIGHT: ENGINEERING AND LUXURY COMBINE IN THIS ALMADESIGN CMF SCHEME

Aircraft cabin interiors will be influenced by a new generation of technical materials to engage all the senses. The natural and the technological will combine in high-performance materials and flexible basics. Matt finishing and soft-touch surfaces combined with textiles will set a mood of beauty and meaning into the cabin interior. The ambiance will become more tactile and immersive, bringing the home comfort into the full travel experience.

It's interesting to see textile weaving knowledge being transferred into flooring systems, resulting in significant weight reduction or being integrated into thermoplastics, creating textural interplay in cabin interiors.

In the leather industry we see a move into ecological chrome-free leather, natural anti-allergenic products combined with laser cut details, singular perforations and embroidery details. Deep embossed surfaces with personalized patterns will create premium feeling and new luxury environments.

To create seamless experiences, we are now able to introduce advanced embedded technologies into leather and fabric lamination, such as LEDs, electroluminescent films and capacitive sensors, and produce 'smart' and comfortable solutions with the flexibility to adapt to different surfaces. The introduction of self-cleanable nanotechnologies will also open new possibilities, especially for lighter color palettes, improving maintenance and durability. These future materials and technologies, when combined, will certainly bring additional magic and performance to aircraft cabins.

CATARINA FERREIRA
Almadesign

CABIN MATERIALS WILL BE SOFTER, GREENER AND WORK MORE CLOSELY WITH NEW TECHNOLOGIES, PREDICTS ALMADESIGN CMF EXPERT CATARINA FERREIRA


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2018 IS THE 50TH ANNIVERSARY OF THE BOEING 747, SO TO CELEBRATE, LET'S RECALL A JOURNEY IN WHAT WOULD STILL BE A TOP PASSENGER EXPERIENCE: THE PAN AM B747-100 UPPER DECK. THIS WAS THE FIRST REAL MILE-HIGH CLUB

Words by Jennifer Coutts Clay

THE PAN AM UPPER DECK WAS PERFECT FOR ANYTHING FROM DINING TO AN INFORMAL BUSINESS MEETING. IMAGE COURTESY OF THE PAN AM MUSEUM FOUNDATION

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"Philippine Airlines even installed dorm-style bunk beds"

When Pan Am launched the Boeing 747-100 in January 1970, publicity announcements trumpeted, "The circular stairway leading to the cocktail lounge in the skies."

Juan Trippe, the airline's chief executive, had decreed that the upper-deck 'hump', located behind the cockpit, should be used by passengers (and not for crew-rest facilities, as many employees had hoped). Walter Dorwin Teague Associates furnished the lounge to accommodate 16 visitors: two tables, each with four swivel chairs and a sofa-couch against the back wall with eight seat positions.

During the first oil crisis in the early 1970s, it was difficult to sell all the seats on a wide-body aircraft, so airlines such as Braniff and Lufthansa emulated Pan Am's onboard lounge initiative, and Philippine Airlines even installed dorm-style bunk beds.

In 1972, Pan Am tested a dining concept for 12 passengers in the B zone of a B747-100. Following positive assessments, the airline took the decision to turn all its upper-deck lounges into restaurant-style dining rooms. The 'dining in the sky' experience was designed by the famous Maxim's de Paris restaurant, and first class passengers were asked to make advance reservations.

Flight service handbooks provided details and pictures of Pan Am's high-quality hospitality procedures, along with the correct forms of address for important personages and explanations of the rank and branch of armed-forces service personnel in uniform.

Joan M Benham, formerly system director for frequent traveler marketing at Pan Am, describes the first class dining experience: "The upper-deck dinner mirrored the service in the main cabin, but it was more leisurely. The upper deck was decorated in warm colors and the tables were set with fine china and cutlery, crystal stemware, beautiful linens and flower arrangements. Name cards identified

ABOVE: AN IDEAL SPACE FOR PASSENGERS TO MEET ONE ANOTHER, IN COMFORT AND IN COLOR. IMAGE: BRANIFF / GEORGE DESIGN STUDIO

BELOW: AN EXAMPLE OF THE FINISHED PRODUCT LOOKING EVEN BETTER THAN THE CONCEPT SKETCH. IMAGES: PAN AM MUSEUM FOUNDATION

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LEFT: THE PRIME RIB ROAST WAS A HIGHLIGHT OF THE PRESIDENT SPECIAL DINNER

where each passenger would sit, streamlining the seating process."

The President Special dinner was a lengthy multicourse event, accompanied by the finest champagnes, wines and spirits. A typical menu started with assorted hors d'oeuvres and passengers were invited to select from a range of canapés, consommé, turtle or oxtail soup, and Caspian caviar with gourmet garnishes. The fish course was followed by a sorbet.

For their main course, passengers were offered various meat dishes, including grilled lamb cutlets, veal marsala, duckling, pheasant, or the *pièce de résistance* – the prime rib roast. In accordance with Maxim's superlative traditions, the rib roast was partially pre-cooked in the airport's flight-catering kitchen, then chilled for further processing on board. Flight attendants received professional training in how to handle the cooking so that the *cuisson* ('doneness') of the meat was medium-rare in the center and relatively well-done at the extremities. When ready, the roast was presented on a carving board surrounded by parsley decoration and accompanying vegetables in heavy silver-plate salvers. With French-style sauces and condiments, the display was placed on a food cart and wheeled alongside individual passengers. Flight attendants then carved the roast to suit personal preferences: medium, well done or slightly pink, thick or thin slices, etc.

In the European tradition, the salad course was offered after the hot dish, followed by a food cart with cheese, fruit and dessert. Finally, another food cart arrived with coffee, digestif liqueurs, chocolate mints and branded cigarettes in packets of five (until no-smoking regulations were enforced). After dinner the tables were folded and, if they wished, passengers could carry on lounging in the upper deck.

The circular stairway, located at the back of the A zone on the B747-100 fleet, conveyed an aura of mystery, and

BELOW: DINERS COULD RELAX AFTER THEIR MEAL WITH A DIGESTIF. IMAGES: PAN AM MUSEUM FOUNDATION

"The circular stairway conveyed an aura of mystery"

"Pan Am's upper-deck dining was one of the most talked-about events in air travel"

press reports hinted vaguely at glamorous 'goings-on' in the secluded area above the main cabin. In later B747 variants, the stairway design was modified and relocated, but the step-edges always required close maintenance attention. Before, during and after flight operations, all traffic to the upper deck has to move through the stairwell. Flight attendants groaned when they had to haul catering equipment up and down the steps, and passengers sometimes dragged carry-on bags that had vicious metal corners. The outcome? Coverings on step-edges got beaten up at a great rate, and fraying carpet is extremely dangerous.

The solution? Non-slip tread surfaces and durable polyurethane 'bullnosing' incorporating reduced-edge radii to replace carpeted step-nosing.

ABOVE: THE UPPER DECK OFFERED SEVERAL SEATING OPTIONS TO SUIT VARIOUS PASSENGER PREFERENCES

BELOW: THE WINDOW SURROUNDS HAD A BEAUTIFUL ARCHITECTURAL STYLE. IMAGES COURTESY OF THE PAN AM MUSEUM FOUNDATION

COME FLY WITH ME

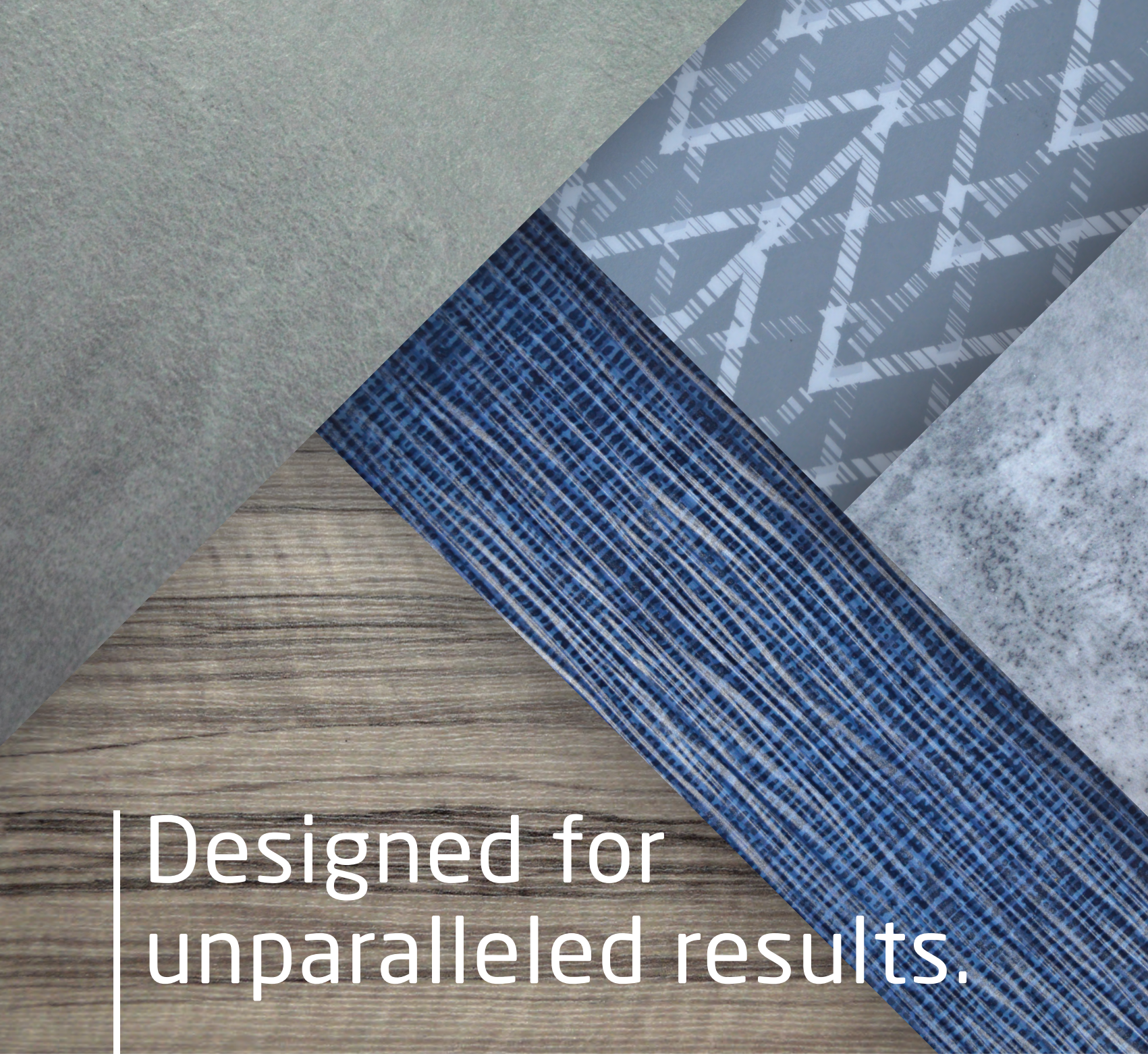
Before the advent of seatback entertainment systems and wi-fi enablement, Pan Am's upper-deck dining was one of the most talked-about events in air travel.

"I have very fond memories of how social that upstairs area was – something so lacking in today's era of isolated private suites and coffin-like pods," said Joyce Stogo, a travel consultant at ProTravel, a corporate and luxury travel agency based in New York, at a recent business meeting. "The upper deck was very popular and you could mingle with other passengers in a club-like atmosphere, making it the first mile-high clubroom in just a fun, convivial way. That definitely helped pass the time on long flights. I used to enjoy meeting people on flights – something I greatly miss today!"

ABOUT THE AUTHOR

Jennifer Coutts Clay has worked on the refurbishment and upgrade of Boeing 747 fleets, across all classes of service: at British Airways when she was controller of corporate identity; at Pan American World Airways (Pan Am) when she was general manager of product design and development; and when she was consultant to South African Airways.

Jennifer is the author of the e-book *Jetliner Cabins: Evolution & innovation*, available on Amazon, Apple iTunes and Google Play (more information at www.jetlinercabins.com).



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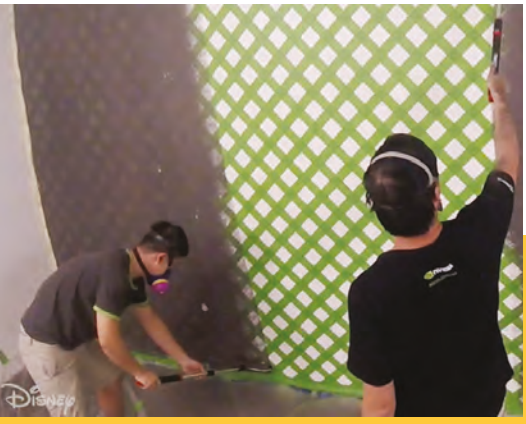

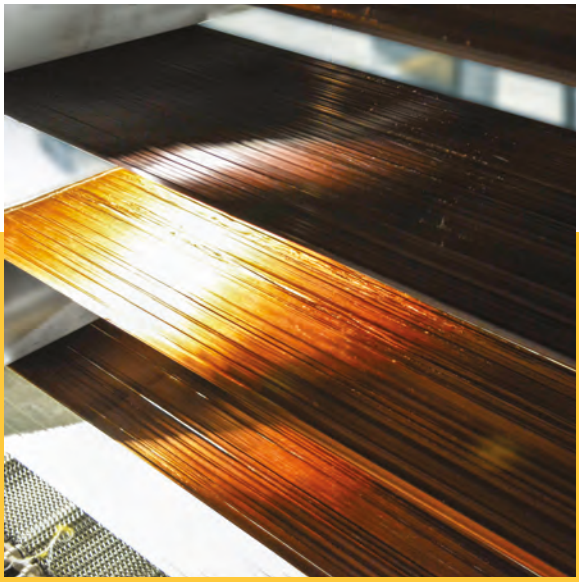

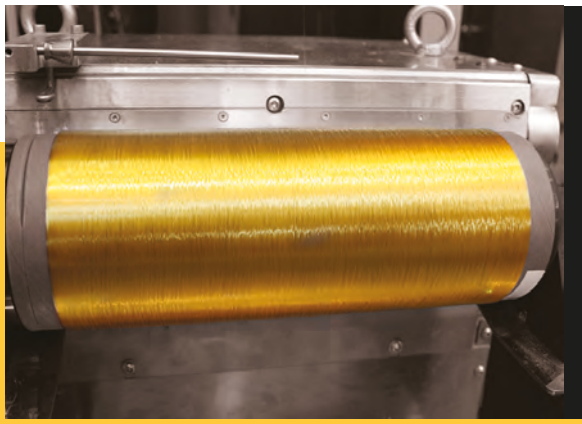

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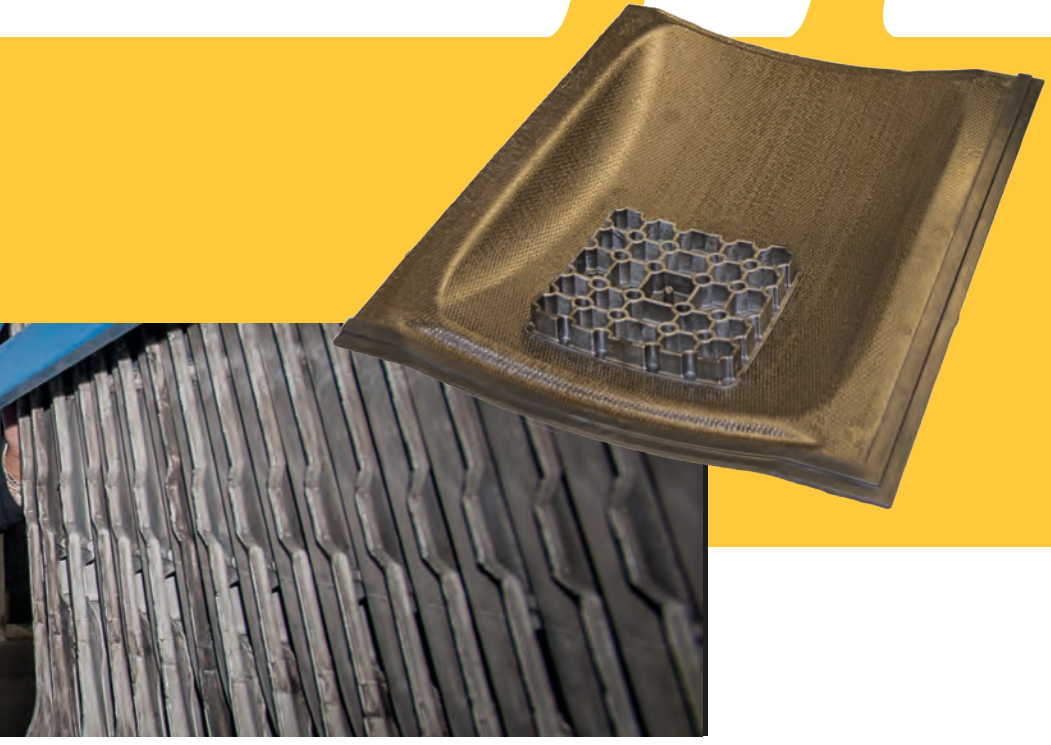

THE NEXT GENERATION OF AIRCRAFT INTERIORS COULD BE EVEN LIGHTER, WHILE ALSO BEING STRONGER AND SMARTER, IF THE LATEST RESEARCH AND DEVELOPMENT INTO MATERIALS IS IMPLEMENTED. THESE ARE SOME OF THE LATEST MATERIALS TECHNOLOGIES WORTH INVESTIGATING

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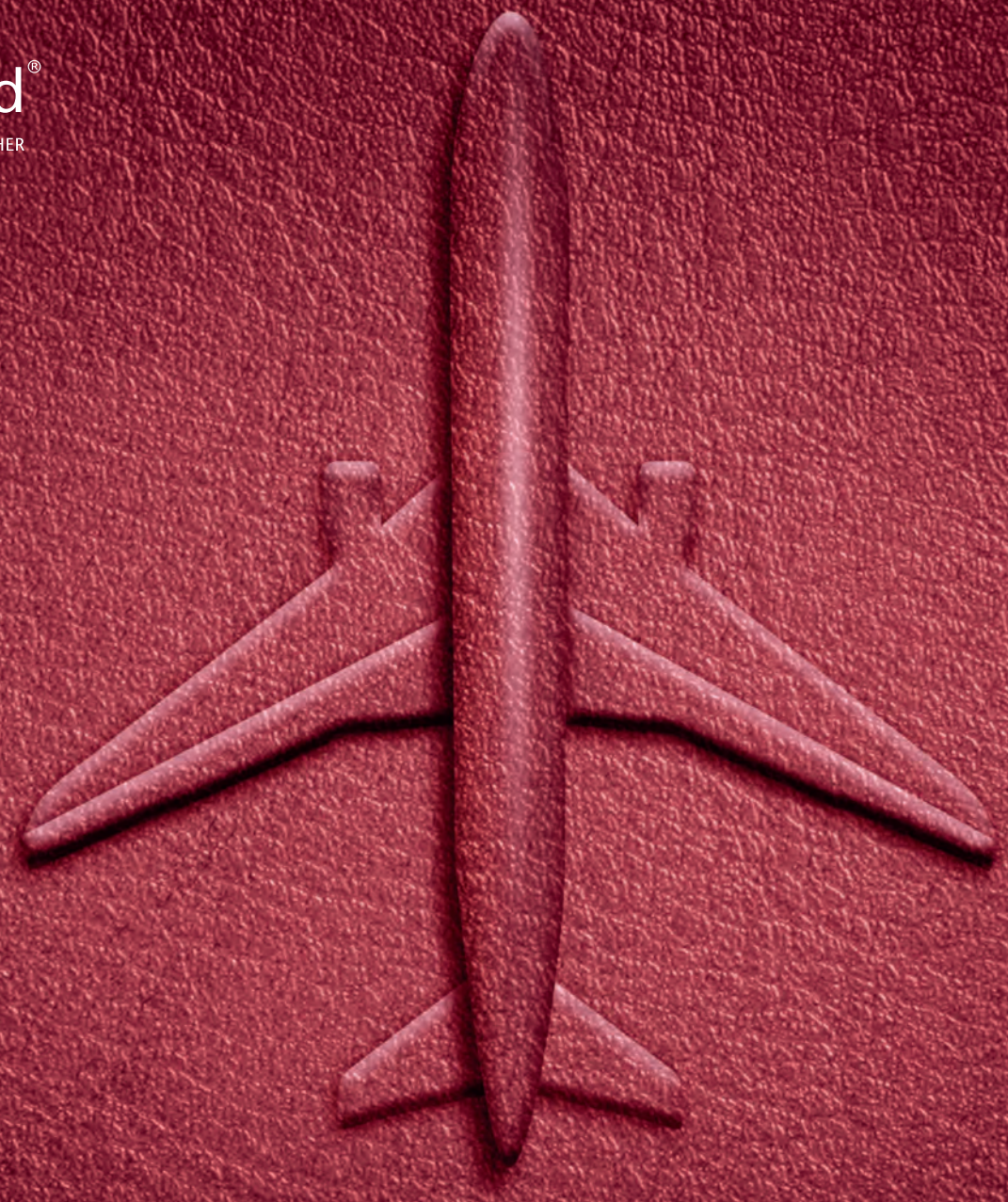

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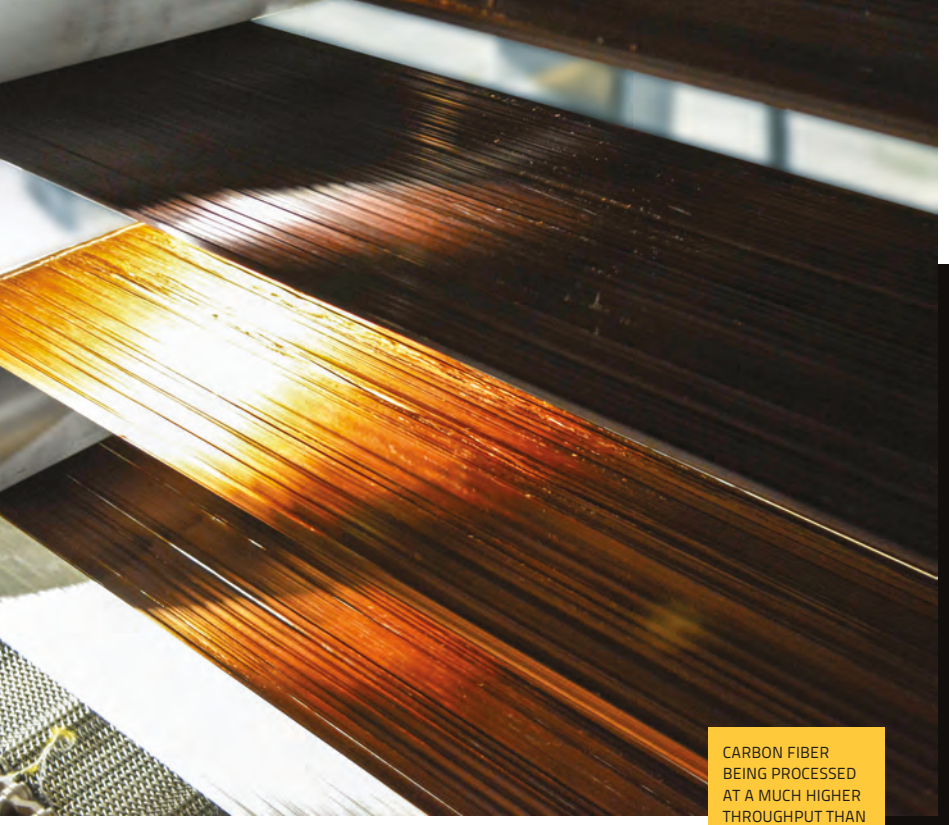


CARBON FIBER BEING PROCESSED AT A MUCH HIGHER THROUGHPUT THAN IS POSSIBLE WITH CONVENTIONAL METHODS

REDUCING THE COSTS OF REDUCING WEIGHT

Carbon fiber has many advantages, but cost is not necessarily one of them. However, researchers at the US Department of Energy's Oak Ridge National Laboratory (ORNL) may have found a way to reduce the costs of carbon fiber, having devised a production method that could reduce the cost of the material by as much as 50%.

The team analyzed the costs associated with the nine major process steps involved in producing carbon fiber, and identified the use of polyacrylonitrile (PAN), a very expensive precursor used to maximize the mechanical properties of the end product, as a potential area to save money. ORNL researchers have discovered that acrylic fiber – a high-volume product used in the clothing and carpet industries – is of similar chemistry, and costs roughly half as much as PAN.

According to the laboratory, mechanical property tests performed on carbon fiber created using acrylic fiber have been encouraging, as have prototyping trials with automotive manufacturers and their suppliers. ORNL is making the method available for licensing.

Self-healing composites

Even advanced composite materials can be susceptible to damage, including mechanical overload, fatigue, heat/chemical attack, and impact – the last resulting in a reduction in strength, elastic modulus, structural durability and damage tolerance. Solutions investigated to date have included adopting a damage-tolerant design philosophy and complex repair techniques, but such approaches can be expensive and slow. However, researchers at the UK's University of Bristol believe they have developed a natural solution, with a bio-inspired approach to self-healing.

The principle is similar to the human body healing a cut. A laminate is manufactured from hollow fibers ranging in diameter from 30-100µm and hollowness up to 65%, filled with uncured resin systems that bleed into a damage site if a fiber is fractured. Once cured, the resin prevents the crack spreading further and recovers the mechanical integrity of the component. Cabin components take impact from baggage and carts, but this science could see them self-heal. Clearly airlines and MROs would wish to know where the healing process has occurred, and by introducing UV fluorescent dye into the healing resin, any damage/healing events that the structure has undergone are illuminated, simplifying the inspection process.

Continuing the biological approach, the Bristol team has also considered the vascular system for laminate or sandwich structures. A vascular network can carry a circulating healing agent throughout the structure. If the structure is damaged, the network is breached, allowing the healant to infiltrate the damage site and restore mechanical integrity.

If the vascular network is coupled with a circulatory system, periodic replenishment of healing agent is possible, enabling multiple healing events and precise location of any healing events within a structure.

SUN-LOVING MATERIALS

The aircraft cabin can be a light-filled space, whether the source is sunshine or LED lighting. That light makes materials look great, but it can also make them move, following research at Tufts University in Massachusetts, USA. The university's school of engineering has developed magnetic elastomeric composites that can move in different ways when exposed to light, performing movements ranging from the simple to the complex. The idea is akin to flowers and leaves turning toward sunlight, but the principle is based on Curie temperature – the temperature above which certain materials will change their magnetic properties. By heating and cooling a magnetic material, its magnetism can be turned off and on.

Biopolymers and elastomers containing ferromagnetic CrO_2, shaped into films, sponges and hydrogels, heat up when exposed to laser or sunlight, temporarily losing their magnetic properties until they cool down again. Combined with a nearby permanent or electromagnet, this movement can be a bending, twisting or expansion motion, triggered and controlled wirelessly, using light. Unlike some unidirectional light-actuated materials based on liquid crystals that are being developed by other teams, these materials can move either toward or away from the direction of the light, enabling complex, coordinated movements.

Potential application in the cabin includes auto-adjusting window blinds or sun visors on seats, branding panels that catch the best light, or even self-activating mini-fans.

Materials used to create the light-actuated materials include polydimethylsiloxane (PDMS), a widely used transparent elastomer often shaped into flexible films; and silk fibroin, which is a versatile biocompatible material with excellent optical properties that can be shaped into a wide range of forms, from films to gels, threads, blocks and sponges.

"With additional material patterning, light patterning and magnetic field control, we could theoretically achieve even more complicated and fine-tuned movements, such as folding and unfolding, microfluidic valve switching, micro- and nano-sized engines, and more," states Fiorenzo Omenetto, professor of engineering at Tufts University.

COMPOSITE LAMINATES WITH NANOWIRES

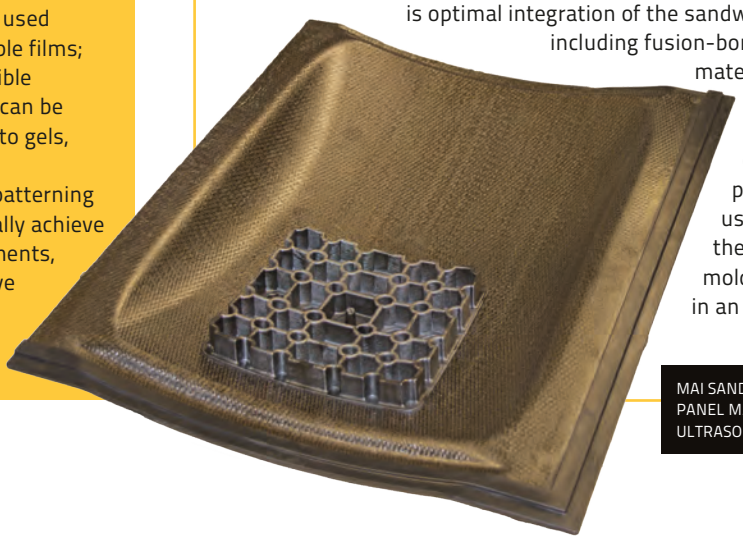
Multifunctional fiber-reinforced polymer composites are claimed to have improved strength- and stiffness-to-weight ratios compared with monolithic metallic alloys, as well as greater resistance to fatigue and corrosion. However, researchers at RMIT University in Melbourne believe that there is room for improvement, as laminated composites have weak interfacial bonding between the laminate ply layers.

The solution to improving the inter-ply bonding between composite layers, they believe, lies in the use of nano-anchored metallic nanowire interleaves. These metallic nanowires are uniformly dispersed on the glass or carbon fabric, and then laser-treated to create 3D interleave networks, resulting in laminated composites with greater interlaminar fracture resistance. Further claimed benefits include improved thermal and electrical conductivity, and a multifunctional nature that can result in weight savings for aerospace structures.

Innovative sandwich design

Components with a sandwich structure enable lightweight and sturdy designs, ideal for secondary structures such as aircraft floor paneling or interior linings. One technique being pursued to make such structures even lighter is the use of composite materials, with an especially light core combined with 'skins' of fiber-reinforced plastic on both sides. As part of the MAI Sandwich research project, sponsored by the Federal Ministry of Education and Research of Germany, a consortium of experts including Airbus and BASF has been developing an integrated sandwich structure concept for aviation components made of composites. The concept applies cutting-edge thermoplastic material design with recycled carbon fibers, combined with an efficient production technique.

Today's methods of producing sandwich structures is time intensive, with a cycle time of up to one day, and is therefore fairly cost intensive. The MAI partners claim to have cut this time to five minutes. The key is optimal integration of the sandwich components, including fusion-bonded thermoplastic materials between the core and skins. The partners have also developed a fine-tuned production sequence using the techniques of thermoforming, injection molding and fusion bonding in an automated facility.



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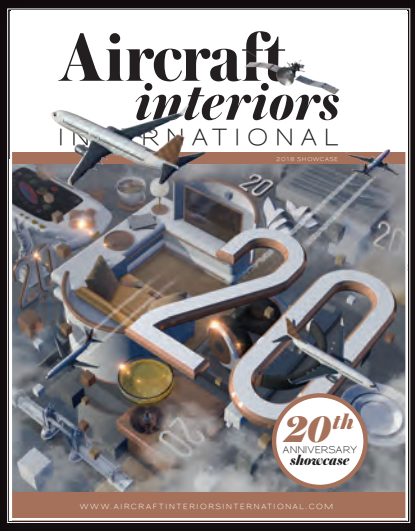

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BIOPLASTICS FOR THE CABIN?

Bio-on is working to identify processes, technologies and patents to produce materials such as fabrics, yarns, flexible surfaces and films from bioplastic. The company views many of today's such materials as synthetic and harmful to the environment, with synthetic fibers invisibly released during each wash cycle, which pollute the environment and the seas. By making such materials from bioplastics, the company says they would be natural and 100% biodegradable. The initial target is the fashion and luxury industry, but the aviation industry could be a future prospect.

"The search for innovative and eco-sustainable materials, which respect the environment and people, is a priority in the luxury and fashion sector," explains Marco Astorri, president and CEO of Bio-on. "Today the creativity of the best designers is expressed through the choice of natural and biodegradable materials."

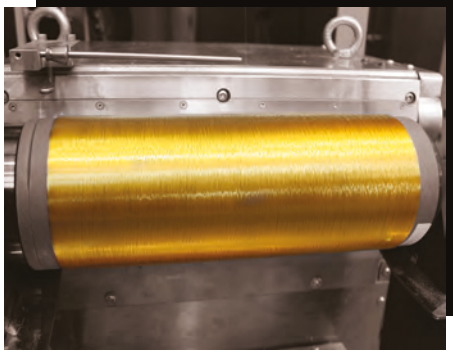
COST-EFFECTIVE CARBON FIBERS

The Fraunhofer Institute has developed ComCarbon, a technology it says will make it possible to produce carbon fibers at low cost for the mass market.

About half the cost of producing conventional carbon fibers is incurred in producing polyacrylonitrile fiber (PAN). This so-called precursor fiber cannot be melted and is produced using an expensive solution spinning process.

"We have developed an alternative PAN-based precursor technology that saves around 60% of the precursor costs. It is based on an inexpensive melt-spin process using meltable PAN co-polymers that we developed," explains Johannes Ganster, who heads the biopolymers division. "Once they are converted to an unmeltable state, these precursor fibers can then be processed into carbon fibers in the same way as conventional precursors."

When producing carbon fibers, the precursor fibers must undergo stabilization and carbonization. To do this, the melt-spun precursor fibers are converted to an unmeltable state. Once this pre-stabilization is complete, the multifilament yarn is fed into stabilizing furnaces and carbonized at temperatures of up to 1,600°C (2,900°F). Eliminating solvents means that all the melted material can be spun, enabling higher spinning speeds.



Transform sidewalls into sensors

Cabin sidewalls and dividers can be attractive, but rather static and uninvolving. However, add conductive paint and electronics and these surfaces could become a smart infrastructure that can sense human touch, detect gestures and detect when devices are used.

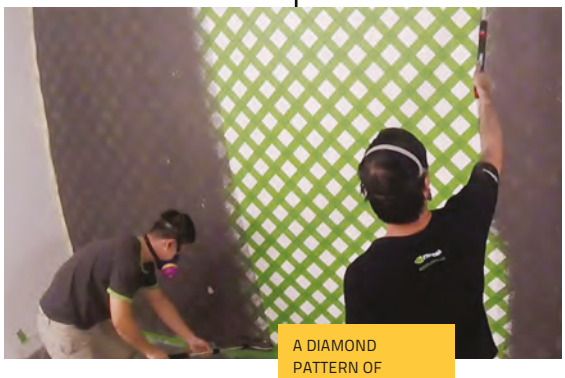
Researchers at Carnegie Mellon University (CMU) and Disney Research are working on these principles for architectural walls and have found they can transform them into a smart infrastructure at a mere US$20 per square meter, a low cost enabled by dispensing with expensive paints, such as those containing silver, instead using a water-based paint containing nickel.

The invention is named Wall++ and uses conductive paint to create electrodes across the surface of a wall, enabling it to act as a touchpad to track users' touch and an electromagnetic sensor to detect and track electrical devices and appliances.

The electrode wall can operate in two modes: capacitive sensing and electromagnetic sensing. In capacitive sensing, the wall functions as a capacitive touchpad – when a person touches the wall, the touch distorts the wall's electrostatic field at that point. In electromagnetic sensing mode, the electrode can detect the distinctive electromagnetic signatures of devices, enabling the system to identify their locations.

Similarly, if a person is wearing a device that emits an electromagnetic signature, the system can track their location.

The possibilities are only limited by the imagination, for example being able to place or move touch controls around a wall, controlling video games or scrolling through IFE content using gestures. By monitoring activity in the space, this system could adjust light levels when a display is turned on, or alert crew when a galley appliance has completed a task. Even better, the team says the wall-sized electrodes consume about as much power as a standard touchscreen.



A DIAMOND PATTERN OF ELECTRODES IS CREATED USING CONDUCTIVE PAINT, WHICH IS THEN HIDDEN AND PROTECTED BY LATEX PAINT

BIOPLASTICS FOR CATERING

Inflight catering is a plastics-intensive sector, but Bio-on, an Italian intellectual property company operating in the bioplastics sector, reports that it has developed a process for the production of polymers called PHAs (polyhydroxyalkanoates) from agricultural waste. According to the company, bioplastic produced in this way is able to replace the main families of traditional plastics in terms of performance, thermomechanical properties and versatility.

PHA bioplastics can be made from molasses, sugarcane and sugar beet syrups and are classified as 100% bio-based, certified by the United States Department of Agriculture, and completely biodegradable, certified by Vincotte. The company is seeking to market licenses for PHA production and related ancillary services, and to undertake further R&D projects, possibly through new collaborations with universities, research centers and industrial partners.

GRAPHENE AEROSPACE STRATEGY LAUNCHED

The Aerospace Technology Institute and the National Graphene Institute at the UK's University of Manchester have published a joint paper on the potential of graphene in aerospace.

Graphene, which is believed to have been invented in Manchester, is a two-dimensional material with the potential to improve aircraft performance, cost and fuel efficiency. It is thought that aircraft safety, weight and performance could benefit from incorporating atomically thin graphene into existing aerospace materials.

In the paper, Virgin Group founder Sir Richard Branson says, "The potential for graphene to solve enduring challenges within aerospace presents real opportunities for the material to become disruptive, and a key enabler in future aircraft technology. We need to accelerate the opportunity for the UK to realize the benefits from graphene by creating a portfolio of graphene-related research and technology projects, which if undertaken would lead to real impact in our aerospace industry."

James Baker, CEO of Graphene@Manchester at the University of Manchester, adds, "Major generational improvements in aerospace have been associated with embracing new materials. Aluminum and carbon fiber have seen airplanes become faster, greener, cheaper with more functionality. Now graphene and related 2D materials can mark the next step-change."

Magnesium is ready for take-off

Researchers at the UK's Birmingham City University are hoping to increase the use of magnesium in aerospace, following the relaxing of the SAE ban on magnesium in aircraft seats.

Magnesium has a lot going for it. At 1.8g/cm³, magnesium is the lightest of all structural materials, the eighth most abundant chemical element in Earth's crust, and is 100% recyclable. Magnesium is produced from sea water, brines and magnesium-bearing minerals, which offer unlimited reserves, with an estimated 500,000 metric tons produced each year. It is 75% lighter than steel and 33% lighter than aluminum – better still, magnesium is 100% recyclable.

The university has entered into an exclusive partnership with the world's largest producer of magnesium components, Meridian, which will see them work together in the education, research and development of magnesium use. A key consideration is that the costs of tooling and setup when using magnesium in low-volume manufacturing can be relatively high using current manufacturing methods, so the partners are investigating new ways to make production more financially viable.

Two psychologists from the university's Faculty of Business, Law and Social Sciences are interviewing engineers from across the UK to try to understand why there has been a historical aversion to designing products with magnesium, compared with less sustainable and heavier metals.

ABOVE: THE TEAMS AT BIRMINGHAM AND MERIDIAN BELIEVE IN THE BENEFITS OF MAGNESIUM

LEFT: THE MANCHESTER TEAM IS AT THE FOREFRONT OF GRAPHENE RESEARCH

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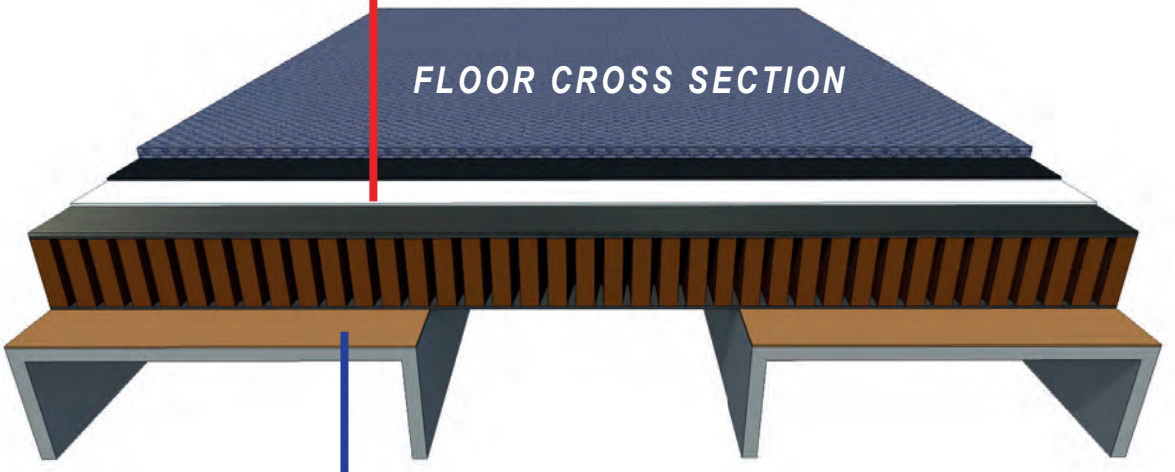

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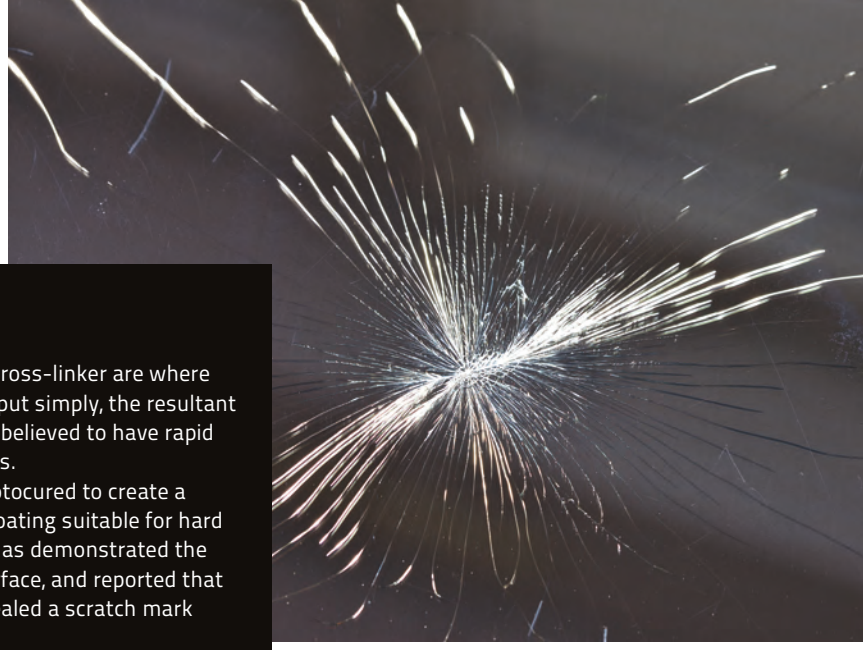


SELF-HEALING COATINGS

Aircraft cabins suffer a lot of wear and tear. Just imagine if scratched cabin coatings could heal themselves. A team of scientists at Japan's University of Osaka has created polymer gels composed of polyrotaxane and poly (acrylamide) cross-linked with boronate linkages, which combine dynamic covalent bonds with a sliding motion of functional molecules. The mobility of the ring molecules along the axle in the polyrotaxane and the sliding nature of the cross-linker are where the magic happens – put simply, the resultant gel-like materials are believed to have rapid self-healing properties.

The gel is then photocured to create a scratch-healing top coating suitable for hard materials. The team has demonstrated the coating on a glass surface, and reported that it successfully self-healed a scratch mark during the trial.

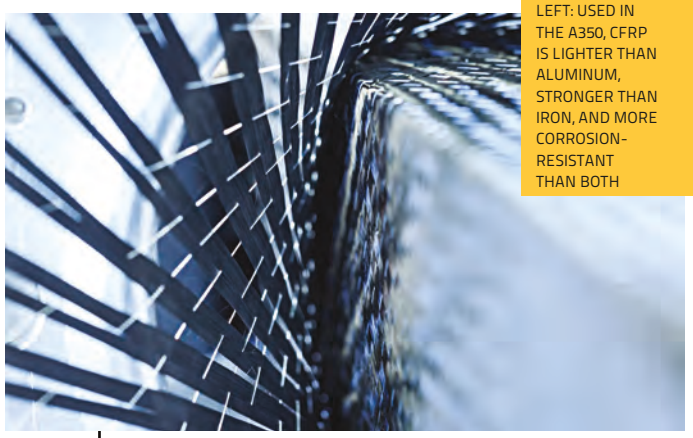
Polymer composites must evolve

The aerospace sector was one of the earliest adopters of CFRP, and its strength and stiffness-to-weight ratio has led to composites now accounting for over 50% of the structural parts in the latest models of civil aircraft. However, this dominance is under threat, with emerging metal alloys and additive manufacturing being some of the key contenders, according to market research company IDTechEx.

The company says that there are many progressions underway to improving the performance of composite parts, including next-generation pre-preg material and high-performance thermoplastics.

Thin-ply composites from spread-tow fibers are gaining attention. This involves spreading the fibers for a reduced density (typically below 75gsm) and a stronger homogeneous fiber-matrix interaction. The early market for these are motorsport and sporting goods, but aerospace is the next step. This material is already being used by HAECO for seating on A350 aircraft (pictured below).

At a much earlier stage is the use of pure boron fibers for polymer reinforcement. It is proposed that this fiber can replace carbon fiber in much the same way that carbon fiber may replaced aluminum in the very long term. The fibers are synthesized via a laser chemical vapor deposition route. There are many technical and economic hurdles, but it is certainly one to watch, says IDTechEx.



LEFT: USED IN THE A350, CFRP IS LIGHTER THAN ALUMINUM, STRONGER THAN IRON, AND MORE CORROSION-RESISTANT THAN BOTH

AIRBUS EXTENDS RESEARCH INTO NANOSCIENCE

In July, Airbus Beijing Engineering Centre (ABEC), a joint venture between Airbus and China Aviation Industry Corporation, opened a new lab on nanocomposite materials jointly with the National Centre for Nanoscience and Technology (NCNST) of China. On the same day, the two parties signed a cooperation agreement on engineering polymer nanocomposites for aeronautic applications.

The result is that both parties will agree to carry out R&T activities on electrically conductive, self-healing and toughening nanocomposites, with the aim of exploring the application of the state-of-art nanocomposite technology in aerospace.

The research will be jointly conducted by ABEC engineers and a group of top Chinese academies and universities. Airbus has also committed to setting up an Airbus Scholarship program at NCNST to support the development of the future talents in nanoscience.

Liu Minghua, director of NCNST, says, "As a cutting-edge technology, nanoscience is changing people's perception and will have great impact on the future economy and industry development."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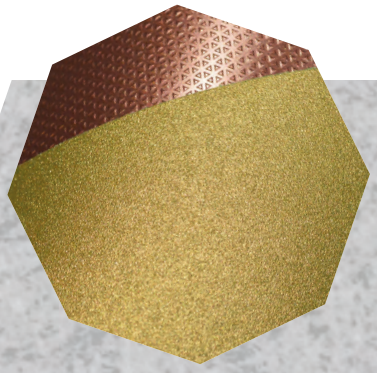
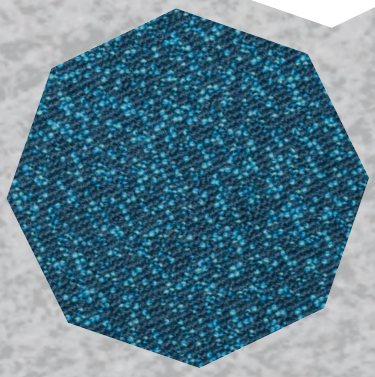
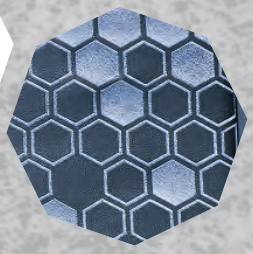
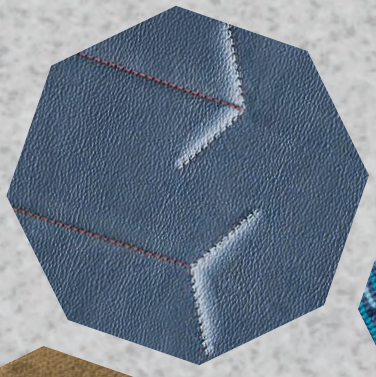


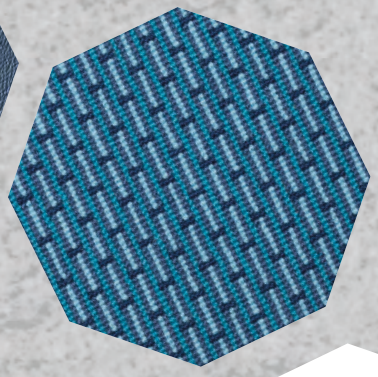


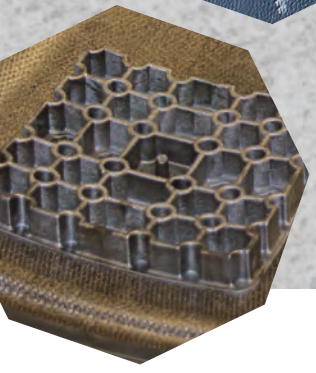


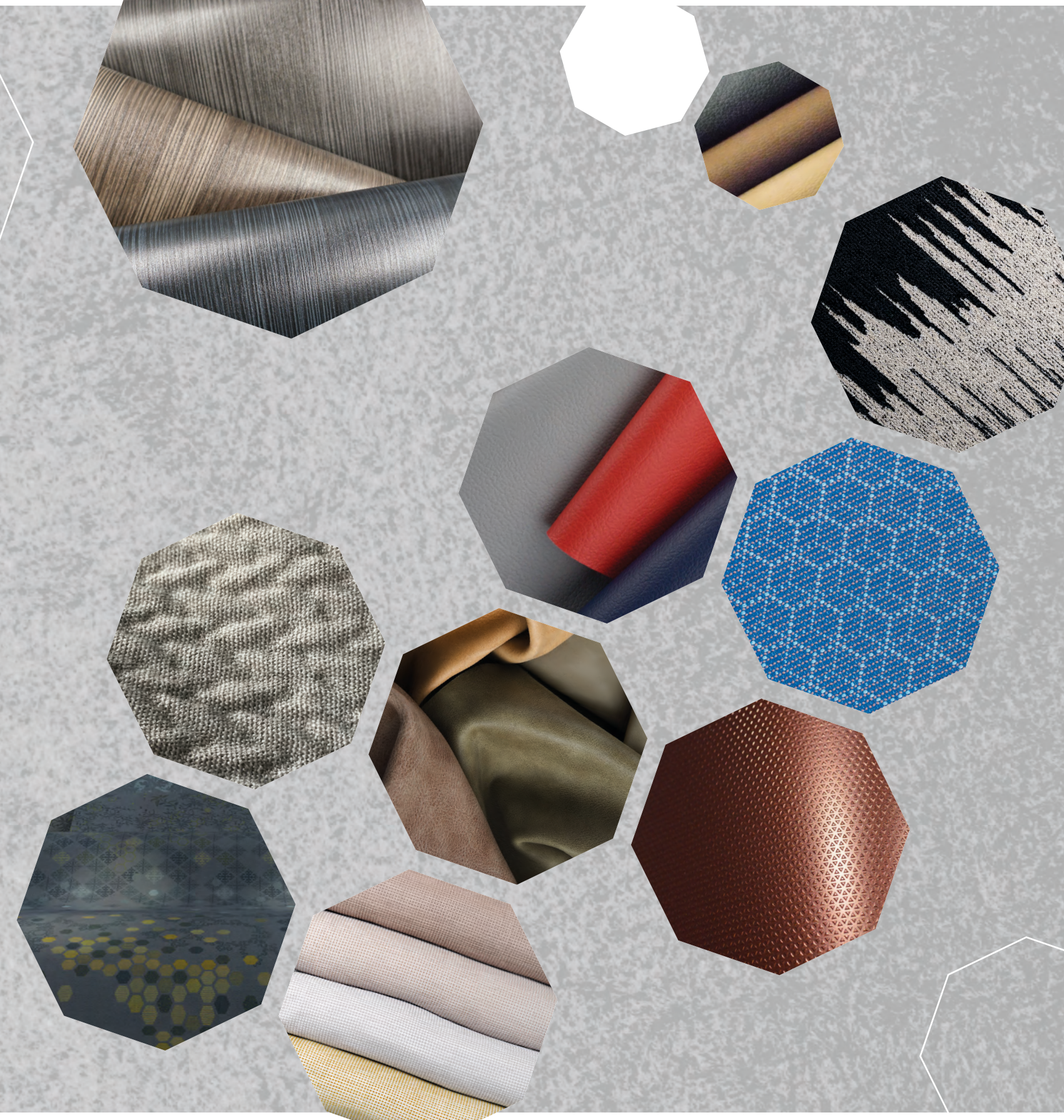
Finishing TOUCH

This year's ranges of trims and finishes give airlines some great new options to choose from to help ensure the aircraft cabin looks and feels good for passengers, and performs well in service









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Seat textiles

3D OPTICS

Lantal is reporting brisk demand for fabrics with new types of appearance, and as part of its Conceptual Forecast collection has introduced a 3D-style seat fabric with a unique look. The technical yarn used in this fabric gives the material a greater feeling of fullness, with great 3D optics and haptics that enable the creation of relief-like structured designs that create visual interest.

The design may be unusual, but seat cover materials that contain this unique yarn are sensible, meeting all relevant airworthiness standards.

NATURAL ACOUSTICS

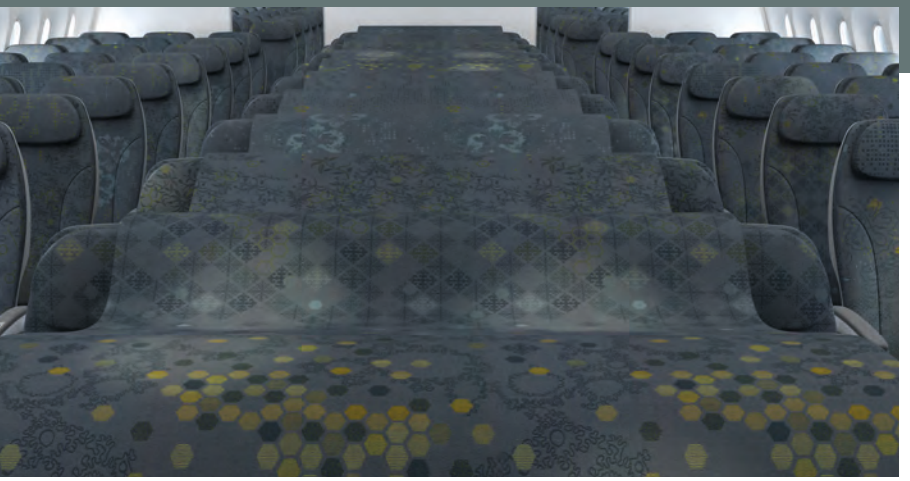
Tisca is introducing a new high-end stock range seat cover fabric line named Musica. This premium wool-blend fabric collection encompasses six different designs, each available in a wide range of colors, with 129 variants in total. The designs are characterized by small patterns and repeats, intriguing 3D effects and textures, combinations of different thread sizes, as well as small weave structures.

During development, special emphasis was put on comfort and acoustics, with the fabrics engineered for the maximum sound-absorbing effect, to help create a quiet and noise-free cabin. These eco-friendly fabrics are produced with natural, renewable raw materials, and offer high durability and wear resistance, resulting in long-life and low total lifetime costs. The individual design lines are named Mira X Allegro, Commedia, Concerto, Opera, Ritmo and Suono. All ranges are available from stock, with no minimum order quantity, ready for immediate shipment.

Eclectic textile concept

Rohi's design teams have developed something a little different to the usual uniform textile designs for aircraft seats. The result is a range of eclectic textiles, which allow more individuality in each passenger seat, especially in economy class.

The eclectic design consists of an up to 6.5 yard-long (5.9m) design repeat, composed of varying colors, patterns, textures and styles that are strung together endlessly and transition-free – and with only one part number.



ABOVE: WITH ROHI'S ECLECTIC TEXTILE, SEATS CAN BE AS INDIVIDUAL AS PASSENGERS BUT STILL WORK IN HARMONY TO CREATE A CONSISTENT AND ATTRACTIVE CABIN

Leathers

PSYCHOLOGY OF PATTERNS

Designers are increasingly using design tools to visualize functional properties. Slimline seats, for example, are lighter and provide more freedom of movement, but there is a risk that the passenger will subconsciously consider the upholstery to be too thin for comfort. This idea alone is enough to have a negative effect on the comfort actually perceived.

"One of our tasks as a seat designer is to make the cushions appear more voluminous," says Thorsten Buhl, head of design at leather manufacturer, Boxmark. "The unique surface texture of genuine leather helps here, while special patterns can also achieve the desired psychological effect."

Winds of fortune

Cortina Leathers has introduced Jetstream, a line of aviation leathers made in the USA to offer high performance standards and value. Custom colors and small dye lots are also available, with short lead times.

Jetstream joins the company's range of Italian-made leathers launched last year – the Mediterranean-inspired Collezione Vento. This line of high-performance leathers is named after the wind gods of Greek mythology: Boreas, Eurus, Notus and Zephyr. Each god is associated with various seasons and weather conditions, which is fitting as these leathers perform well whether conditions are polar or subtropical.

In addition to its added global capabilities, additional leather lines and strong growth, Cortina Leathers is also expanding its representation in Europe. The company has signed an agreement to work with BOES Aerospace as its representative across Europe. Signed at Aircraft Interiors Expo in Hamburg in April, this agreement adds a European-based company with tremendous technical experience to enhance the company's ability to service European customers.

LIGHT AND TOUGH

A lightweight European cattle hide product has been developed by Austrian tannery Wollsdorf Leather, which is claimed to be possibly the lightest bovine leather in the world at 650g/m^2.

The product, named Amba Eco, also benefits from the newly developed SPS (Surface Protection System), which is claimed to enhance the leather's resistance to soiling many times over compared with untreated product. In addition, the leather surface is antibacterial and resistant to mildew.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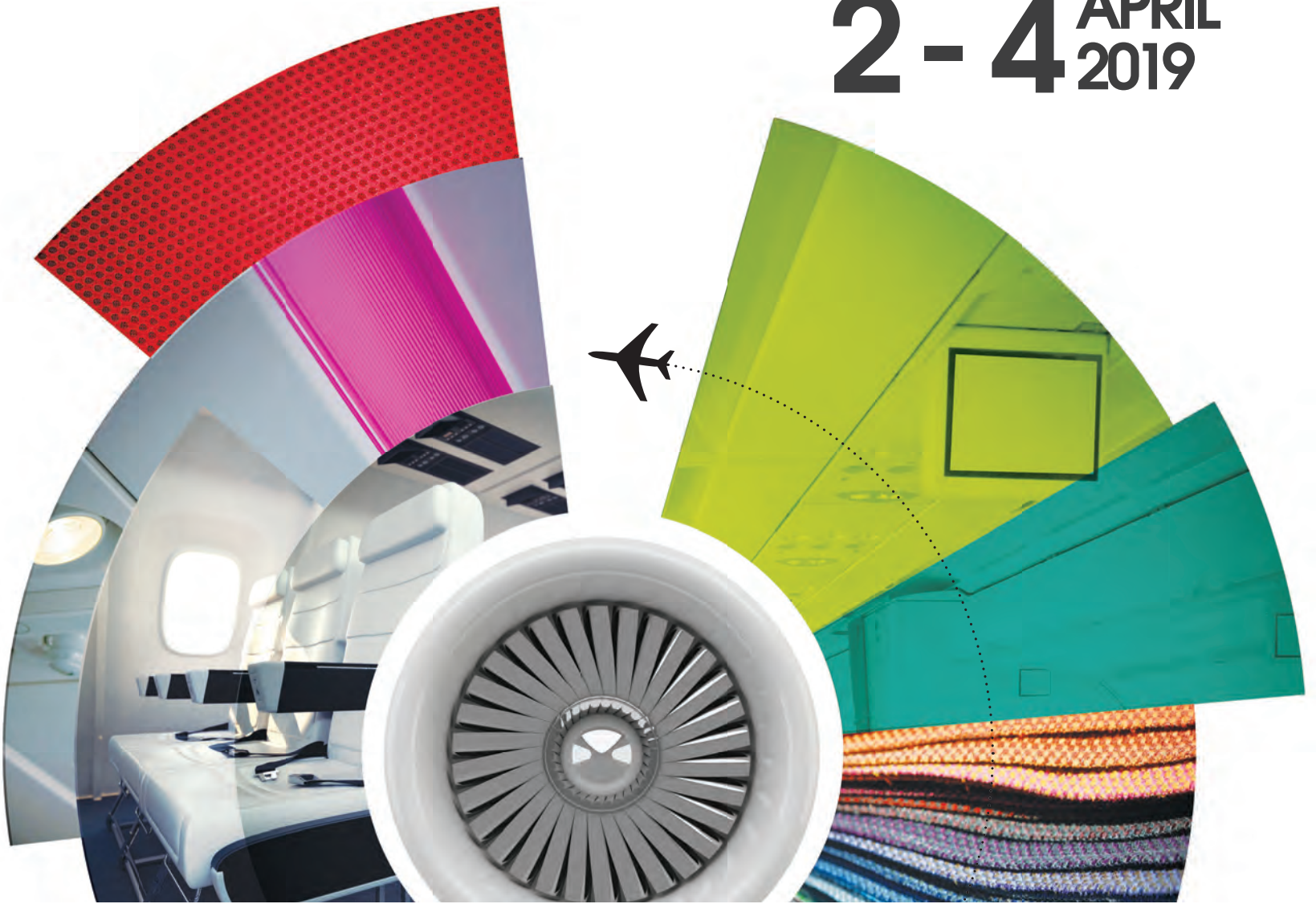

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Technical leathers

All white now

The ink- and stain-resistant technology used in Ultraleather Pro was recently selected by an unnamed high-end electric car manufacturer for an all-white interior, specifying Ultraleather Pro in various interior applications including seats, door panels and other cabin elements.

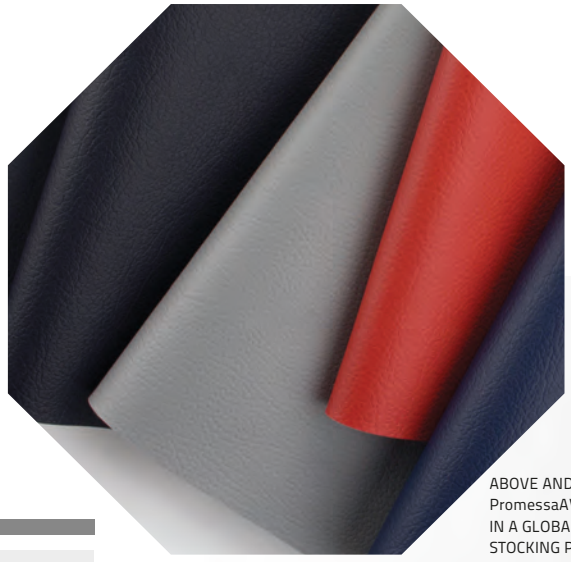
This technology resists the most difficult stains, including ballpoint pen and denim transfer, and provides lasting resistance to stains that does not wear over time. Ultraleather Pro is also manufactured with EPA-registered antimicrobial protection, making it an ideal solution for all medevac and air ambulance applications, and it is becoming increasingly popular in commercial aviation.

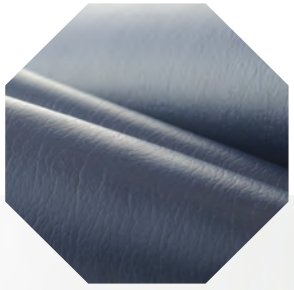
The innovative engineering and technology used to manufacture these products offers performance advantages over many rival products to deliver comfortable and luxurious interior solutions.

Spring back

A polymer construction has been developed by Lantal Textiles that looks like leather, but is claimed to offer greater elasticity and a lower price.

Named TEC-Leather, the material is stain-repellent and low maintenance, requiring just an occasional clean with soapy water. The elasticity of the material means it is suited for complex seat shapes and does not sag. According to Lantal, other advantages are its light weight and its flame-retardant properties, which eliminate the need for an additional fire blocker.





ABOVE AND BELOW: PromessaAV IS AVAILABLE IN A GLOBAL QUICK SHIP/ STOCKING PROGRAM

FEELS GOOD

The result of a collaboration between Tapis Corporation and Ultrafabrics, PromessaAV seat fabric was launched at the 2018 Aircraft Interiors Expo in Hamburg, offering what the partners say is the best aesthetic and haptic in the industry.

PromessaAV was born out of the well-established Ultraleather brand, but takes things to the next level, using a proprietary backcloth that provides greater durability, dimensional stability and recovery.

The manufacture of the new fabric uses Takumi Technology, a process that combines four layers into one, ensuring enduring bond strength and longevity without risk of delamination. This means years of active use, enduring the demanding rigors of daily travel without compromising on softness, making it arguably the most comfortable seat cover material on the market.

Flooring

SPECIAL EFFECTS

Tisca Tiara has introduced the Tisca Eco Structure polyamide aircraft carpet line, produced with 100% solution-dyed polyamide yarn. The stepped loop-pile design with an inventive 3D texture makes this carpet eye-catching and unique.

Tisca is offering this product with lead times of just one to two weeks, with a minimum order quantity of 60m² (645ft²). Total lifetime costs for operators are minimized thanks to the carpet's durability, long service life, ultra-lightweight construction and easy maintenance, while passenger comfort is ensured thanks to its soft and noise-absorbing 3D texture.

The company has another new polyamide carpet line, Tisca Eco Premium, which is available in three weight classes. As the name suggests, it is a high-end product, and it is available in any customized design, pattern and color.

Heated stone flooring

A fully certifiable real stone aircraft flooring product featuring integrated heating has been developed by F/List. The durable, highly resilient stone surface can add a sophisticated feel – especially in first and business class – while also offering the practical benefits of being fireproof, light, and easy to clean.

A hook-and-loop tape fastening system means the flooring is easy to install, maintain and dismantle, and can be heated to any preset temperature between 23°C and 33°C (73-91°F), with a heat-up time of only 20 minutes – surface temperature 28°C (82°F), cabin temperature 20°C (68°F).

Woven vinyl

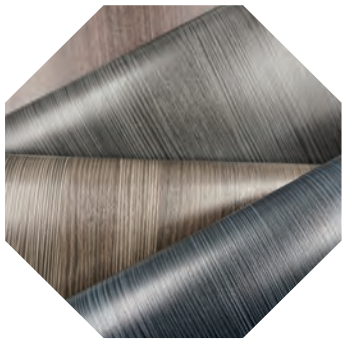
Each cabin interior is a new tapestry where fashion-forward looks and superior performance are imperative, and Infinity designed its LWV (luxury woven vinyl) flooring with this in mind. Heavy traffic rated, lighter weight than carpet and easy to clean, LWV provides utility while also offering opportunity for unique designs in weave, texture and color. As the manufacturer of the product, Infinity controls the entire process, from raw materials to finished flooring, and offers pre-cut pieces as well as rolled goods. Infinity flooring also exceeds slip and abrasion requirements.

DESIGNING FOR COMFORT

Cabin materials can help strengthen an airline's brand in the minds of customers, as well as maximize comfort and contribute to creating a pleasant environment for passengers. Loncontrail was designed by Lonseal to meet all these aims.

This aviation sheet vinyl flooring has a natural, striated wood-look with a thick, combed look. In addition to its warm and familiar design, many consider that wood creates a healthy-feeling cabin environment. The continuous brushstroke has a soothing appearance, creating order in a demanding space. Loncontrail is also easy to keep clean and maintain, as scuff marks are easily camouflaged and the surface is relatively easy to wipe clean of spills and splashes.

LONSEAL BELIEVES A WOOD LOOK CAN ADD A SENSE OF HARMONY AND BALANCE TO A CABIN



Natural beauty

USA-based Scott Group Custom Carpets has created a range made from luxurious natural fibers. The Turas Collection is intended to deliver feelings of 'expeditions, excursions and voyages', defining a passage from one place to another. Inspired by the Irish word for journey, the Turas collection is inspired by different cultures, exploring their own world of travel.

The first part of the collection is Symbol, inspired by the visual language used by cultures, such as symbols. The Alchera and Alluvion designs are interpretations of a traditional icon for a river, drawn with flowing, curvaceous lines.

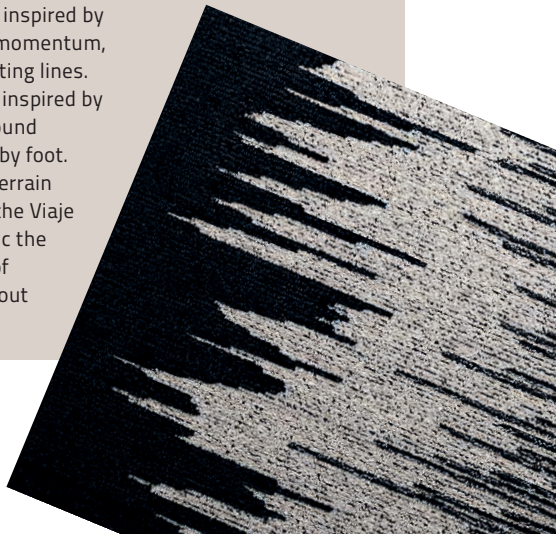
The Glacial range is inspired by the indigenous people of the Arctic, who for many generations have used natural materials to create vehicles to assist in their journeys. The Awani and Crevasse designs echo the impressions and tracks that these vehicles make through frozen terrain.

Beautifully designed terraces are evidence of early agricultural innovation. The distinctive linear landscape and balanced harmony is worthy of replication in the pattern Arroyo from the Terrace range.

The Caravan and Jornada designs in the Pathway range are inspired by roads, intersections and momentum, with parallel and intersecting lines.

The Savannah range is inspired by the many civilizations around the world that still travel by foot. From treacherous rocky terrain to effortless grasslands, the Viaje and Waters designs mimic the lyrical, swirling patterns of landscape found throughout these lands.

THE CREVASSE DESIGN EVOKES THE NOTION OF TRAVEL THROUGH THE FROZEN ARCTIC



TEC-Leather.
Superior comfort for the passenger, easy maintenance for you.

Meet Lantal's newest innovation and ingenious alternative to all known leather and artificial leather products: TEC-Leather. Its soft touch and excellent thermal properties deliver a stunning improvement in passenger well-being. The high-quality material features ultra-convenient cleanability paired with extraordinary resistance to stains and dirt. It reduces laborious cleaning and maintenance of seat covers to a minimum.

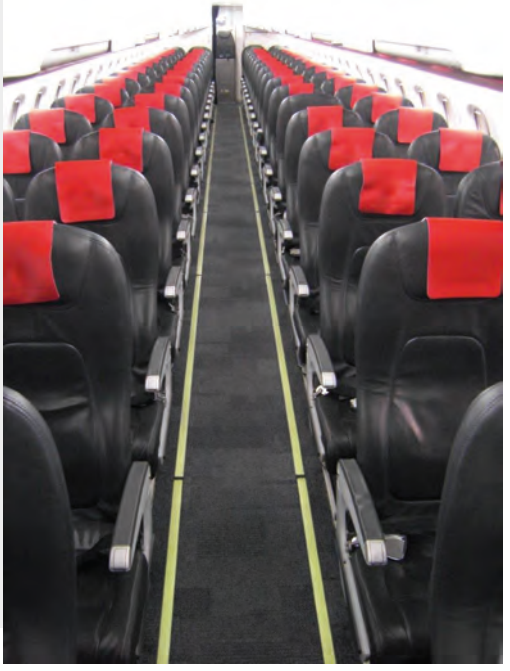
Lantal Textiles, Inc.
Switzerland, USA, France, Singapore, Abu Dhabi
www.lantal.com

Flooring

Quality guaranteed

Looking for a guarantee that a modular aircraft carpet will keep looking good? SkyPaxxx is offering just such a thing: a guarantee of appearance retention and in-service life for its Sky-Tiles carpet. And not just against manufacturer defects and raw materials, but on the final, installed product.

The company boldly says that Sky-Tiles will last two to three times longer than any other aircraft carpet, with no serging/binding, no fraying, no shrinking or stretching, or selective replacement of individual tiles. And when it does reach the end of its life, it is 100% recyclable. Better still, SkyPaxxx has now reduced the weight of Sky-Tiles by more than 10%.



Carpeting reconceived

Traditional woven carpet specialist Anker has developed Flooro, a flooring product the company is billing as a "revolutionary" textile carpet for the aviation industry. The carpet is claimed to weigh 30-70% less than conventional aviation carpeting, while also being extremely hard wearing and green, with 50% of this new-generation textile flooring made using recycled Econyl yarns. This combination of properties has been made possible by a newly developed high-tech woven system.

LEFT AND FAR LEFT: SKY-TILES CARPET IS CLAIMED TO OFFER A LONGER THAN AVERAGE IN-SERVICE LIFE FOR AIRLINES

SMART AND STYLISH

Since the takeover of Desso Aviation by Tarkett, a flooring and sports surface specialist, Tarkett Aviation has undergone a metamorphosis. It has expanded its product portfolio in both carpets and non-textile flooring products, including enhanced focus on product development, strengthening the sales organization, and a closer cooperation with local Tarkett sales organizations.

A key innovation is Hook'nFly, an aviation carpet installation solution intended to do away with time-consuming removal of old adhesives and glue residues. During refurbishments, the Hook'nFly hook tape stays firmly on the aircraft floor panels and the specially developed Desso Wilton aviation carpet can be replaced more easily and quickly, saving time and money.

Another innovation is the Spectrum color-on-demand aviation carpet. This 100% nylon loop-pile aviation carpet range is inspired by the rainbow-like rays of light refracted through a prism, and offers the possibility to create designs in any color, based on a customer's color reference. Once approved, Tarkett delivers the carpet on rolls with a short lead time, ready for departure.

Finally, Safetred Aviation is a tough and durable range of on-textile safety flooring for use in heavy-duty applications where safety underfoot is a priority, such as aircraft galleys and entrance areas.

Repositionable idea

Schneller's product engineers and designers have developed AerFusion Fit, a new flooring material for the aviation market. This repositionable flooring product is particularly suitable for entrances, aisles, galleys and lavatories. With possible retrofits in mind, Schneller also expects to make it available for refurbishments through aftermarket channels.

The product contains an integral repositionable adhesive system that enables precise correction where needed. That means it can be cleanly removed from floors at the time of installation, or indeed long after it is originally installed.

LEFT: ICELANDAIR ASKED TARKETT TO PRODUCE A CUSTOM CARPET IN THE DESIGN OF A FOOTBALL FIELD TO TRANSPORT THEIR NATIONAL TEAM AND SUPPORTERS IN STYLE TO THE 2018 FIFA WORLD CUP IN RUSSIA

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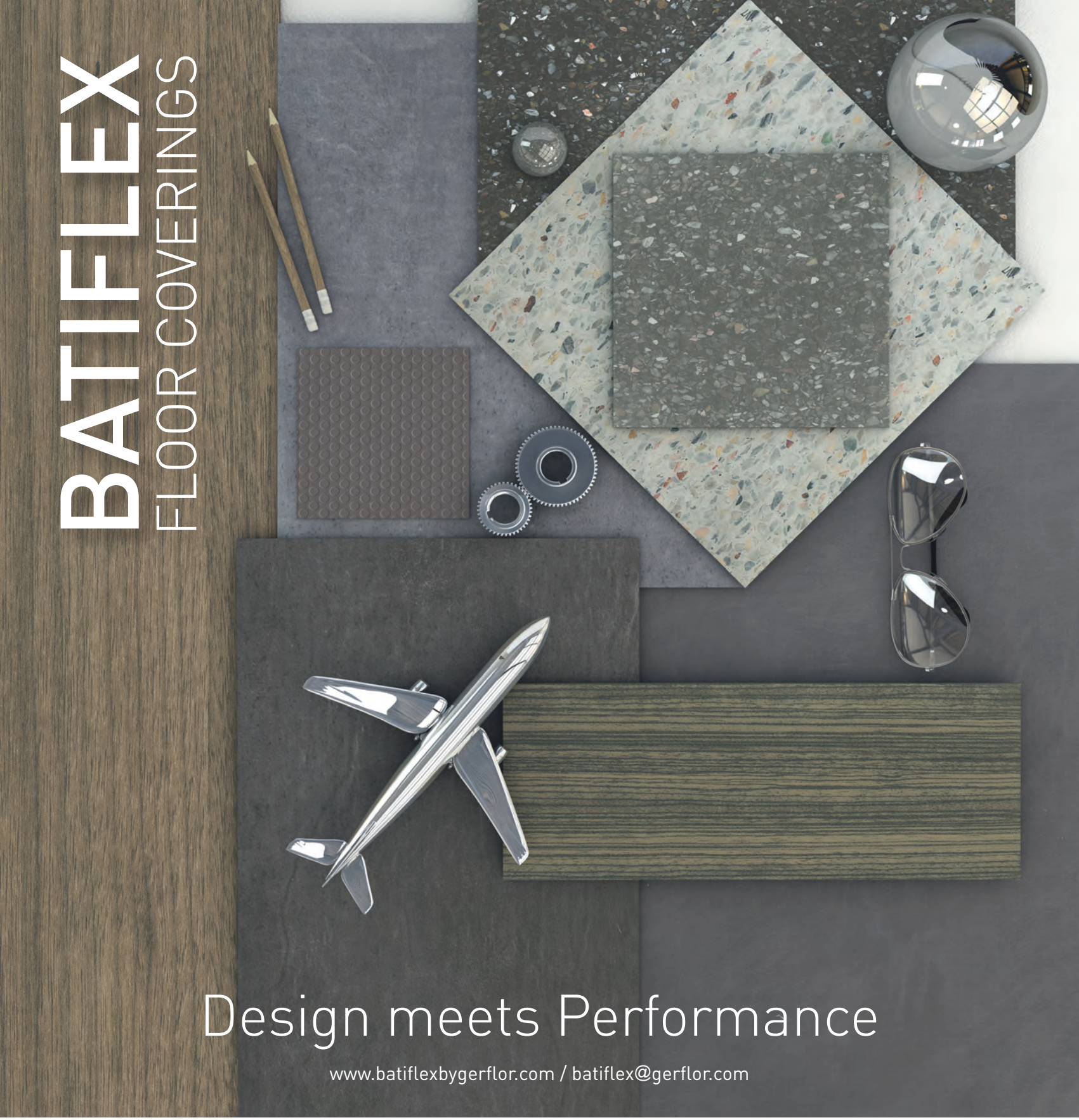

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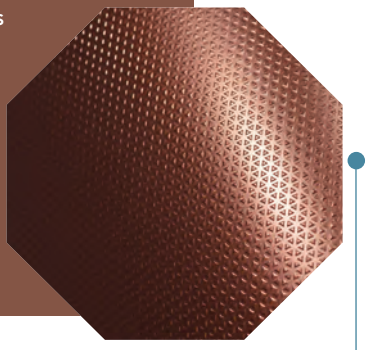
Cabin materials

Simply elemental

Inspired by the elements, Schneller's 2018 design collection, named Simply Elemental, takes its cue from the natural world and the five elements of fire, earth, air, metal and water. This collection represents transformation and change by incorporating a mixture of graphic elements, rich color and pigment effects to create a range of effects, from soft subtle stone finishes to luxurious metallic gradients and vivid jewel tones.

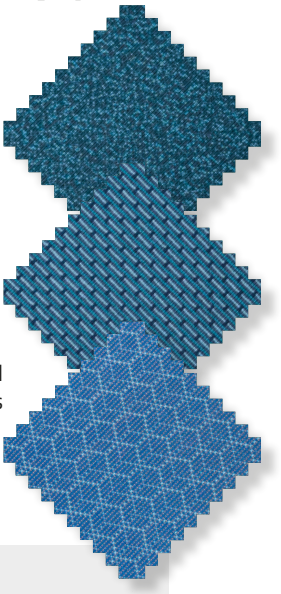
The collection was inspired by studies of various processes, functions and phenomena of nature. Schneller's new collection reflects nature by using earth tones, simplified symmetrical patterns, rich metallic effects, and combined geometric structures with natural wood and stone patterns. The result is a rich spectrum of decorative laminates and flooring.



BLUE AS SKY

This year, Tisca introduced a trend collection of elegantly harmonized textiles for furnishing the complete aircraft interior. The Stream collection is made up of shades of blue, from fresh sunny-day blue, to the darkness of night blue. The collection plays with the concept of cabin classes, giving each its own mood through colors and designs.

The three classes, as well as the individual seat covers, carpets and curtains, have been conceptualized in coordinated and aligned designs and colors. This holistic collection reflects the latest global trends in terms of patterns, textures, materials and color combinations. As an all-inclusive manufacturer, Tisca designs, develops and manufactures all these product groups under one roof in Switzerland without subcontracting.



ARAMID SHELL AND WALL COVERINGS

Seat shells for premium seats have become more than just partition walls in recent years. The shell can contribute to a pleasant traveling experience, the design creates an inviting homey feeling for the passenger, and the structure of the lining dampens sound. Lantal has taken these considerations into account when constructing its new aramid wall coverings.

A combination of a new yarn and weave structure gives the material great 3D optics and haptics. The relief designs create a contemporary moving surface and add a premium accent to the overall appearance of the cabin. These aramid coverings meet all relevant airworthiness requirements, including heat release rate.

High-impact thermoplastics

Thermoplastics giant Sekisui SPI has launched two products designed to help airlines reduce weight and improve efficiency, while exceeding safety requirements.

The two launches – Kydex 6523HI and 6565HI – are both high-impact products, designed to absorb more impact energy prior to failure, aided by featuring a ductile failure mode rather than the brittle failure mode more common in PVC/PMMA materials. This ductile failure characteristic increases the likelihood that thermoformed parts made with the new Kydex materials will pass HIC testing when used on demanding geometries in the passenger HIC zone and meet FAR 25.853 (a) and (d) requirements.

Kydex 6523HI is a high-impact material with integral pearlescent finish. The material was engineered to improve passenger safety when used in components requiring the HIC test.

High-tech ideas

A SANDWICH PANEL MADE WITH ULTRASON PESU FOR AN AVIATION RESEARCH PROJECT

BASF is helping the aerospace industry accelerate production and customization with its new additive manufacturing materials for lightweight functional components and high-temperature tooling. The company's growing portfolio includes thermoplastics (Ultrason PESU/PPSU, Ultramid PA, and Elastollan TPU), composites, stainless-steel 316L, and photopolymers. 3D-printed structures and components weigh much less than those produced by conventional processes and are just as functional, if not more so.

For a lightweight alternative to injection-molded plastics, Contoura combines Acrodur acrylic resins with a variety of non-woven fiber reinforcements, producing a prepreg composite ready to be formed into its final shape. Available in custom thicknesses, densities and mechanical properties, it can be formulated to meet 60-second vertical burn per FAR 25.853, custom colored, and designed specifically for use in cabin interior components.

EUROPEAN AVIATION

INNOV8

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NOW TRENDING

Boltaron is creating eco-friendly, long-lasting and lightweight performance plastic for the aircraft interiors industry

Reducing aircraft cabin weight to minimize fuel consumption is not a new topic; however, the push for airlines to become more environmentally friendly and fuel-efficient remains strong.

One area where there is room for more development and opportunity is in aircraft interior components. Aircraft Interior components must meet FAA compliance for performance and safety, however there is some leniency in adaptations, depending on the area of use.

For aircraft carriers, the focus is on finding opportunities to use lightweight plastic to replace metal, aluminum, or even a heavier plastic material, without compromising performance or safety. Depending on where the component is used, it can have several code requirements such as impact strength standards or fire-retardant ranges that must be met. For example, the weight of thermoformed seat shells in six aircraft seats using Boltaron 4330L would be equivalent to the weight of thermoformed seat shells in five seats using standard FAR materials.

Lighter aircraft use less fuel, which opens up endless opportunities for new routes with fewer stop-overs and greater cost savings.

Performance cannot be compromised when designing lighter-weight material for interior components. Thermoplastics for seatbacks, tray tables and IFE bezels are nearly half the weight of the metal versions. In many cases, performance plastics that replace other materials outlive the life of the aircraft itself.

When altering material chemistry, many performance requirements need to be met. Some notable performance requirements are: outstanding flame, smoke and toxicity characteristics (must meet the flammability, smoke and heat-release requirements of FAR 25.853(a) and (d)); high temperature resistance; superior resistance to impact, vibration and abrasion; and UV, chemical and scratch resistance.

MAIN IMAGE AND BELOW: THIS CONCEPT SHOWS HOW BOLTARON THERMOPLASTICS CAN BE APPLIED THROUGHOUT FOR A LIGHTWEIGHT, HIGH-QUALITY DESIGN

ABOVE: SEVERAL COLORS AND FINISHES ARE AVAILABLE

Boltaron thermoplastics meet the requirements of FAR 25.853

The environmental aspect of producing lighter-weight options for aircraft interior components includes a standardization process. When design engineers can source components for use across a variety of applications in the aircraft cabin, the new product design process is less costly.

Also, aerospace OEMs are recognizing the value of investing in production tooling for lower overall program costs. The product validation process can be reduced with a standardized mechanism, which OEMs are realizing as they look for new ways to use one solution for multiple aircraft interior components.

One concern when replacing traditional component materials with lightweight performance plastics is that new components will not convey top quality to the passenger, or may negatively influence the inflight experience.

In fact, fabricators are finding new ways to enhance the aesthetics of high-performance plastics through thermoforming and other techniques and tools. Boltaron's 4330L, for example, is a thermoplastic sheet that meets FAR 25.853 (a) with a 20% reduction in weight compared with standard thermoplastics. This provides limitless ways for designers to bring their dreams to life and delight the customer.

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ITALIAN INNOVATION

Aviointeriors is expanding its range of aircraft seating, with innovative new designs being created for economy, premium economy and business class

Following the success of its Columbus range of seating, Aviointeriors is now working on a brand-new family of economy class seating, named Michelangelo. The first Michelangelo long-range seat was presented at Aircraft Interiors Expo in Hamburg in April 2018, and the company's sales team has already received many enquiries about the seat. The seat features a 13.3in IFE monitor, numerous stowage spaces, and carefully styled bumpers and armrests.

Aviointeriors has also been working on a short-to-medium-range version of Michelangelo, and will be presenting these products at Aircraft Interiors Expo 2019 in Hamburg, next April. The Michelangelo MR (medium range) economy class seat represents a modern solution, with armrests and bumpers that are characterized by a fresh design, easy maintenance, and a tablet holder on the rear backrest.

Aviointeriors looks at the airline market as a whole, an approach that the company believes enables it to serve even the most demanding carriers' requests in the fullest way. Aviointeriors' innovation is not limited to the economy class market, as it will continue improving its already wide product range of premium economy and business class seats. The new premium economy seat, named Caravaggio, has all the technical requirements to compete with competitor products in this category. Caravaggio is intended to match and exceed customer expectations in terms of comfort, quality and storage, offering a passenger experience similar to a regional business class seat.

The company's 40 years of experience in aircraft seat manufacturing are even more visible in the business class seat sector. Italian design, comfort and quality characterize Aviointeriors' business class seats. Adagio, a high-density fully flat seat, can be fitted eight-abreast on the B777 and B787, and seven-abreast on the A330. The technical characteristics of Adagio are outstanding: a seat pitch of 43in, seat width of 20in, bed length of more then 76in, bed width of more than 26in, and 18in ottomans.

At Aircraft Interiors Expo 2019, Aviointeriors will also present a prototype of Adagio designed for the A320, which will be exciting news for the narrow-body fully flat seating market.

Look out for an A320 version of Adagio at AIX 2019

ADAGIO OFFERS A GREAT DEAL OF PASSENGER COMFORT IN A HIGH-DENSITY PACKAGE

RESPECTING NATURE

Wollsdorf Leather is a fully integrated tannery, handling the entire production process, from raw hide to finished leather

Founded in 1936, Wollsdorf Leather deals with every stage of the tanning process, from raw hide to finished leather hide. Based in Wollsdorf, Austria, in 1997 it became the first tannery to receive ISO 14001, an environmental certificate that is reissued annually. In recent years, the company has also received many other awards for its environmental commitment, including an 'environment Oscar' from Austrian magazine *Umweltschutz*, the Austrian waste avoidance award, the Waterland Styria 2012 certificate for water protection, the Blue Angel award for low-emission upholstery leather, and the ECO_2L Energy Controlled Leather label.

As an example of the company's environmental responsibility, unavoidable waste is disposed of safely using the latest technologies. An in-house sewage treatment plant cleans wastewater, and the accumulated sewage sludge is burned, recovering energy. Wollsdorf Leather has spent more than €10m (US$11.8m) on waste, wastewater, environmental and safety measures since 2009, and wastewater values are checked daily to ensure that standards are being met.

Wollsdorf Leather is the first CO_2-neutral tannery in Austria. Optimal use of resources such as water, energy and other raw materials, as well as the environmental compatibility of all processes within the company, are of utmost importance to it, and many projects have been realized in recent years to make the Wollsdorf Leather's locations more sustainable.

Water consumption at the plants has been cut in recent years through various production optimizations and is now well below the leather industry benchmark.

Energy consumption has also been reduced in recent years, resulting in a total annual saving of nearly 1GWh of electricity. By using only renewable energies such as water and wind, the company has reduced its CO_2 emissions to 50% of the leather industry standard.

Wollsdorf Leather adheres to ecological criteria in its supplier selection

The remaining emissions are neutralized through the purchase of climate certificates, which are used for climate protection projects in rainforests.

Wollsdorf Leather employs alternative tanning processes for its aircraft leathers. Traditional tanning processes use chromium, but to maintain its clean relationship with its environment, the company instead uses synthetic vegetable tanning agents.

Alternatively tanned (chrome-free) leathers are produced in a more environmentally compatible way than conventional leathers. Chrome-free aircraft leathers achieve the same quality standards as chrome-tanned leathers in terms of specifications and flame- and fire-retardant behavior.

As a result of the use of synthetic or vegetable tanning agents and plant-based fatliquoring agents (such as palm, rapeseed and beet oils), it is possible, by employing alternative tanning, to produce leather in a more environmentally compatible manner while using renewable raw materials.

The leather is free from heavy metals and thus poses no hazard to those allergic to chromium, or to metals in general.

Aircraft seat manufacturers are able to guarantee takeback of used seats, because it is possible to incinerate alternatively tanned leathers without any environmental issues. Even under the best conditions, a certain proportion of highly toxic hexavalent chromium is released when chrome-tanned leathers are incinerated. Many tanneries are unable to produce alternatively tanned leather due to the complicated production requirements of this type of leather, which requires a great deal of experience.

Wollsdorf Leather is the only full-stage tannery to have been producing chrome-free aircraft leathers since 2010, and has produced leather for more than 150,000 aircraft seats. Chrome-free aircraft leather is available in standard versions or in a unique lightweight version with a guaranteed weight of less than 650g.

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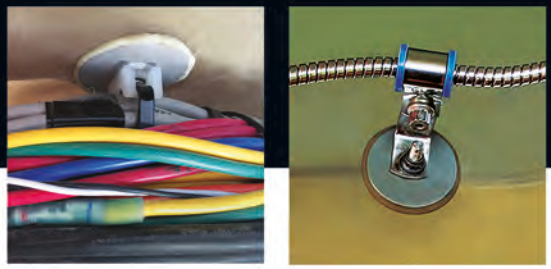

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COMFORT AND WELLNESS

Cushions should be so comfortable that passengers don't even notice them, says Supracor

While seat manufacturers design seats with the latest comfort features, often forgotten is the role the cushion plays in providing comfort. The cushion should remain comfortable for the duration of the flight without becoming hard or too warm over time. In the best case scenario, the cushion should provide a sense of well-being without being noticed by the passenger.

THE CELLULAR MATRIX CONTOURS TO FORMS

Supracor's Stimulite honeycomb cushions feature wellness benefits that work to ensure long-term sitting comfort. They are composed of a lightweight and flexible cellular matrix that contours to the body and is more than 90% open space. As the honeycomb cells flex, they help to stimulate blood flow, which boosts oxygen and promotes relaxation. The cells are perforated to allow air to circulate, keeping the seat temperature at a comfortable level.

Passengers flying on Swiss International Airlines B777s in economy class are enjoying the wellness benefits of Stimulite cushions, and the airline has also chosen Stimulite for its A340 retrofit in economy, economy plus and first class. Supracor is currently working on programs to integrate Stimulite

ABOVE: CLOSE-UP OF THE STIMULITE HONEYCOMB STRUCTURE

cushions with several airlines, so more passengers will soon be able to experience its comfort and wellness benefits when they fly.

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REDUCE WEIGHT NOW

Ebco has reduced the weight of its hard foam for tray tables by 30%

Ebco is an experienced supplier of tray tables for well-known manufacturers of aircraft seating. At the end of 2017 a customer challenged Ebco to reduce the weight of its existing tray table by 30g without changing its design, form and function. The foam and adhesive in this tray table accounted for 33% of its weight.

Due to this customer requirement, the only option was to substantially reduce the weight of the existing foam filling system without negatively influencing the flammability and head injury criterion (HIC) tests.

This challenge provided the initial spark for development, with a series of approaches taken with a view to solving the problem.

"If it had been easy to reduce the weight of the lightweight foam, of course we would have done it much sooner. But at this stage it gave us the opportunity to look for completely new solutions," says Ebco CEO Hanspeter Ebner.

All changeable and modifiable parameters were selected and also the applicability of the additives. The next step was to create and realize a complex plan for the various series of experiments. In addition, a process improvement for gluing was sought, to save further weight.

After an intensive series of tests, the results of the flammability and adhesive durability could be verified.

The result was a 38g reduction in the weight of the tray table, so the

customer's request was fulfilled. Indeed Ebco has since reduced the weight of its hard foam for tray tables by 30%, and this new foam can be implemented for other customers.

Sometimes it takes a customer challenge to generate a pioneering improvement.

FREE READER INQUIRY SERVICE

To request more details from Ebco, visit **www.ukimediaevents.com/info/aim**

FRESH THINKING

Lantal's stain-repellent and hygienic seat covers offer many advantages to operators and passengers

Airlines have transported more people than ever in recent years – last year alone, they carried more than four billion passengers. This enormous growth also increases the need for hygienic interiors as well as simple and quick maintenance of aircraft cabins. Lantal is aware of this challenge and in response has developed the innovative TEC-Leather material. TEC-Leather stands out in the market due to its high resistance to stains and dirt, its insensitivity to oils, body fluids and alcohol, and its unmatched ease of cleaning. The material has a leather-like appearance and is non-cytotoxic and resistant to fungal growth.

The Swiss company also offers fabrics with stain repellent and hygienic finishes. Lantal's hygienic finish can be applied direct to seat covers and curtain fabrics, and offers a reliable and durable bacteriostatic effect against a large number of gram-positive and gram-negative bacteria. Further advantages are the prevention of mildew spots and unpleasant odors caused by microbes.

Lantal's stain-repellent finish means that spilling a drink on the seat cover

fabric is not a problem; liquids simply roll off the fabric without leaving traces. The fluids do not penetrate the fabric and can be wiped off easily.

The stain-repellent finish continues to work even after 10 dry-cleaning cycles and has been developed especially for seat cover fabrics made of wool/polyamide. The natural breathability and moisture absorption properties of wool are not reduced when the finish is applied. Thus the seating comfort of such textiles remains unchanged while their visual appeal is ensured over a long lifetime.

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Boeing 747

As the Queen of the Skies turns 50, it is difficult not to become a little sentimental about the glamorous grande dame. The iconic, curvy shape must be the most recognizable and loved aircraft design in the world, and as a child of the 1960s it seems fitting that the B747 is a 'far out' design, conceived during the jet age started by the B707 and DC-8. As pretty and fast as those aircraft were, their relatively small capacity, combined with fast-growing passenger numbers, was leading to congestion in airports, built before jetset travel was imagined. Someone who did have a vivid imagination, however, was Pan Am president Juan Trippe, an airline titan who envisioned the solution to congestion in the form of a passenger aircraft around 150% larger than the B707.

As the story goes, Trippe's vision became a challenge during a fishing trip in summer 1965 with then-Boeing president Bill Allen, when he said, "If you build it, I'll buy it." Allen's almost too perfect, certainly too bold response was, "If you buy it, I'll build it."

Whether this fishing yarn is accurate or apocryphal, one truth is undeniable: these two characters were starting something big. A few variants were considered for the design, codenamed 747 from the outset, including a twin aisle, full double-deck fuselage. This design had merit, as we know today with the A380, but evacuation of the upper deck presented a problem, as did the limited cargo capacity. This latter point was critical, as both Boeing and Trippe predicted that before long, supersonic commercial flight would render the B747, and indeed all subsonic airliners, redundant.

The vision was that by the time 400 aircraft had been sold the B747 would have to cease operating as a passenger liner and continue life as a freighter – hence the upper deck 'hump' enabled a freight-loading door to be fitted in the nose. This distinctive hump was at one point considered by the design team as a crew rest area, an idea shot down by Trippe, no doubt already seeing passenger experience potential in the space.

ABOVE: A B747 CAUSING A COMMOTION AT SAINT MARTIN. PHOTO: TIMO BREIDENSTEIN

BELOW: AIRLINES SAW THE FIRST B747 ROLL OUT OF EVERETT IN SEPTEMBER 1968

BOTTOM: FISHING BUDDIES ALLEN (LEFT) AND TRIPPE. RATHER FITTINGLY, THEY SIGNED THE CEREMONIAL CONTRACT FOR THE B747 AT THE BANQUET MARKING BOEING'S 50TH ANNIVERSARY

Trippe made good on his promise from the fishing excursion, with Pan Am placing a US$525m order for 25 B747-100s in 1966. In turn, Allen fulfilled his side of the bargain, putting his top engineer, Joe Sutter, in charge of the design and build team, a man who would become known as the "father of the 747". Allen and Trippe might have been tempted to launch a paternity challenge, but there is no denying Sutter's talents, especially since he was given just 28 months to deliver the B747.

Remarkably the deadline was met (especially given many challenges, including evacuation times) and the first Pan Am B747 – 'Clipper Young America' – was named on January 15, 1970, by First Lady Pat Nixon.

The huge cabins enabled airlines to elevate the passenger experience, with spacious economy cabins, luxurious first classes, and upper deck lounges. However, the feeling of space was also due to airlines struggling to fill the aircraft, with economic problems around the world not helping matters. Indeed airlines were not achieving the B747's boast of having the lowest potential operating cost per seat.

The B747's 'jumbo' moniker derives from a famous elephant at London Zoo, and indeed the aircraft could have become a white elephant, but with more than 1,500 built over the past 50 years it has proved a big success for a big gamble. Sales have slowed, but with more than 460 B747s still in service, and more than 20 orders for the B747-8 on the books, the jumbo experience can still be enjoyed. To paraphrase Bill Allen, "If you fly it, I'll book it."

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