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1. What technological developments does the future hold? And what opportunities do they present to the cabin industry?
JOB AVIATION

Editor's Letter

As I find myself completing my first issue of the magazine I can't help but think back to my younger days. When I entered the aviation industry, the world was on the cusp of what was dubbed 'The VLJ Revolution.' It was the start of a new millennium and the advent of the sub-million dollar Very Light Jet. It seemed that every man and his dog had a scheme to create an affordable, economical and easy-to-fly jet and I would report on companies touting the best innovation since Orville and Wilbur gave up on bicycles.

Of those, a small number built a flying prototype and fewer still managed to get their inventions as far as production. Fast forward 20 years and while there are a number of VLJs in service the majority fell by the wayside. You could say that the metaphorical wheat had been sorted from the chaff.

Two decades later, as I compiled this issue, I was struck by the number of companies offering a future of supersonic travel, 'green' powerplants or the much-promised flying car. However, we are already at the stage where NASA is preparing its X-59 QuietSuperSonic Technology (QueSST) demonstrator and the quest for Urban Air Mobility (UAM) is attracting huge investment at both corporate and government level. The electric Vertical Take Off & Landing (eVTOL) craft of the future are already flying and, while their autonomous operation is some

way away, many are predicting they could be in regular 'manned' service within the next few years. Those advances in eVTOL have driven the development of electric and hybrid-electric powertrains with associated improvements in battery technology and development of hydrogen fuel cells. We are already at the stage where the grains of wheat are beginning to separate – and when giants like Airbus and Rolls-Royce invest in eVTOLs you must assume they're confident of a return on their shareholder's money.

So, what does this have to do with cabins you may ask? Well, regardless of whether it's a fuel-efficient airliner, a supersonic bizjet or an electric-powered flying cab, the manufacturers will have evolving needs for a new generation of cabin infrastructure. It might be radical, lightweight or luxurious but this new era calls for innovation at every level. Millions of pounds, dollars and euros are being invested

in new businesses that have entered this market and in years to come – when we have to choose whether to travel to the next meeting in an eVTOL with a 'relaxation pod', an 'office pod' or maybe even a 'party pod' – we can look back at how we helped form part of what governments are dubbing the 'Fourth Industrial Revolution'.

I've thoroughly enjoyed producing my first issue but I'm very conscious that this is 'your' magazine. As such, I'm keen to hear from you; to learn more about your area of the industry and discover what factors and issues are important to you and your business. You'll find my e-mail address below and I pride myself in responding to all correspondence.

Until next time, blue skies and tailwinds.

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BUSINESS BRIEFING

CONNECTIVITY

FAA Voices Concerns over 5G Networks

The FAA issued a Special Airworthiness Information Bulletin (SAIB) in November that highlights potential radio altimeter interference issues by new 5G networks. In the USA, the 5G network will ultimately

use the 3.7 to 3.98GHz bands whereas radio altimeters use the 4.2 to 4.4GHz band. Other countries operate 5G on bands from 3.3 to 4.2GHz and according to the FAA some “have implemented temporary technical, regulatory, and operational mitigations.” However, it added, “There have not yet been proven reports of harmful interference due to wireless broadband operations.”

STATISTICS

Bounceback Predictions

November’s Dubai Airshow was the first major tradeshow since the pandemic and representatives from both Airbus and Boeing were in confident mood.

In its latest global market forecast Airbus, which came away from the show with 269 firm orders and 139

commitments, outlined what it predicted would be a progressive shift in demand from fleet growth to accelerated retirement of older, less fuel-efficient aircraft. The company claimed this would result in a need for some 39,000 new-build aircraft over the next decade, of which 15,250 aircraft (40%) would be replacements.

Meanwhile, Boeing predicted a \$3.2 trillion demand for 19,000

new aircraft over the next ten years, reflecting signs of the industry’s recovery following the impacts of the global shutdown. The US manufacturer expected demand for domestic air travel to grow as health and travel restrictions ease. Looking further ahead, it predicts a global demand for more than 43,500 new aircraft by 2040. It indicates that 32,660 (88%) of

those aircraft will be new single-aisle airliners but carriers will also need 7,670 new widebody aircraft to support fleet renewal and to meet predicted growth in longer-haul markets.

Airbus concludes that the projected increase in demand will also result in vacancies for more than 550,000 new pilots as well as more than 710,000 highly skilled technicians over the next two decades.

40%

↑

Airbus predicts that 15,290 (40%) of the 39,000 new-build aircraft it expects will be delivered in the next decade will be fleet replacements for older less fuel efficient airframes

88%

↑

Boeing research suggests that 32,660 (88%) of the 43,500 new aircraft that will be needed by 2040 will be single-aisle airliners such as its 737



RETROFIT

BA Awards Club Suite Contract to Collins

Collins Aerospace has won a contract to upgrade the business class seating on British Airways’ fleet of Boeing 777s. The airline’s Club Suite seating offers direct-aisle access, a suite door for “greater privacy” and “luxurious” flat-bed seats in a 1-2-1 configuration. British Airways has already retrofitted

several of its Boeing 777 aircraft with the upgraded seating, with the roll out on the remaining aircraft expected to be completed by the end of 2022. As part of the upgrade, the airline’s ‘Club Kitchen’ will also be fitted with new chillers with built-in storage for snacks, drinks and other refreshments.



Beechcraft

UPGRADES

Textron Focuses on Cabin Upgrades

Business aviation giant Textron Aviation has focused significant attention on cabin interior upgrades as part of its new range of jets and turboprops.

The new Cessna Citation M2 Gen2 and Citation XLS Gen2 were unveiled in October and offer updates aimed at improving comfort and productivity for both passengers and pilots. According to Textron, this includes “ambient accent lighting, re-mastered illuminated

cupholders and additional in-flight accessible storage.” Productivity has also been bolstered with the latest technology in the cabin such as wireless charging capabilities and USB-A ports at each cabin seat. The larger XLS Gen2 now offers an optional Bongiovi Immersive speakerless sound system.

Textron’s Beechcraft King Air 260 turboprop (illustrated) has also been the subject of a cabin redesign with new cabinetry and a selection of fabrics and colour schemes. Additionally, the aircraft now features a digital pressurisation controller, which automatically schedules cabin pressure during climb and descent to increase overall passenger comfort.



● Geven has unveiled a new line of “passenger centric” seating in partnership with design studio PriestmanGoode. The Materia range (above) allows for easy customisation and configurability for different types.

● Viasat has acquired Inmarsat in a deal valued at \$7.3 billion. The combined company intends to become a leading global communications innovator with the aim of “affordably, securely and reliably connecting the world.”

● Passengers flying on selected United Airlines routes can now make touch-free inflight purchases, even when wi-fi is not available, by simply showing a QR Code in the PayPal app.

● Saudia and Iraqi Airways have signed IFE and connectivity deals with Panasonic Avionics. Saudia has agreed a contract for the company’s latest 4k and Bluetooth audio IFE innovations and Iraqi Airways has selected Panasonic’s ‘X Series’.

● ST Engineering has received a Supplemental Type Certificate (STC) from the FAA to install Aviation Clean Air’s cabin air purification solution aboard Airbus airframes.

● SABIC has launched a range of polyetherimide bio-resins. They are the first certified renewable high-performance amorphous polymers available and for every 100kg of resin produced, SABIC replaces 25kg (25%) of fossil-based feedstocks with material derived from bio-waste.

63%



Some 190 tons of waste from Emirates’ decommissioned A380 (63% of its empty weight) will be recycled or turned into furniture or artwork

25%



For every 100kg of resin produced, SABIC replaces 25kg of fossil-based feedstocks with material derived from bio-based waste

UPCYCLED

From Airborne to Art Form

Emirates has worked with Falcon Aircraft Recycling to ‘upcycle’ its first decommissioned Airbus A380, aiming to reduce the environmental impact of the dismantling process and the amount of waste that goes to landfill. Some 190 tons of metal, plastic and carbon fibre (63% of its empty weight) will be recovered from the aircraft to be recycled or used by Wingscraft to create furniture such as this ‘mainwheel table’ (left) and other artwork.



Trend watch.

Luke Chamberlain and Steve Bridgewater select their
Top Ten developments from across the industry



01
←

No Animals Harmed in Making of this Helicopter

When Dr Urs Brunner specified that his new ACH145 helicopter must have an interior that was fully vegan, Airbus Corporate Helicopters' (ACH) design team rose to the occasion. The cabin has had all the leather elements deemed essential to its luxury feel replaced with Ultraleather which captures the visual and tactile leather experience with comparable durability. Head of ACH Frederic Lemos said: "We're very proud of our team's work in creating this bespoke ACH Line interior. The material that we used is certified for aviation use and is hard-wearing, but it can only be stretched in one direction which means it is a challenge to work with, particularly on the seats."



05
↑

Together in Electric Dreams

According to UK-based ZeroAvia, a Hydrogen-electric commercial air service could start between London and Rotterdam as early as 2024. ZeroAvia has teamed up with UK regional carrier Aurigny Air to convert a 19-seat Dornier 228 into a development aircraft to trial a new hydrogen propulsion system based on its 600kW hydrogen-fuel-cell-based powertrain. The HyFlyer II project aims to create a regional airliner with a range of 500 miles and will begin with a hybrid hydrogen fuel cell and battery combination before progressing to hydrogen-only flight in mid-2022.

Elsewhere, ACIA Aero Leasing and Universal Hydrogen have signed a letter of intent to convert up to 30 ATR 72-600s to fly on liquid hydrogen. Universal Hydrogen is also in the process of developing a conversion kit for the de Havilland Canada Dash 8, with a view to getting an STC for the system by 2025.

02
↓

Airbus Unveils ACJ TwoTwenty

The 2021 Dubai Airshow offered a first chance to view the opulent interior of the new Airbus Corporate Jet ACJ TwoTwenty.

The VIP variant of the A220 is referred to by Airbus as an "Extra Large Bizjet" and is aimed at owners of existing large-cabin bizjets who want more space at what Airbus says is a similar price (around \$72 million). The aircraft offers six VIP living areas for up to 19 passengers and a 12-hour range.

Airbus recently announced a partnership agreement with Latécoère Interconnection Systems to develop a Smart LiFi (light fidelity) monitor for its ACJ fleet. The 4K monitor will feature wireless technology to offer Wi-Fi, Bluetooth and LiFi connectivity.



03
↑

Lufthansa Single-Aisle Airspace

Lufthansa has become the first operator in Europe to introduce Airbus' new Airspace cabin into service. The German national carrier has chosen to equip more than 80 of its new A320 Family aircraft with Airspace cabins and the first A321neo flew its first commercial routes in November.

The Airspace cabin features slimmer sidewall panels for extra personal space at shoulder level and better views through the windows thanks to their redesigned bezels and completely integrated window shades. It also has Airbus' largest ever overhead bins, enabling it to carry 60% more bags.

The latest full LED lighting systems include an LED-lit entrance area while the new lavatories have hygienic touchless features and antimicrobial surfaces.

04
↓

Denali Takes Flight

The prototype Beechcraft Denali made its first flight on 23 November. The single-engined turboprop has the largest cabin in its class thanks to a flat-floor design. The cabin will feature a standard seating configuration of six reclining seats but a nine-place seating option is also available. It also features an in-flight accessible baggage compartment.



08

Emirates adds Premium Economy

During the Dubai Airshow, Emirates announced that it will begin an 18-month retrofit programme to convert 52 Airbus A380s and 53 Boeing 777s to feature a new premium economy class.

The project is due to begin towards the end of 2022 and in the case of the 777 will involve removing five rows of seats behind business class and replacing them with 24 premium economy seats laid out in 2-4-2 configuration. On the A380 fleet, 56 premium economy seats will be installed at the front of the cabin's main deck.



10

SIA Debuts New Cabins

Singapore Airlines (SIA) has unveiled new economy and business class cabins to be rolled out on its Boeing 737-8 fleet as part of a US\$169 million upgrade. The refit will see the aircraft fitted with 154 seats including ten in business class. The latter will feature Vantage lie-flat seats created by AVIC Cabin Systems (ACS), personalised by London-based Factorydesign and manufactured by Thompson Aero Seating.

Vantage seating features alternating rows of double and single seats that recline into fully flat beds. It is designed to maximise space utilisation but still be spacious and comfortable. Factorydesign has created a special pink champagne and anthracite colour scheme mixed with burnt orange accents to give what ACS refers to as "a sophisticated yet fresh feel".

Economy class will feature the latest generation of slim line seats built by Collins Aerospace as well as Panasonic's X-Series seat-back IFE (linked to KrisWorld entertainment content) and Panasonic's in-flight Wi-Fi service.

06

Virgin Australia Trials New Seat

Virgin Australia has unveiled a new cabin interior design prototype which it plans to trial on two of its new Boeing 737-800 aircraft. The concept focuses on the airline's latest seats that have a new horizontal rib design to provide added support and comfort.

The cabin will house eight new business class and 162 economy seats while other features include self-deployable, non-slip cocktail tables and movable tray tables with in-built device holders. If passenger feedback is favourable the carrier will look to implement elements of the new design in other aircraft.



07

ATR Customer Experience Studio

Regional aircraft manufacturer ATR has introduced an innovative Customer Experience Studio at its headquarters in France. Equipped with seven cameras, a high-performance sound system, touch screens and virtual reality devices, the ATR Customer Experience Studio is the first of its kind in the aeronautical industry.

Through a series of interactive digital experiences, this fully connected space will enable ATR to bring its customers from all over the world to its headquarters, both remotely and in person, for a fully customisable and comprehensive touch and feel tour of its products and services – whether that's on the flight deck or in the cabin.

09

Floating on Air

Having previously focused on the air cargo market, Hybrid Air Vehicles has begun pitching its Airlander 10 airship as a kind of floating Orient Express. Mock-ups of the 100-seat cabin include floor-to-ceiling windows and swivelling chairs and HAV says the hybrid-electric-powered airship could be ready to enter service as early as 2025 with plans for a fully electric version to follow by 2030.



KEEPING PASSENGERS SAFE

Buckle up as Schroth Safety Products LLC's senior vice president (Aerospace) **Sean Padfield** discusses the certification of airline seatbelts



“Head Injury Criterion is a measure of the likelihood of an injury arising from an impact: in this case the forward and rebound motion in a typical accident”



Sean Padfield is senior vice president (Aerospace) at Schroth Safety Products LLC. Find out more at [schroth.com](https://www.schroth.com)

When you sit down in an aeroplane and buckle your seatbelt, have you ever thought about what that restraint goes through in order to be certified as airworthy? For those not in the aircraft seating industry, it can be surprisingly complex to integrate passenger restraint systems into aircraft seating.

The Wright Brothers first installed a seatbelt in their aeroplanes in 1910 but it would be many years until they were made mandatory.

Speaking at the 1929 aeronautical meeting of the American Society of Mechanical Engineers, Charles N Monteith, chief engineer at Boeing Airplane Company, emphasised the need for passenger seatbelts. “British and Dutch opinion is against their installation,” he told the delegates, “and most of the transports operating in the United States today do not provide belts for the passengers. However, it is being demonstrated rapidly that they are sometimes very necessary.”

Monteith went on to explain that safety belts not only protected passengers in the event of a crash, they also reduced the risk of injuries in turbulent air. However, it would not be

until 1972 that aviation requirements for basic safety features, including passenger safety belts, were solidified.

Today, regulations from civil aviation authorities like the US FAA and Europe's EASA are just the starting point. The primary legislation is contained in the sections of the FAA's 14 CFR Part 25 or EASA's CS-25. Section 25.785 specifically covers safety belts.

Certain aircraft equipment is certified against the FAA Technical Standard Order (TSO) or EASA European Technical Standard Order (ETSO), and for seatbelts and restraint systems that is TSO- or ETSO-C22(g) and C114. These TSO/ETSO documents refer onwards to minimum performance standards set by SAE International.

1972



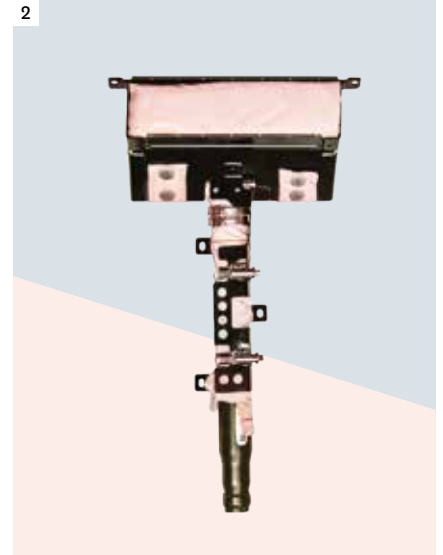
It would not be until 1972 that aviation requirements for basic safety features, including passenger safety belts, were solidified

It is when a novel or innovative seat, or other product, isn't covered in the TSO/ETSO documents that things get complicated with individual certification demonstration processes often required. The FAA designates these as Special Conditions, and EASA refers to them as Certification Review Items, but they are

both formal methods of certifying cutting-edge technologies.

Head Injury Criterion

At the end of the day, the seatbelt is there to protect a passenger during a crash, which itself is a massively complex scenario, driving a wide range of requirements. For example, testing requirements include static trials of seats independently, seats in rows with others, interaction with monuments in front of seats — and that's before other



important requirements like flammability, smoke toxicity and resistance to chemical corrosion enter the equation.

One of the more complicated elements of the seat belt certification process is the Head Injury Criterion (HIC). HIC is a measure of the likelihood of a head injury arising from an impact: in this case, the forward and rebound motion in a typical crash scenario. It considers the magnitude of head acceleration as well as the duration of the acceleration. At Schroth Safety Products, this calculated value is predicted through Computational Fluid Dynamics (CFD) analysis and verified through testing. The design of

seatbelt products takes into account the overall head arch of the passenger and the HIC to select the best solution for the specific aircraft seat.

Differing Requirements

In economy class, seats in most rows use a breakover feature which allows the seatback to pivot during an impact — to act as a crumple zone. Standard two-point lap belts, what most people would think of as the usual airline seatbelt, is typically sufficient for these standard configurations.

In exit rows, seats must remain in place so as not to impede evacuation, requiring the passenger behind to be spaced far enough back for the passenger's head to miss the exit row seat during a crash event. In bulkhead (typically first row economy) seats, too, either the passenger must be spaced far enough behind to completely miss the bulkhead, or a restraint system or airbag must be used. In most airline cases, the airbag is contained within a lap belt.

Meanwhile, in premium economy, business and first class

1&2. Seen here after deployment and before, Schroth's structure-mounted airbag systems (SMA) provide certification solutions for oblique and other unique seating configurations

3. Schroth's Model 30 is a three-point diagonal pretensioning restraint system with PHARS (Pretensioning Head Arc Reduction System). PHARS is activated by the Mechanical Crash Sensor Unit (MCSU) which is battery powered and independent from aircraft power

“A crash is a massively complex scenario, driving a wide range of requirements”

cabins it's even more complicated, with seats angled away from the centreline of the aircraft, seats facing towards the side or rear, feature elements or privacy wings, suite doors and much more that can come into play. These require more complex solutions such as three-point pretensioner restraints and structure mounted airbags.

At Schroth Safety Products we have compiled a white paper looking at aircraft seat belts and helping customers to navigate the complex web of regulations, testing and updates. If you would like a copy, please get in contact.

With the cabin interior evolving at a faster rate than ever before, innovation in the safety belt market is more critical than ever. 



3 In exit rows, seats must remain in place so as not to impede evacuation, requiring the passenger behind to be spaced far enough back for the passenger's head to miss the exit row seat during a crash event. In bulkhead (typically first row economy) seats, too, either the passenger must be spaced far enough behind to completely miss the bulkhead, or a restraint system or airbag must be used. In most airline cases, the airbag is contained within a lap belt.

Meanwhile, in premium economy, business and first class



HOW GREEN IS YOUR CABIN?

Much emphasis has been placed on the need for alternative powerplants and fuel sources, but **Steve Bridgewater** asks what the airline industry can do within the cabin to reduce its carbon footprint and overall effect on the environment

In late 2021, the world's attention was focused on Glasgow as the world's leaders discussed the environment at the much-anticipated 26th Conference of the Parties (COP26) Climate Summit.

Perhaps surprisingly, the transport sector was not discussed until almost the last day, when a coalition was announced to put forward a declaration that encourages net zero carbon emissions globally from the air transport business by 2050.

Meanwhile, addressing the 'Green Aviation Event' – which took place in the City of London on 25 October and was co-organised by the Honourable Company of Air Pilots (HCAP) and the Worshipful Company of Scientific Instrument Makers (WCISM) – Robert Courts MP (UK Aviation Minister) pointed out that aviation was responsible for 5% of global emissions, but was getting more than 5% of attention. Noting that the world needed a sustainable and highly profitable aviation sector, he emphasised the desire for what he called 'guilt-free' flying: "Flying is not the problem; emissions are," he said.

While much emphasis has been placed on the quest for alternative powerplants – be they electric, hybrid or hydrogen – and the development of Sustainable Aviation Fuel (SAF), there is much more that the air transport industry can do to both minimise its impact on the climate and win the hearts and minds of the eco-minded traveller.

Procedural Changes

Continuous descent approaches and continuous climb departures could each save approaching 1% on fuel burns, while single-engine taxiing could save over 2%. Even bigger savings could come from unimpeded taxiing, and using electric tugs to transport aircraft to the end of the runway could save a total of 15 minutes of engine running per departure. Building more stands at terminals to reduce delays would help further and it is estimated that these changes alone would amount to a 10% reduction in fuel burn. To put that into context, 1% of fuel use across Europe alone

is the equivalent of two million tonnes of CO₂ emissions per year. Then there is the ethical question of whether ferrying aircraft halfway round the world to benefit from cheaper maintenance is justified.

Speaking at the Green Aviation Event, UK CAA Chairman Sir Stephen Hillier emphasised the importance of airspace modernisation, which he claimed could offer a rapid opportunity to reduce carbon.

However, this would need to take into account the impact on noise, and would have to apply to all airports and routes equally. Looking further into the future, Professor Paul Robinson of Imperial College

introduced the results of research which demonstrated potential drag reductions through the excitation of small-amplitude, high-frequency vibrations in aircraft skins. Such research is at an early stage, and he acknowledged that, as yet, there was no knowledge of any effects that such technology might have on, for instance, cabin noise.

Design Opportunities

Multiple airlines have announced programs to try to become more sustainable in

the coming years. Delta recently committed \$1 billion to become carbon neutral by 2030, while easyJet pledged to get there by 2035, JetBlue by 2040, and United Airlines by 2050. Older aircraft remain the least fuel efficient and Wizz Air UK – which operates a fleet with an average age of 5.08 years – estimates that if all other European airlines ran aircraft of a similar vintage, they would save 34% on their emissions.

During the event in the City of London, easyJet's David Morgan produced a startling statistic regarding future fuels, claiming that 18 tonnes of kerosene



Wizz Air UK – which operates a fleet with an average age of 5.08 years – estimates that if all other European airlines ran aircraft of a similar vintage, they would save 34% on their emissions

1% of fuel use across Europe alone is the equivalent of two million tonnes of CO₂ emissions per year



would enable an Airbus A320 to fly from London to Dubai; 18 tonnes of battery would get the same aircraft to Dover; and 18 tonnes of hydrogen would get it all the way to Sydney, Australia – but the volume involved would be impossible to carry.

If hydrogen is the saviour, it will require a complete redesign of new aircraft to carry the fuel in the mid-section – perhaps with passengers above/below/alongside in a blended wing concept. This need for new aircraft – however they are powered – in turn opens opportunities to radically change, modernise and improve the cabin environment. As discussed in our *Future of First Class* feature [Ed: see p38] some operators are already looking at ways to reconfigure interiors but the advent of entirely new concepts gives even greater scope for innovation and radical change.

In recent months, increasing emphasis has been placed on the ‘green’ cabin, with many airlines realising that small changes go a long way towards their carbon footprint and the regard in which their customers hold them.

Supply chains are starting to take sustainability very seriously and many OEMs are demanding verifiable sustainability from suppliers and

“One might be a family-friendly cabin, one a business suite and one could even be a flying casino”

partners. For some years, business aviation giant Gulfstream Aerospace has mandated “environmentally conscious business practices” in its suppliers’ code of conduct and others are following suit.

Sustainable materials and manufacturing processes found in Gulfstream’s cabins, such as the use of renewable natural fibres like cotton and wool, are now becoming commonplace in airliners too. Likewise, many of the materials are recyclable.

Fello’fly

Around a decade ago I attended an Airbus press conference where the manufacturer announced plans for fleets of aircraft flying in a ‘V’ formation “like flocks of geese” to save fuel. The concept was simple and followed the aerodynamic principle in which geese migrate in large groups, effectively ‘surfing’ on the wake of the birds ahead of them. At the time Airbus admitted that having flights departing at the same time would limit passenger flexibility. So, it came up with an innovative

concept to make the proposal more appealing; each aircraft would be ‘themed.’ One, it proffered, would have a family friendly cabin, one might have a business suite, one could be dedicated towards sleep and relaxation and one could even be a flying casino.

Serendipitously, just as this article was being written ten years later, Airbus performed the first long-haul ‘fello’fly’ demonstration of such formation flying and the two A350s saved more than six tonnes of CO₂ emissions on a trip between Toulouse and Canada’s Montreal-Trudeau International Airport.

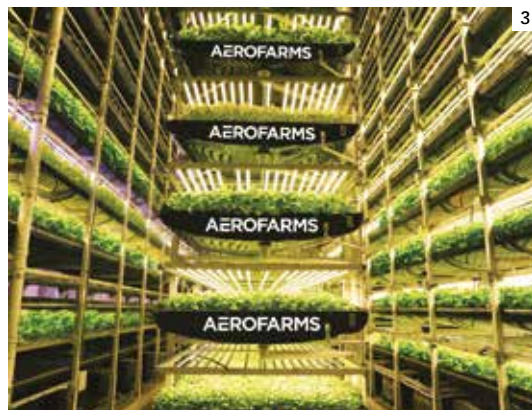
Airbus said the flight confirmed that by using specially developed flight control systems to stay in the wake updraft of the proceeding aircraft, fuel savings of more than 5% could be achieved without compromising safety.

The next step is to get the support of authorities so the new operational concept could be certified – but Airbus says this wake-energy retrieval has the potential to reduce CO₂ emissions by between 3 and 4 million tons per year.

If the fello’fly concept proceeds as planned it could revolutionise the aircraft cabin, negating the need for zones within individual aircraft and allowing entire cabins to be designed for specific needs.

Technological Advances

Among the innovations unveiled at November’s Dubai Airshow was Lufthansa Technik AG’s Explorer VIP cabin concept. It is aimed at the super-wealthy owner/operator but the most striking element of the proposal could easily be adapted by airlines choosing to theme aircraft for fello’fly use. The Explorer’s cabin features the



1&2. Airbus' Maveric is a blended wing concept aircraft. The extra space within the cabin could be utilised by airlines in many ways

3. AeroFarms is the world's largest indoor vertical farm and claims to use 95% less water compared to field farming. It provides fresh produce for Singapore Airlines

4. An A350 rolls into the paint shop. Chromium-free primers utilise organic alternatives using alkali earth or transition-metal compounds

5. easyJet's new pilot and cabin crew uniforms are made using fabric made from 100% recycled plastic bottles

large-scale projection system for virtual content, which can turn the cabin into anything from a disco to a virtual aquarium. Although similar features have been seen in other Lufthansa Technik design studies, the company has now found a way to implement them in a way that is certifiable. Working with Diehl Aerospace, Diehl Aviation and Thales it has developed lightweight passively cooled projectors which can be integrated into cabin walls and ceiling.

Increasing use of 'intelligent' technologies is opening up opportunities to streamline the cockpit and the cabin. Integrated platforms work together to both improve operational efficiencies and significantly reduce the amount of wiring required for the cabin, galley, and flight deck. New materials could also help airlines 'go green' and researchers are investigating new composites and coatings that are lighter, thinner, less toxic and more environmentally friendly than those already in use.

Using composites instead of traditional aluminium to manufacture aircraft components has helped reduce the overall weight of aircraft such as the Boeing 787 and Airbus A350 by around 20%. Now, research is being undertaken at the University of Alabama to enable



SUSTAINABLE FUEL?

Rolls-Royce recently flew a Trent 1000 engine using 100% SAF on its Boeing 747 testbed and has committed to making all its Trent engines capable of operating on 100% SAF (compared with the 50% currently approved) by 2023. That would mean that within two years, net zero carbon operation would be possible with about 40% of the world's long-haul aircraft engines.

However, while Sustainable Aviation Fuel (SAF) is seen by many as offering significant savings in carbon emissions, current production capacity of only 800,000 tonnes/year is insignificant against aviation's current total global consumption of 445 million tonnes/year by 2050. Furthermore, the world's current annual production of vegetable oils (likely to form the majority of feedstock for SAF) amounts to only 200 million tonnes. It also costs five times as much as traditional jet fuel.

So what of hydrogen power? As already stated, the amount that needs to be carried is huge but its manufacture is also a cause for concern, as production either emits huge quantities of CO₂ when using traditional methods, or consumes enormous amounts of electricity. There is also the issue of storage, with cryogenic methods involving maintaining the pressurised hydrogen at a temperature of -253°C.

carbon fibre composites to be embedded with nanoparticles and enable them to be cheaply and quickly produced by 3D printing. The latter would reduce material loss because parts can be produced in the exact size and shape needed instead of being cut out from a larger piece of material, as is done with aluminium.

Whereas metal aircraft conduct electricity in the event of a lightning strike (the current passing directly through them with little or no damage) composites are not conductive and can be severely damaged. Manufacturers bond a copper mesh within the carbon to conduct the electricity.

To improve conductivity and allow aircraft to dispense with the heavy copper layer, scientists are developing reinforced composites with nanographene or carbon nanotubes, and conductive polymers.



Using composites instead of traditional aluminium to manufacture aircraft components has helped reduce the overall weight of aircraft such as the Boeing 787 and Airbus A350 by around 20%

Chromium Free

Of course, the ecological effect of aircraft begins when it is manufactured and one of the ongoing problems that has plagued the industry for many years is the use of hexavalent chromium as a corrosion inhibitor or paint primer. This is harmful to the eyes, skin and respiratory system as well as a known carcinogen.

Coatings companies have therefore been trying to eliminate the compound and companies such as PPG Industries are looking towards organic alternatives using alkali earth or transition-metal compounds. Not only are these better for the environment, they are also potentially 30% lighter than standard chromated primers. Furthermore, they can be applied by either dipping or plasma electrolytic oxidation rather than spraying, thus reducing the amount of primer that is applied as well as removing the need for the use of harmful aerosols.

The drive for sustainability has already seen a number of 'small' changes, which



AIRBUS



easyJet

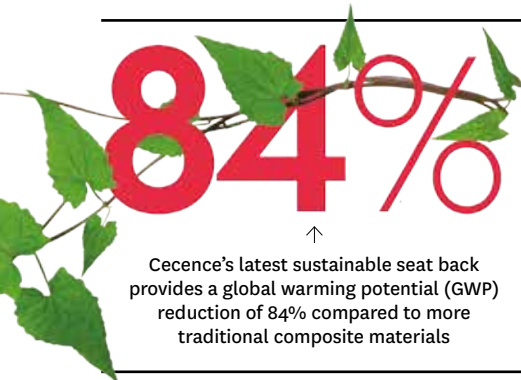


Lufthansa Technik AG

1

add up to create a significant difference. Airlines' drive for sustainability includes the reduction, re-use, and recycling of plastics used in packaging, swizzle sticks and drinking straws.

Singapore Airlines recently started working with US-based AeroFarms – the world's largest indoor vertical farm – to deliver sustainable fresh produce “from farm to fork” on selected flights. The



AeroFarms system is said to use 95% less water compared to field farming and 40% less than hydroponics. Grown indoors, without sunlight, soil or pesticides, the farming method is also more productive with leafy greens taking 14 days to reach maturity instead of the normal 30-45. According to AeroFarms this results in 390 times more productivity per square foot compared to traditional field farming.

In November, easyJet was presented with the Sustainability Award at the 2021 Professional Clothing Industry Association Worldwide Awards. This was in recognition of its new pilot and cabin crew uniforms, which are made by Tailored Image using fabric made from 100% recycled plastic bottles. With 45 bottles in each uniform, this will prevent

2,700,000 plastic bottles from ending up in landfill or in oceans over five years.

Thinking Differently

The UK Digital Cabin (digitalcabin.aero) project by aerospace trade association ADS includes a number of companies which are developing green technologies.

Cecence, an award-winning composite solutions company, specialises in lightweight FST compliant sustainable structural components for aero interiors.

The company has a purpose-driven agenda to innovation in lightweight aero interiors using recycled carbon, natural fibres and bio-based resin systems.

Composite materials provide weight savings and durability without compromising on strength but often rely on materials which require a huge amount of energy to produce. Natural fibres such as hemp sequester CO₂ in their growth. By combining these with a bio-resin, Cecence is able to produce net zero products that make a positive contribution from the very beginning of the product's life. Cecence's latest sustainable seat back provides a global warming potential (GWP) reduction of 84% compared to more traditional composite materials.

STG Aerospace specialise in emergency exit and cabin lighting systems. Its lighting products provide either no power or low power lighting. Its saf-Tglo emergency exit systems are self-charging, requiring no power, while its cabin lighting systems are designed for low power. Brand marketing manager Kate Williams says: “There is increasing expectation that every business should operate as sustainably as possible and prioritise social value with the same rigor as economic value. STG fully embraces that challenge.”

1. While Lufthansa Technik AG's Explorer concept is aimed at the VIP widebody market it is not a giant leap to imagine this projection technology filtering down into the fello'Fly formations of aircraft. In this case, the cabin occupants are 'enjoying' a disco!

Meanwhile, Airtek offers an all-composite seat which is lighter and helps drive down weight and emissions. It combines high end cabin design with motorsport-derived engineering and certification and uses a patented monocoque structure which results in a reduced need for much of the traditional metallic under seat support structure. This reduces weight and, in turn, aircraft fuel burn and associated carbon emissions. It also offers the largest volume of under seat storage space of any business class seat in the market.

ADS represents and supports more than 1100 UK businesses operating in the aerospace, defence, security and space sectors and its Digital Cabin initiative is a new route to market for aircraft interiors SMEs. Using 3D Web-GL technology, it has created a virtual aircraft cabin where aircraft interiors companies can showcase

“Aviation needs to go green or go home. If it doesn't we won't have a home to go to”

their products and services to a global audience in a new and immersive way.

In recent years the aviation world has become a very visual target for climate change protestors. It is worth remembering that although the industry contributes a relatively small amount of carbon this is contrary to popular public perception. Therefore, anything the aviation world can do to win the hearts and minds of the eco-conscious traveller is a benefit.

There is no doubt that airlines will have to continue using kerosene for some time to come, so it must become more efficient, burn less carbon per customer and do all it can to play its part in slowing climate change.

In the words of the Lord Mayor of the City of London, speaking at the Green Aviation Event: “Aviation needs to go green or go home – and if it doesn't go green we won't have a home to go to.” ©



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The Air That We Breathe

Cabin air can be extremely dry and cause dehydration and a reduced immune system. This results in increased risk of getting infections during and after a flight. **Steve Bridgewater** looks at air filters, humidifiers and how best to keep passengers fresh and hydrated

As more attention is placed on health, safety and sanitation, passengers are understandably starting to look more closely at what's inside their aircraft. Maybe more importantly, they want to know what's kept out.

In a recent briefing paper, the International Air Transport Association (IATA) said: "The overall risk of contracting a disease from an ill person on board an aircraft is similar to that in other confined areas with high occupant density, such as a bus, a subway or movie theatre, for a similar time of exposure. That said, the risk on aircraft is probably lower than in many confined spaces because aeroplanes have filtration systems equipped with HEPA filters."

Humidity

HEPA (High Efficiency Particulate Air) filters have similar performance to those used to keep the air clean in hospital operating rooms and are designed to trap 99% of microscopic airborne particles as small as bacteria and viruses. Once it has been filtered, the air is recirculated and provides higher cabin humidity levels.

Without filtration, flights at higher altitudes – particularly those with low occupancy – can see cabin air humidity drop substantially. This increases the risk of eye, mouth and nose disorders as well as cracked lips and dry hands.

According to Peter Landquist, VP senior advisor sales at CTT, which provides humidifiers and dehumidifiers for retrofit and line-fit on commercial aircraft as well as private jets, dehydration is a degenerative process.

Noticeable symptoms include changes to the sense of taste and the viscosity of saliva, but passengers' mucous membranes will also swell, the volatility of odour molecules decrease and the ability to vaporise in the nose decreases and nasal cavities quickly dry.

"You often get a cold after a flight," says Landquist, "but the probability is that you didn't catch that cold 'on' the flight. It is more likely that you caught it after you had disembarked and were mixing with other people before your mucus membranes had dried out.

"These membranes contain silica that is our first line of defence against infection. It catches the germs and virus and transports them down to our stomach where they are destroyed by acid. When it is dry it doesn't work as effectively, and the germs can reach our receptors and we can catch viruses."

1 & 2. The air we breathe within the cabin is actually cleaner than what we breathe in the high street. The likelihood of catching a cold or virus after a flight is more probably the result of the aircraft's relative humidity rather than any pathogens circulating within the cabin

Humidity is therefore important for comfort but is also vital for our immune system, improves our wellbeing, sense of taste and ability to relax and sleep. Several studies also suggest a relationship between insufficient humidity and the transmission of infections, such as Corona viruses. Dry air creates an environment where droplets remain airborne longer, and therefore can possibly transmit infections to a larger extent.

Our normal living environment has a typical humidity ratio of around 30% and a well-filtered cabin with high passenger density can see levels as high as 20%. However, for less-occupied aircraft flying at high altitudes, in-cabin humidity can drop significantly. "The only contributor to humidity in flight is the passengers and crew," continues Landquist.

"The paradox is that the higher the passenger density, the better the humidity – so the problem is particularly acute in first and business class cabins where relative humidity can drop to 5-6% and 6-10% respectively – that's lower than the desert or the Arctic."

Relative humidity is at its worst in the cockpit and crew rest areas where a figure of 0% is often recorded, so CTT's Humidifier Onboard system is provided as standard for crew rest areas on the Boeing 787. While it is optional for flight deck equipment, the take-up rate is in excess of 85%.

The equipment is also offered as an option on the Airbus A350 where it has been selected by Aeroflot and China Southern for use in premium class areas. Other airlines have selected it for flight deck as well as cabin and flight

20%



Our normal living environment has a typical humidity ratio of around 30% A well-filtered cabin with high passenger density can see levels as high as 20%. However, for less occupied aircraft flying at high altitudes in-cabin humidity can drop significantly

Removing 200kg of water equates to a reduction in CO2 emissions equivalent to 66 tonnes per aircraft per year

crew rest areas. The Boeing 777-X will also have it as an option for first and business class areas as well as crew areas. The system is also available as a retrofit to existing airframes and can be installed (under an STC) when a cabin upgrade is underway.

"Rain in the Plane"

CTT's Humidifier Onboard unit increases humidity to around 25% – which is still quite low in comparison to the normal environment. "We could increase it further," explains Landquist, "but firstly that would involve carrying large amounts of water and the weight penalty associated with it. The unit itself would also need to be heavier and more expensive.

"Critically, it would also mean that airlines would need to employ a drying system to counter the condensation formed within the cabin, something that can create 'rain in the plane!'"

Even without humidifiers, an aircraft is prone to condensation as ice formed on the inside of the airframe at altitude begins to melt when the aircraft descends. Most

of this will run down into the belly where it can easily be emptied through drain valves, but some accumulates in the cabin insulation blankets.

According to Landquist: "This is a particular problem for carriers with high density cabins – such as low-cost, short haul airlines – especially those operating in regions where there are long, cold, damp winters. This can have an adverse effect on an aircraft's wiring and electrical components and, on average, these aircraft can carry up to 300kg of water locked within their insulation.

"At CTT, we have calculated that removing 200kg of water results in a weight-saving that equates to a reduction in CO₂ emissions by the equivalent of 66 tonnes per year per aircraft within a fleet."

CTT provides its Anti-Condensation System product as a standalone item or in combination with the Humidifier Onboard unit.



1

Via CTT



How Clean is the Air?

It's safe to say that the air within a cabin is much cleaner than it is in most of the world's cities, and regulatory authorities such as the FAA and EASA require a minimum rate of 0.55 pounds per minute outside fresh air flow per occupant.

David Conrad, vice president for business development at PTI Technologies Inc, which makes all types of filters for the aviation industry, says: "An aircraft exchanges its entire volume of cabin air 20 to 30 times more frequently than the air in an office, and five to six times more than hospitals.

"The air circulates through strategically placed vents and upper and lower air inlets around the overhead bins. The air flows downward at 1 m/sec (3.3 ft/sec) from top vents and flows out at floor level. Every row has its own vents. That the air flows vertically, not horizontally, limits the probability of virus dissemination."

Cabin air systems are usually designed to operate most efficiently by delivering approximately 50% outside air and 50% filtered, recirculated air. This normally provides between 15 to 20 cubic feet of total air supply per minute per person in economy class as well as a sterile and particle-free air supply. As the circulation is continuous, fresh air is always flowing into and out of the cabin.

The 50/50 mix of outside and filtered air is a deliberate choice as the air at cruising altitude contains almost zero moisture. Using 100% outside dry air in the cabin would be very uncomfortable and retaining filtered air from within the aircraft helps maintain the humidity balance. Furthermore, air that is taken from the engine to pressurise the cabin and provide clean air results in increased fuel consumption.

HEPA Filters

According to the ISO/European air filter efficiency classification, a HEPA filter can be "any filter element rated between 85% and 99.995% removal efficiency."

To meet HEPA standard in the USA, filters must remove from the air that passes through it at least 99.97% of particles whose diameter is equal to 0.3 microns. "Scientists have found that particles of 0.3 micron size get through air filters more than larger or smaller particles," says Conrad.

"To better understand a size of 0.3 microns it is useful to first have some comparisons. The average diameter of a human hair is about 70 to 75 microns and the human eye can see unaided about

2

Via CTT



40 microns. The majority of the bacteria species are typically between 0.2 and 10 microns in size. While viruses are even smaller in size, filters tend to trap these particles quite well."

The carbon elements within HEPA filters are traditionally changed as part of an aircraft's regular maintenance schedule. If they aren't, IATA points out that "airflow through the filter might be reduced, but the efficiency of the filter at capturing viruses is not affected".

100%



Using 100% outside dry air in the cabin would be very uncomfortable and retaining filtered air from within the aircraft helps maintain the humidity balance

3

Via PTI Technologies



1. Anti-Condensation System can reduce the amount of water held within cabin insulation, thus reducing the aircraft's weight and, in turn, the amount of CO₂ it emits

2. CTT's Humidifier Onboard system is fitted as standard in selected crew rest areas and available as an option within the cabin. It is now fitted to more than 1,000 widebody commercial airliners and close to 100 VIP aircraft

3. Most HEPA filters are made of interlaced boron silicate microfibers or polypropylene and polyester fibres formed into a flat sheet in a process like paper-making. These sheets are then pleated to increase the overall surface area and then separated by aluminium baffles designed to direct the airflow through the filter

Developments

PTI's Cabin Air filters are designed to remove both smaller particles such as viruses and larger particles such as lint and pollen, and its HEPA media has a demonstrated efficiency of greater than 99.999%. Today, the units are fitted to Airbus, Boeing and Bombardier airliners and are designed and tested to a standard of 7,500 hours between changes. This is roughly a change interval of C Check to C Check or every 18 months.

David Conrad sees the business segment for cabin air filtration and cabin air quality changing over the coming years. "While Covid has been a catalyst, it is not the only factor driving change," he says. "We are seeing airline flight crews reporting adverse health effects from fumes in the cabin, and lawsuits filed over cabin air quality.

"In addition, we are seeing studies and engagements by regulatory agencies such as the FAA and EASA studying cabin air quality and health effects. We believe that we have developed the technology for the filtration technology gap and we are testing it now. The next step will be to integrate it into an aircraft and fly it." ©

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CONNECTING THE DOTS

The latest developments in satellite communication and antenna design are improving the passenger experience, driving changes in cabin design and reducing fuel burn. **Paul E Eden** connects with executives from OneWeb, Panasonic Avionics, Viasat and Moment

Inflight entertainment has been a key aspect of the passenger experience for many airlines for quite some time,” says Don Buchman, Viasat’s VP and general manager, Commercial Aviation. “Increasingly, inflight connectivity is also becoming a vital component in the passenger experience and, indeed, a key passenger comfort amenity. Almost 90% of passengers bring a personal electronic device on a flight and, with the acceleration of our digital lives during the pandemic, passengers are keener to use their own devices.”

Buchman’s comments are a sign that consistent, reliable broadband is now a prerequisite for many passengers. At the same time, the way they choose

to be entertained is changing, so the availability of quality inflight connectivity (IFC) may enable significant changes in the cabin as travellers choose their own devices over those in the seatback. This has ramifications for IFE content, as well as opening the door to simplified cabin architecture and reduced weight.

Just a few kilograms reduction in cabin weight is sufficient to make a noticeable difference to fuel burn over time, reducing costs and carbon emissions. And with the latest generation of satellite communications options promising lighter antennas and associated equipment, advanced connectivity promises to make a perhaps unexpected further contribution to sustainability. The savings are even more

impressive for airlines opting to delete seatback IFE altogether; Buchman notes: “Our Ka-band IFC solution is a fraction of the overall weight when compared to an embedded seatback IFE system.”

Among the major IFE and IFC players, Panasonic also promises its airline customers reduced fuel burn, through a next-generation Ku-band antenna. Developed in partnership with ThinKom Solutions, it will roll out for line fit and retrofit in 2023. Jeff Sare, vice president of In-Flight Connectivity Solutions, Panasonic Avionics Corporation, says: “The ThinAir antenna builds upon ThinKom’s flight proven, Variable Inclination Continuous Transverse Stub technology. It will provide excellent support for LEO and GEO satellite

1. OneWeb is currently a little over halfway through establishing a constellation of 648 low-earth orbit satellites

“APSTAR-6D IS DEDICATED TO COMMERCIAL AVIATION AND COVERS MORE THAN 99% OF FLIGHT ROUTES”



networks, while its sleek design minimises aerodynamic drag, helping reduce fuel cost.”

Over the past half decade or so, Ka-band has been hailed for its ability to deliver the fastest inflight broadband, but speed is not the only parameter important to delivering consistent data rates. Ku-band remains an important alternative, not least as the cornerstone of Panasonic's offer, and Sare is keen to debunk the belief that Ka-band is the only choice for true high-speed connection.

“It's a common misperception that Ka-band offers faster speeds. The work we've done with the APSTAR-6D and the other high-throughput Ku-band satellites in our network clearly demonstrates that with the right equipment and service, Ku-band can deliver a very high-speed, robust passenger experience.

“Panasonic Avionics delivers inflight connectivity through its third-generation

Illustration: Phil Couzens



Via OneWeb

[Gen-3] network of high-speed, high-bandwidth Ku-band satellites. The network is 100% dedicated to commercial aviation, covers more than 99% of all flight routes and places capacity where it is most needed to meet the growing needs of airlines and their passengers.

“APSTAR-6D, our first extreme high-throughput satellite and the most recent addition to the Gen-3 network, has significantly boosted capacity over China. In August, a China Eastern Airlines' flight connected to '6D and saw average speeds up to 100Mbps, and a peak exceeding 200Mbps. Passengers enjoyed streaming television, video conferencing, large file transfers and high-speed web browsing on multiple devices simultaneously.”



Alternative Connection

For carriers looking to offer a selection of regularly updated streaming content without a satellite or ATG connection, French IFE provider Moment offers an alternative. Often installed on aircraft lacking seatback IFE, for a significant saving in cost, complexity and weight, the Flymingo Box is a portable wireless IFE system enabling passengers to connect to a local cloud and stream content via their own devices.

The solution creates its own onboard Wi-Fi network; in effect, passengers are connected to the Flymingo Box rather than the internet. The experience is therefore different but, as Moment's co-founder and CEO, Tanguy Morel, notes: “The server can store and broadcast 10,000 hours of content, and be updated via USB, ethernet or 4G”.

Customers opting for the Flymingo Connect system, comprising a server/WAP and additional WAP, have access

to further services beyond entertainment. Morel explains: “Its open architecture allows fast, smooth content updates and with the integration of IoT, Wi-Fi, Bluetooth 5.0 and LTE technologies, Flymingo Connect can manage many operations and personal services.

“The system's powerful embedded server becomes the central hub in the cabin to which all devices – from the equipment in the galley to the luggage rack and windows – are connected, enabling the centralisation and processing of cabin data. It also provides the crew with an enhanced overview of the cabin by automatically checking seatbelts, overhead bins, doors, pressurisation etc.”

Morel says there are further benefits: “The use of digital publications, menus, duty-free catalogues and safety sheets held on the cloud reduces the need for printed matter, saving weight and resources.”

Location, location

There are further alternatives for airlines flying over North America and continental Europe. Intelsat offers air-to-ground (ATG) connectivity after its acquisition of Gogo Commercial Aviation in the US, and Inmarsat delivering ATG through the European Aviation Network.

For smaller aircraft, including regional jets and turboprops, the reduced antenna sizes associated with ATG are a boon compared to those required for satellite connections, but larger airliners, particularly in the US, are generally moving to Ku now that availability and pricing have become more favourable. Since it is based on a network of fixed ground sites, ATG is



1. Who's Zooming who? If the last two years have taught us anything it is that video conferencing is here to stay, and for airline passengers that means a high speed, stable Wi-Fi connection
2. Panasonic's Ku-band antenna promises its airline customers reduced fuel burn thanks to its sleek design which minimises aerodynamic drag

Panasonic

1

“IT IS ABOUT DELIVERING AS MUCH BANDWIDTH AS POSSIBLE TO A TUBE FLYING AT MORE THAN 500MPH”

limited geographically, while Ka-band is delivered by geostationary orbit (GEO) satellites as a more ‘focused beam’ than Ku, meaning there are parts of the world Ka has yet to reach.

That isn't a problem for most users since demand is itself generally geographically limited. Viasat's Buchman explains: “Global air travel satellite bandwidth demand is heavily concentrated over major hub cities. Airlines increasingly understand that matching demand with supply over these busy hubs is the primary challenge for providing great inflight connectivity.” That's exactly what Viasat's Ka-band constellation does, while for those airlines looking for global connection, especially over polar regions, alternatives are rapidly emerging.



Panasonic

LEO constellation

Among them, OneWeb was a little over halfway through establishing a constellation of 648 low-earth orbit (LEO) satellites at the time these words were committed to print. The complete array will provide Ku-band connectivity everywhere and for those concerned about the perceived lack of speed provided by Ku compared to Ka there is an important further factor to consider: latency.

Latency, essentially the time elapsed between a user making a demand and the remote server responding, is critical to achieving fast connection. For Fortnite users it may be the difference between thinking you're still in the build fight when you're actually back in the lobby; for others it means website pages are slow to open or emails delayed.

OneWeb's LEO satellites are stationed closer to the earth, reducing the time elapsed for signals to ‘bounce off’ them, although some clever technology is also involved. Noting that latency becomes more important as apps increasingly rely on 5G, Ben Griffin, OneWeb's VP Mobility, explains more about the company's proposition. “We're creating a vast, disruptive network that will change

aviation connectivity. It means an aircraft is never far from its nearest satellite and there is redundancy in the network too. And, from day one, we'll be reaching everywhere, including the polar regions.”

OneWeb has returned phoenix-like from the ashes of bankruptcy, so when is day one expected? Griffin confirms that a stronger company has emerged, focused on the same mission, and says: “The network has already launched for fixed services above 50°N. The constellation will be completed late in 2022 and aviation services will follow in 2023.”

Another OneWeb advantage comes from its antenna design. Aircraft will require an electronically steered array, rather than the more familiar

mechanically steered antenna. This means less weight and lower profile radomes creating less drag; in some cases, the array may even be conformal, for no aerodynamic effect at all. Either way, drag is reduced and fuel saved. And with no mechanical parts to fail, OneWeb expects its antennas to be more reliable.

The industry has long since promoted its ability

to deliver a home or office broadband experience to passengers. The reality is few if any travellers have that experience. But Panasonic's Jeff Sare believes: “We are getting closer every day.” Satellite internet, he explains, is significantly more complicated than running a cable between a building and the street.

“Connectivity is about delivering as much bandwidth as possible to a tube flying at more than 500mph, often through turbulence. The antennas, while very much state of the art, offer limited real estate to maximise the bandwidth available to passengers. Still, the industry deserves a lot of credit for continuing to innovate. The latest announcements show this commitment to delivering high speeds. We're well on our way to achieving a significant improvement in passenger experience.” ©

200

↑
A flight connected to APSTAR-6D saw average speeds up to 100Mbps, and a peak exceeding 200Mbps

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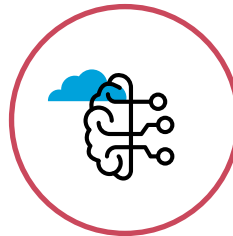
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Staying Connected to your Customer

Ever-improving onboard connectivity solutions are not just a benefit to passengers, they also enable airlines to understand, plan and profit more while wasting less. **Luke Chamberlain** logs on to find out more

For in-flight entertainment and connectivity (IFEC) solutions to be viable investments for airlines, it's crucial they satisfy the demands of the market they serve. "This always starts with collecting relevant data and performing the right analysis," says Tudy Bedou, chief technology officer of Thales, an aerospace services provider of a range of IFEC solutions. "This allows airlines to optimise their content acquisition costs, understand how the IFEC system is utilised, know the level of satisfaction of their passengers and generate revenue."

A cohesive strategy for capturing and managing data is therefore a key component of many modern IFEC packages. The type of data that airlines can gather through current IFEC systems includes: content usage, including clicks, dwell time, and screen transitions; the number of user connections to inflight Wi-Fi and the types of devices connected; payment processing information; anonymous passenger survey data; advertisement impressions; hardware equipment logs, including security and health monitoring; and crew generated data, such as cabin requests and usage.



Data potential

Collecting and analysing this data unlocks a range of cost saving and revenue potential for airlines. "Gaining visibility of what content is most popular is a key way to ensure an airline is choosing and allocating budget that will result in the highest level of satisfaction for their passengers," says Kevin Clark, CEO of IFE content and wireless connectivity solution provider Inflight Dublin.



1

"It also identifies content that may not be performing well and allows the airline to adjust their IFE strategy going forward. Curating a tailored content package that aligns with the target audience's preferences greatly enhances passenger experience and results in a higher ROI. This allows for better cost optimisation in relation to content by focusing on what is popular with a particular passenger set and removing any content that is not the right fit."

2



Personalising the Product

Data analysis can even allow airlines to personalise inflight content to suit each individual passenger. As Dominic Green, senior director of digital product management at Panasonic Avionics, explains: "Our sophisticated use of data helps to target content that is

appropriate to each passenger. At its most basic, this could be based on demographic information that relies on destination, cabin class, length of flight etc, but that ability is further enhanced when we layer in personalisation capabilities that target content, services, advertising and merchandising to each individual passenger.

"Map usage can be monitored to help understand passengers' travel interests and then leverage other, integrated features to deliver contextual experiences that have the potential to satisfy even the most sophisticated of global explorers."



Bluebox

“DATA UNLOCKS A RANGE OF COST SAVING AND REVENUE MAKING POTENTIAL”

Understanding passengers’ inflight behaviour can also provide opportunities outside the cabin. There are unique commerce opportunities for customers within the context of the travel journey, explains Bedou, such as “booking a special restaurant at destination, planning a visit to a museum, and purchasing tickets for a water-park with your family”.

Green claims Panasonic Avionics’ eCommerce platform for managing storefronts (“Marketplace”) helps airlines to further differentiate their brand by personalising their passenger experience.

“Destination-based offerings, promotions, and options are all examples of how Marketplace will embrace the modern digital building blocks of usage patterns like ‘predict my next move’ or ‘motivate me’ through special pricing or other new offers.”



Sustainability

Incentives for capturing and managing IFEC data also extend to inflight retail. In 2018 airlines generated around 6.7 million tons of cabin waste, according to the International Air Transport Association (IATA). Using data to inform decisions on what to stock onboard flights can not only limit this, but also reduce costs and cabin weight.

CCO of Bluebox Aviation Systems Barry Flynn, expanding on the capabilities of Bluebox’s inflight Wi-Fi connectivity solution, says: “By enabling airlines to implement an order-from-seat food and beverage shopping channel onboard, we’ve demonstrated both increased revenue – no-one has to miss the trolley service as its effectively always available – and a smoother demand throughout the flight, which can be more truly indicative of passenger demand.

“That in turn can improve how and what the airline supplies for a flight meaning less shortage of high-demand items, and less waste of low-demand items.”



Panasonic Avionics 3



Future trends

Heading into 2022, the IFEC market faces a “crossroad” of multiple trends, according to Bedou, with data capture and management set to play a key role. “With cost pressures on airlines mounting,” he says, “optimising IFEC systems to utilise passenger relations and generate revenue will be high on airlines’ agendas next year.”

Green predicts: “One key trend will be a continued focus on controlling costs as airlines navigate a path of recovery out of Covid. This means the importance of using strong analytics to drive smart decisions will continue to grow. The analytics capabilities that we can provide will be crucial to support an efficient approach.”

However, airlines will have to find a balance between cutting costs and investing into IFEC system. According to Flynn: “As passengers return to the air, they’ll be

“USE OF DATA HELPS TO TARGET CONTENT THAT IS APPROPRIATE TO EACH PASSENGER”

boarding with new higher expectations of their digital engagement with airlines. And though many would love full connectivity onboard, that part of the industry will still take some time to ramp up given the level of investment required.

“So, what can airlines do in the meantime to ensure they delight their passengers onboard? Develop an engaging digital inflight service which can push the limits of what can be done in an off-line environment. That’s what we’re already doing with our retail solution and continuing to work on in our development roadmap.”



Thales 4

1. Everhub is Inflight Dublin’s revenue-generating IFE software solution
2. Bluebox’s IFE portfolio provides tablet-based wireless systems as alternatives to seatback IFE
3. Panasonic Avionics’ IFEC and Wi-Fi systems power 70% of the global IFE-equipped fleet
4. AVANT Up is the latest evolution of personalised IFE from Thales

THE ULTRAVIOLET REVOLUTION

Not only is UV sanitisation quicker and more thorough than traditional cleaning methods, but it also reduces the reliance of chemicals that can be harmful to the environment.

Charlotte Bailey asks is the future bright?

On average, a cleaning crew takes 20-30 minutes to prepare a cabin between arrival and departure, but with increased passenger anxiety over cleanliness airlines are looking for ever more thorough cleaning protocols.

Although using ultraviolet (UV) light to keep surfaces hygienic is not a new technology, UV sanitisation, like many other cleaning methods, has seen renewed interest since the outbreak of the pandemic. In fact, some shops are even installing UV 'portals' that customers walk through before entering stores. Furthermore, the environmentally friendly option is finding increasing favour with airlines ever more conscious of their impact on the planet.

Ultraviolet cleaning (UVC) has been used in hospitals, air and water filters and microbiology laboratories for many years but until recently has not been explored

The sterilisation robot emits concentrated UVC light across the cabin, killing 99% of pathogens

by the aviation industry. Properly applied, UVC lights deliver doses that can reduce various viruses and bacteria, including SARS, MERS and Covid-19 viruses. In 2020, Boston University researchers placed plastic dishes coated with SARS-CoV-2 droplets under UVC lamps; about 99% of virus particles were destroyed after six seconds. The study is still to be peer reviewed, but the findings were enough to spur many companies into exploring the technology, not least in the aviation sector.

Among the companies to seize this technological revolution is Honeywell, which has partnered with Dimer to offer an ultraviolet cleaning (UVC) system

to airlines that, when properly applied, significantly reduces certain viruses and bacteria on aeroplane cabin surfaces.

The company claims its UV Cabin System can treat an aircraft cabin in less than 10 minutes for just a few dollars per flight for midsize to large airline fleets. The Honeywell UV Cabin System is roughly the size of an aircraft beverage cart and has UVC light arms that extend over the top of seats and sweep the cabin to treat aircraft surfaces.

Crew members or hired cleaners roll the device down the aisle, projecting UVC light onto seats and seat belts and other high-touch surface. Aircraft flown by Qatar Airways entering and departing Hamad International Airport are already cleaned this way.

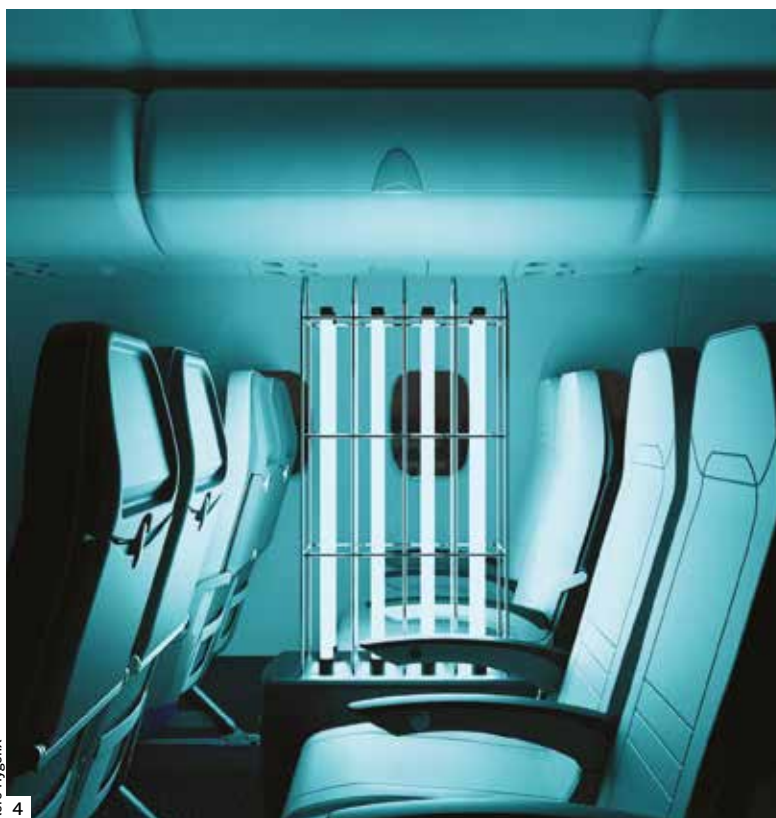
"As the travel industry begins to recover, we know hospital-grade technology will ease passenger concerns, and that's what we're providing with this system," said Elliot M Kreitenberg, co-founder and president of Dimer.





Aero HygenX

3



Aero HygenX

4

While Honeywell is marketing the carts at midsize airlines with “aircraft in the hundreds”, it has also launched a more cost-effective alternative for smaller operators. The hand-held UV Treatment Wand is being aimed at business jet and general aviation owners and operators.

“A lot of people said, ‘I still need a system I can just carry into a plane’,” said Bob Lenz, who oversees UV technologies at Honeywell Aerospace. “The most important part of what they need is portability.” Hence the company developed the 27cm hand wand that, at roughly the size of a roll of paper towels, can clean hard-to-reach surfaces including cockpits. The wand’s 35-watt bulb is powered by a lithium-ion battery stored in a rolling backpack-like case that crew members or hired cleaners would wear across their shoulders or pull behind them via a handle.

Whereas the cart has a speedometer to ensure the correct dosage of UVC light, the wand is more reliant on operator training. Honeywell also recommends that operators wear long sleeves, latex gloves and a face shield to protect against the possibility of UVC wavelengths damaging their skin and eyes.

JetBlue has also launched a trial of Honeywell’s portable device, while Qatar

Airways has become the first to adopt the devices. The latter says that the system will be utilised as an additional step after manual disinfection, to ensure the very highest standards of cleanliness.

The airline’s onboard linen and blankets will continue to be washed, dried and pressed at microbial lethal temperatures, while its headsets are sanitised after each flight. These items are then sealed into individual packaging by staff wearing hygienic disposable gloves.

Among the high-profile companies investigating the area is Boeing, which is licensing this technology to companies

1. Swiss-based companies dnata and Uveya have joined forces to produce an autonomous UVC device
2. The Honeywell cart has a speedometer to ensure the correct UVC dose is administered
- 3,4. Aero HygenX has partnered with Ethiopian Airlines to deploy its autonomous UVC chemical-free disinfecting robot called ‘Ray’
5. Qatar Airways has become the first to adopt the Honeywell wand

that will develop applications for the market, including a potential UV lavatory with installed 222nm UV lighting for regular disinfection.

Boeing first demonstrated the UV technology on its ecoDemonstrator aircraft in 2019 and is now applying the research to the UV cleaning wand as part of its Confident Travel Initiative. The wand design has been licensed to Healthe Inc and Far UV Technologies and is now available to airlines or other users.

FULLY AUTONOMOUS

In Europe, Swiss-based companies dnata (one of the world’s largest air services providers) and Uveya (a technology company) have joined forces to produce a proof-of-concept autonomous UVC device. During the automated cleaning process, the sterilisation robot emits concentrated UVC light across the cabin, killing 99% of pathogens in the air and



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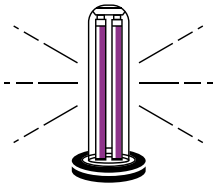


1. The future is bright; the future is ultraviolet 2. Honeywell's hand-held UV Treatment Wand is just 27cm long and has 35-watt bulb powered by a lithium-ion battery stored in a rolling case

99%



In 2020, Boston University researchers placed plastic dishes coated with SARS-CoV-2 droplets under UVC lamps; about 99% of virus particles were destroyed after six seconds



'RAY' HAS THE ABILITY TO DISINFECT A NARROW BODY AIRCRAFT IN AS LITTLE AS SEVEN MINUTES

250



Dnata says the UVC system will compliment its existing aircraft cabin cleaning services which the company delivers for over 250 airline customers globally

on all surfaces in a few minutes, without using any chemicals. The machine has been successfully trialed on board aircraft operated by Swiss regional carrier Helvetic Airways. Dnata says the UVC system will compliment its existing aircraft cabin cleaning services which the company delivers for more than 250 airline customers around the globe.

Elsewhere, Aero HygenX has partnered with Ethiopian Airlines to deploy its autonomous UVC chemical-free disinfecting system. Aero HygenX was formed in January 2020 by a group of self-proclaimed "aviation geeks" with strong backgrounds in technology and aviation.

In a virtual signing ceremony which took place on 12 October, executives from Ethiopian Airlines Group and Aero HygenX signed a Memorandum of Understanding (MoU) outlining a plan for fleetwide deployment of the robot, which the 'geeks' have amusingly christened 'Ray'.

Ray has the ability to disinfect a narrow body aircraft (such as a B737 or A320) in as little as seven minutes and can also be used to treat lavatories so airlines can fully sanitize aircraft after every flight. Tewolde GebreMariam, Group CEO of Ethiopian Airlines, commented: "As we emerge from the pandemic, aircraft disinfection and safety are top priorities for Ethiopian Airlines."

"We are one of the few global carriers that has been successful in combating the adverse effects of Covid-19 and we are proud to have been recognised by international humanitarian organisations for our commitment in the global fight against the virus. With the signing of this MoU, we continue our investment in sustainable hygiene solutions that will benefit not only our staff and passengers, but the entire region."

The air travel industry is predicting that demand will return once the coronavirus pandemic subsides, but the rigorous cleaning of planes between flights is probably here to stay. UVC has certainly earned its place at the table and is likely to be one of many cleaning methods on which airlines will continue to rely. ©



HOW DOES UV CLEANING WORK?

Cleaning with UV light is called Ultraviolet germicidal irradiation (UVGI). It is an effective sanitation method which has been used in a wide range of settings for decades.

Short wavelength ultraviolet light, when passed over a surface, works by killing or inactivating micro-organisms (viruses and bacteria) by destroying nucleic acids and disrupting their DNA. The organisms are then unable to perform vital cellular functions – rendering them harmless as they are unable to reproduce.

Most household lamps have between 500 and 700nm of ultraviolet light. In comparison, UVC refers to ultraviolet light with wavelengths varying between 200 and 280nm.

Used for decades, the method is also used for water and air purification and has now been proven to work with Coronaviruses including the SARS-CoV-2 (Covid 19) variant. The virus is thought to survive more than 48 hours at room temperature but UV light destroys it by high energy electrons which pass through or diffuse through the protein coat into the nucleic acid core, resulting in damage of the viral RNA.

500



Most household lamps have between 500 and 700nm of ultraviolet light. In comparison, UVC refers to ultraviolet light with wavelengths between 200 and 280nm



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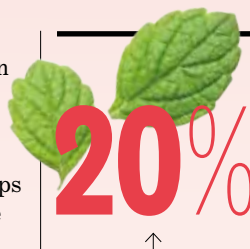
Airlines know they need to reduce waste as well as weight in their catering operations. *Bernie Baldwin* reports on how their suppliers are aiding that task

Corporate parties, wedding receptions, hotel buffets – how many of us have been at just such occasions where, as the event comes to a close, there is a large amount of food sitting out in the open, untouched. Now consider all those groups of anywhere between 50 and 450 people for whom catering is prepared on an industrial scale, for consumption on board millions of flights per year – and also consider the amount left over.

According to IATA, more than 20% of cabin waste consists of untouched food and drink, the majority of which is sent to landfill or incinerated. Carriage of this ‘overstock’ costs money not just for the products themselves, but also for the extra weight – therefore more fuel and more emissions – which translates into charges under schemes such as Europe’s ETS.

In an era where sustainability and recycling are dominant topics, airlines and their suppliers have certainly begun to focus their attention on this and are working to optimise the inventory and thus prevent this waste.

Robin Padgett, divisional senior vice-president, catering & retail at dnata, reports that the industry is indeed tackling this collectively. “Airlines are



According to IATA, more than 20% of cabin waste consists of untouched food and drink, the majority of which is sent to landfill or incinerated

continually investing in methods by which to better understanding customer behaviour and trends,” he remarks. “They are engaging with passengers across every touchpoint, understanding and predicting their preferences. Carriers are also innovating in areas like pre-order and opting for products that are more sustainable.

“Globally, we’re providing and enabling technology that ultimately results in reduced waste as part of our product offering to airlines, pre-order

being an example. We’re working with a broad array of suppliers and developing packaging and other sustainable solutions in-house. The goal is to load what we know will be consumed on an aircraft and little more.

“There is a need to carry additional items onboard to ensure choice and flexibility, but ever-advancing technology is helping close this gap between customer demand and caterer supply,” Padgett adds.



Via dnata

Charitable Enterprise

When there is an excess, dnata also has a plan. “Pleasingly, we’re managing to help a lot of charitable organisations and our communities by donating untouched food items to charity. In the past 24 months we’ve donated more than 400,000 meals to charity across the world,” the SVP goes on to note.

Mario Faustini, VP Operational Excellence & Standards for gategroup, says his company has been fighting waste for some time. “We have vast experience in this area, as well as data from our retail operations where waste was always a critical element.

“We also have predictive systems in development to further leverage that data to support our airline customers in optimising the required loadings,” he confirmed during an interview for this special sustainability-themed edition of *Aircraft Cabin Management*.

“However, as with any predictive system, food waste can be minimised to a certain level, but it cannot be completely eliminated. In that regard, the future lies in pre-order/pre-select, where we also have extensive experience by managing the largest inflight retail pre-order operation in the world,” Faustini emphasises.

“We are in the process of further developing our platform with the best-in-class technology as well as bringing it to the catering operations for our current and future airline customers.”

1. Passengers can be demanding of quality, but they are increasingly demanding of green credentials
2. As with any predictive system, waste can be minimised to a certain level, but not eliminated. In that regard, the future lies in pre-order/pre-select systems

Perishable Produce

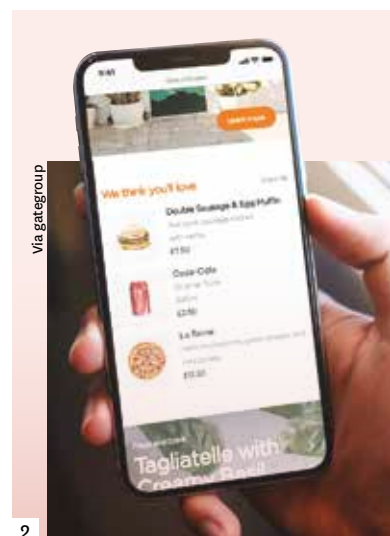
Food, of course, is largely perishable, but LSG Group has a technique to delay the use-by dates and preserve supplies for longer. “Autoclaving allows us to make food shelf-stable up to two years at ambient temperature, which means not only less waste, but also lower CO₂ emissions and lower loading weight due to the fact that no cooling is necessary throughout the transport chain,” the company states. “It is a proven technology and the only reliable sterilisation method that uses high-pressure steam and is, above all, the safest method.

“Water is heated in a closed pressure vessel – the autoclave or steam steriliser – and kills endospores with steam temperatures of 120°C for 120 minutes. The end product is germ-free – thus it is free of reproductive microorganisms in either their dormant stages or permanent forms (for example, spores).”

“Food waste can be minimised to a certain level, but it cannot be completely eliminated”

For those of you who fear that this sounds like it might make the food unappetising, LSG confirms that autoclaving “also ensures the retention of as much vitamins and nutrients as possible. Comparatively, products of the normal pasteurisation process contain significantly fewer vitamins and nutrients”.

LSG Group also has its subsidiary Retail inMotion working in this area. The latter’s retail director, Manuel Hübschmann, explains his company’s contribution: “We placed a lot of focus on



Via gategroup

2

developing and improving our fresh food load planner system, vLPS, over the past three years.

“Six airlines are currently using the data science-driven cloud application, which effectively predicts food consumption on board and thereby reduces food waste. On top of the technology, we also built a nine-step best practice roadmap to fully eliminate onboard fresh food waste,” he comments.

IT Solutions

The use of IT assists in areas such as stock monitoring, procurement and logistics, but Hübschmann confirms that applications also help to measure food waste and reduce it to a minimum. “Our data science-driven predictive load

planning system predicts future food consumption. By combining Retail inMotion’s dynamic loading technology vPACK solution, as well as crew sales and missed sales feedback via our vPOS solution, we can adjust meal loading based on expected

demand,” he says.

“The connection between the solutions ensures that crew feedback effectively impacts future loading and ensures that sufficient products are loaded every day. Moreover, this effectively reduces waste for both economy retail as well as business class complimentary food,” Hübschmann adds.

Padgett acknowledges that technology can help with e-sourcing, improving speed-to-market, supplier engagement, gaining deeper insights into external spend and, ultimately, facilitate better



1. The airline catering sector is determined to play its part in the 'greening' of aviation
2. When there is untouched food after a flight, dnata donates the excess to good causes
3. gategroup uses a Global Catering Reporting System to give full oversight from the moment ingredients arrive in the kitchen

needs, while for short-term planning and execution we are integrated with the airline systems for flight information, number of passengers, pre-order and so on.

"This is getting more accurate through our work with machine learning forecasting based on deep data analytics," he continues. "To provide an end-to-end supply chain solution, we offer a comprehensive vendor interface capability to their portals which can provide real time data exchange and a true insight into customer demand."

After planning comes execution. "All our core processes – goods receipt, production, packing, loading – are system driven and are constantly evolved through our 'gateOPEX' operational excellence programme to minimise waste, which can be tracked as part of the reporting and monitoring protocols. If waste levels become unacceptable, an investigation into the cause (or causes) of the problem is triggered."

The third part of the process is reporting. "We maintain our Global Catering Reporting System for insights and analytics," Faustini concludes. "This

gives us views of the forecasts, analysis of their success, and the ability to deep dive into the measurement of the process through data.

"This lets us set controls by applying a continuous improvement philosophy. We have full oversight of the process from when materials arrive at our backdoor to what happens in the kitchen, giving us full visibility on the theoretical vs. actual consumption."

Reducing waste further across the sector is the intrusion of new materials coming into the industry, particularly in packaging, which can be recycled or re-used more easily. We will be looking at the latest developments in recyclable and biodegradable catering and packaging materials in the next issue of *Aircraft Cabin Management*.

Be it control of the amounts of food dispatched, the elimination of single-use plastics or simply lighter, more recyclable materials for packaging and utensils, the airline catering sector is determined to play its part in the 'greening' of aviation.

After all, as your mother used to tell you... "Waste not, want not". ©

value for end customers. "We use IT applications to drive tight inventory control through our supply chains, giving greater end-to-end visibility to our teams and assessing optimum routes to market.

"In our facilities, we are also driving warehouse improvements by leveraging innovation from our global cargo division, encompassing everything from drone warehouse and stock mapping to automation," he reports.

Three Part Process

At gategroup, when it comes to the cabin side preparation, catering onboard service and wastage management, integration with airline systems is the key to improving efficiency, according to Faustini. "It allows for seamless data transfer in real time, minimising the risk of the data input errors, improving efficiency, optimising resources, minimising wastage and accelerating the change management process."

He continues: "There are three main parts to the process. The first is planning. From menu design, it is important to align with the airline's customers on passenger preference, cost, allergens, nutrition and so on. For long-term sales and operational planning, we correlate historical data, demand from our customers and our understanding of passenger

24

Over the last 24 months dnata has donated more than 400,000 untouched food items to charitable causes around the world



120

Autoclaves kill endospores within food by using steam temperatures of 120°C for 120 minutes. Produce can be stored for up to two years



Via gategroup



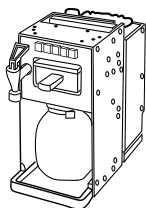
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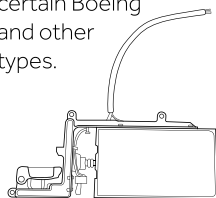
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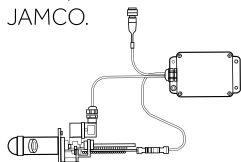
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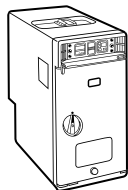
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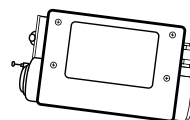
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Approved aircraft Microwaves manufactured by Safran and JAMCO.



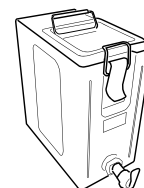
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1. The aeroplane seat folds up to accommodate a wheelchair in the Air 4 All concept
2. The MERU TravelChair is a unique product that provides firm, postural support enabling disabled children to fly on commercial aircraft
3. Another appealing factor for airlines is that the seating design could be adapted to conform with their branding

AIR 4 ALL

Mary Doyle looks at the new Air 4 All system, which allows wheelchair users to travel aboard an airliner in their own wheelchair without reducing the seat count for airlines

A UK-based consortium comprising people with personal experience of disability, aviation interior design and the aviation regulatory airworthiness process has come together to produce a groundbreaking accessibility product which serves both passengers' safety and airlines' pockets.

The team of PriestmanGoode, SWS Certification and Flying Disabled have designed a patented system which solves a problem that the airline industry said for many years was impossible.

Air 4 All allows people with restricted mobility to travel in their own wheelchair on board a commercial aircraft without reducing the seat count for airlines. The launch coincides with the 35th anniversary of the Air Carriers

"This is without doubt the biggest advance in accessible aviation in 35 years"

Access Act, passed by US Congress in 1986 to guarantee that people with disabilities would receive consistent and nondiscriminatory treatment when travelling by air. This 1986 act gave disabled people the moveable armrest (a game changer in access), passenger support through the airport, boarding and deplaning and a host of other advances.

Safely Secured

Air 4 All works in a similar way to ISOFIX /LATCH standards in passenger cars. Both the airline seats and wheelchairs facilitate an installation and attachment system, enabling them to be

securely installed in the aircraft cabin. The system is designed so that different powered wheelchair types can also be certified for flying and will be able to interface with a wide range of airline seats. The big plus point for the airline is that if no wheelchairs require access, the seats function as regular seats.

Air 4 All has been initially designed for a narrowbody 2+2 configuration and is designed to convert front row seats to allow a wheelchair guidance and locking system to be installed. This allows for up to two wheelchairs per row to travel on a

single flight. The consortium is now working alongside Sunrise Medical to establish which powerchairs would be fit to fly, as well as to retrofit and create new standards for powered wheelchairs, thus

enabling passengers with even the most challenging disabilities to travel.

US Research

The Air 4 All launch comes soon after the US Transportation Research Board with National Academies of Sciences, Engineering, and Medicine released a report titled Feasibility of Wheelchair Securement Systems on Passenger Aircraft.

According to the report, the committee did not identify any design or engineering challenges that would likely call into question the technical feasibility of an in-cabin wheelchair securement

system. However, the report notes the removal of two successive rows of seats should provide sufficient entrance/manoeuvrability space as well as load bearing space.

This is excellent work and important recognition; however this loss of seating will potentially be a turn off to the industry and needs further exploration.

“The Air 4 All product stands head and shoulders above anything thus far designed for customers with mobility requirements in the history of aviation,” explains Graham Race MBE, product designer of the EASA-approved MERU TravelChair, one of the earliest seating solutions that allowed disabled children to fly in comfort.

“This milestone in inclusive cabin design shows that meeting disabled customers’ requirements with high level aviation legislation is achievable, and its significance sends a strong positive message across the industry and the global disabled community.”

Whilst the consortium behind Air 4 All recognises that the solution is not suitable for all disabled people (yet) it is the best starting point so far and constitutes real progress for many more powerchair users.



Final Frontier

Aviation is the final frontier in transport disability equality and this system now shows a tangible opportunity for airlines to make the experience safer, more comfortable and dignified for power wheelchair users to remain in their custom-built chairs for the duration of a flight.

There are so many advantages to it and as a wheelchair user it makes my heart scream with joy. Passengers can now roll on and roll off while retaining their independence and as they also stay

in their own purpose-designed chair this reduces the risk of bodily pain and damage transferring from their own chair to aisle chair to cabin seat. It also means that passenger assistance teams need to do less manual handling of passengers, thus reducing the risk of work-related injury.

Furthermore, the powerchair no longer needs to be transported into the hold, saving precious loading time and reducing the risk of damaging this precious mobility device and possible litigation over damaged or lost equipment.

“Take My Money!”

This is without doubt the biggest advance in accessible aviation in 35 years. It will be life-changing and shows that through universal design, collaboration, lived experience and determination true and long-lasting equality is coming to millions of disabled and ageing people who want to travel the world with grace and dignity.

Not only does no loss of cabin seats mean no loss of ticket sales, this system will encourage more powerchair users to fly, likely with a companion and family. This will increase revenue through ticket and associated sales by allowing a disabled person to fly with dignity.

There really are no more excuses for airlines not to have this solution installed and retrofitted across their fleets, before it becomes a policy. The disabled community are shouting “take my money”.

The consortium is looking for partners across the aviation industry who are committed to innovation, positive disruption and inclusion to make this happen in a few short years. Be part of the change you wish to see in the world. 🌐



ABOUT THE AUTHOR

Mary Doyle is the founder of Rocket Girl Coaching and is dedicated to improving inclusion and understanding in society through coaching, consultancy and disability equality training. Mary is also a wheelchair user and an accessible aviation consultant/trainer as well as a solo pilot and a member of Women in Aviation International

ALL Via PriestnamGoode



The future of **FIRST CLASS**

Airline traffic is bouncing back, but the market is predicted to change and some pundits are predicting the demise of first class travel. **Steve Bridgewater** looks at the possible scenarios and how airlines can adapt to survive



2

1. Last time in first? Some industry pundits are predicting a fall in demand for first class travel
2. Air China turned to Recaro to provide mini-suites for its recently refurbished business class cabins

the last decade. Likewise, the number of extremely wealthy individuals continues to rise with the number of billionaires alone doubling over the last decade. Yet the demand and capacity for first class travel has reduced substantially and some analysts are predicting that it could die out completely within a decade.

Premium Offerings

Some within the industry feel the fall in demand is not related to Covid, the financial crisis or a desire to travel less for the sake of the planet. They feel the phenomenon has been caused by the industry itself, with the push to improve premium and business class offerings effectively narrowing the gap between these and first class. Passengers who value a competitively priced fare now have more options.

With low cost carriers catering for the cheaper end of the market, airlines such as British Airways have concentrated on the premium and business class sectors. In 2000, it was the first to add lie-flat beds to the business class cabin and, with most of its competitors following suit, this soon devalued the first class offering. When employees could sleep in business class, the number of CFOs who would sign off the cost of first class travel plummeted.

Today, the dying breed of first class cabins serve only two purposes. Firstly, they provide an upgrade option for loyal business class customers; secondly they provide a marketing and branding opportunity to promote the entire airline. Most of the airlines which still offer a first class long-haul service come from Asia, specifically Japan and China. Thai Airways and Garuda also offer the facility – although the latter only has eight first class seats in its entire fleet.

In Europe, the only airlines to retain a true first class offering are British Airways, Air France and Swiss, while in

On average, first and business class travellers make up 12% of passengers but generate around 40% of the passenger revenue

Two years ago, nobody could have predicted a global pandemic would devastate the airline industry and reduce its 2020 revenue to \$328 billion. That's around 40% of the previous year's and roughly the same as in 2000. Economists and industry pundits are predicting the sector to be smaller for years to come, with some projecting airline traffic won't return to 2019 levels until 2024.

That said, travellers are showing increased confidence and passenger figures are on the rise. However, the pandemic seems to have changed consumer behaviour, perhaps irrevocably. Business travel is predicted to eventually bounce back, although travel logistics experts McKinsey & Company estimate "it will only likely recover to around 80% of pre-pandemic levels by 2024".

The company explains that "leisure trips or visits to friends and relatives tended to rebound first following 9/11 and the global financial crisis. Business trips took four years to return to pre-crisis levels after 9/11 but they also had not recovered to pre-financial-crisis levels as Covid-19 broke out. Therefore, we expect that, as the pandemic subsides, the rise in leisure trips will outpace the recovery of business travel".

First class was disappearing from airline cabins even before the pandemic, but the enforced shutdown has speeded its fall from favour. Across the long-haul market, the majority of well-known

carriers have been substantially reducing the number of first class seats on board their aircraft for more than a decade. Take British Airways as an example. In 2008, the UK's national carrier offered 560,000 first class seats across its fleet, yet by 2018 this had fallen by almost 100,000 or around 18%.

In the USA, the decline has been even more pronounced with United reducing its offering from 380,000 to 180,000 over the past decade and Delta halving its first class seats from 400,000 to 200,000 over the same period. Other airlines have scrapped first class completely and some, including British Airways, have eliminated it when ordering new aircraft.

On average, first and business class travellers make up 12% of passengers but generate around 40% of the revenue. So why don't passengers want the first class experience anymore? The one thing for sure is that it's not because the standards are falling. In fact, both the facilities and service offered to passengers have improved dramatically over



17



SFA provides the front row passengers with over 17sq/ft of shared flat bed space. Bulkhead row seats can also be converted into beds

the Middle East only Emirates, Oman Air and Saudia retain first class cabins.

In fact, Dubai-based Emirates bucked the trend, doubling its first class seats to 600,000 between 2018 and 2020. The region's location at the hub with virtually every market in the world means that around 90% of those seats are occupied by passengers who have paid for them, rather than being upgraded. They value the privacy it offers and the flexibility and prestige it exudes.

Superbusiness

The pandemic has seen airlines shift from double-decker jets like the Boeing 747 and Airbus A380 to smaller, more fuel-efficient aircraft but, even with less space, the prospect of filling first class seats is daunting. With executives trading first for business class and millionaires opting for private jets, the days of utmost luxury aboard commercial airlines seem numbered. Of course, many carriers are dependent on business travellers so what can be done to tempt them back aboard?

Some industry experts are predicting a growth in the number of airlines offering

Travellers may well feel motivated to spend more to ensure their journey is as luxurious as they can afford

'superbusiness' mini-suites. These are more spacious than regular business class seats and passengers will have a fully lay flat seat/bed, an improved business class service and, crucially, closing doors for privacy. These booths will offer the business traveller a better environment regardless of whether they want to work, sleep or just relax.

In 2007, Singapore Airlines was the first carrier to introduce the mini-suites (aboard its Airbus A380 fleet) but other airlines followed suit. However, the idea was reserved for first class passengers until 2017 when Qatar Airways launched its Qsuite. A host of other airlines now offer – or are planning to offer – the superbusiness concept and Air China turned to Recaro to provide mini-suites for its recently refurbished cabins.

The concept is predicted to appeal to the business traveller who wants privacy without the cost of first class travel. Most superbusiness mini-suites have doors that go up to shoulder height as regulations call for flight attendants to be able to see passengers at all times during

take-off and landing. However, Emirates' latest first class offering has full height doors that close the passenger off from the rest of the cabin. In order to pass safety tests, the carrier had to install CCTV.

Reconfigure

Whilst being cocooned in a doored booth will do little in reality to offer added protection from germs and viruses the privacy will doubtless provide a psychological boost and be popular with travellers who can afford it.

With space to fill at the front end of the aircraft, airline bosses are setting their minds towards how best to reconfigure their airframes. Some may shift to better cater to premium-leisure passengers, such as growth of premium-economy cabins or development of business-class seats more suitable for traveling as couples or groups.

Even prior to the pandemic, aircraft manufacturer Airbus predicted that passengers' expectations would evolve to include a focus on more "choice, flexibility and a desire for a personalised, on-demand

travel experience". The company recently opened its Customer Definition Centre (CDC) in Hamburg where airlines can use virtual reality to experiment with customisation and visualise future cabins.

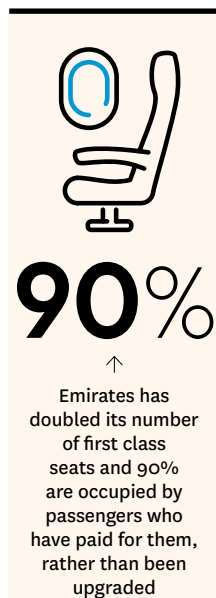
In order to respond to evolving passenger needs, Airbus has also launched its Airspace Cabin Vision (ACV) 2030 programme. Among some of the key areas it is currently looking at are cabin flexibility (specifically for flexible seating and sleeping configuration) and an inflight lounge with transformable

modules. According to Airbus this will "create a connected cabin ecosystem, enabling a more dynamic environment".

As well as offering passengers more personal space, larger overhead storage bins, advanced cabin lighting and the latest generation IFE equipment, Airbus is proposing more radical changes. ACV 2030 includes family compartments where parents and children can face each other; and would offer personalised gaming systems and digital menus. The concept also proposes bunk beds for passengers wanting to take a nap as well as a gym.



Virgin Atlantic 1





1. Some of Virgin Atlantic's new Airbus A350s will be fitted out for the leisure market with a new onboard social space called 'The Booth'
2. Singapore Airlines was the first carrier to introduce mini-suites. The first appeared in its A380 fleet in 2007
3. The Airbus Customer Definition Centre in Hamburg allows customers to experiment with cabin customisation using fully integrated mock-ups and virtual reality tools

Singapore Airlines



SEATING

Looking further ahead, ACV 2050 sees Airbus cabins being 'zoned' rather than split into traditional cabin classes. The company sees the interior as being divided into the 'Vitalising Zone' (to cater for relaxation and well-being) as well as a 'Smart Tech Zone and an 'Interactive Zone'. The latter would imitate any possible social scene, meaning passengers could arrange a virtual business meeting, play a game of virtual golf or even read a bedtime story for their children back at home.

Say Goodbye to Segregation

While Airbus is planning to zone its cabins, other companies are proposing doing away with segregation completely. Traditionally, due to various classes of travel being separated within the cabin, passengers in economy rarely see the benefits and perks offered in first or business class.

However, a study conducted by a South Korean student in partnership with Adient Aerospace suggests mixing classes together could be a more efficient and profitable solution, offering airlines an opportunity to entice passengers out of the 'cheap seats'.

The study was the brainchild of Hongik University student Sahngseok Lee and is dubbed One for All (1FA). It uses a Tetris-like concept to mix and match classes throughout the cabin to maximise seating capacity and revenue. The cabin would be on multiple levels, connected by staircases to allow better use of space and ease of passage for crew.

The 1FA system effectively interweaves the various seat classes and could see economy passengers sitting next to (and even above or below) first or business class passengers. While the radical proposal won the Crystal Cabin Award in 2019, challenges including emergency egress regulations and the perceived downgrading of the exclusivity and privacy offered by premium offerings mean the industry is yet to see anything quite like it in practice.

However, the idea of mixing classes clearly has merit and 1FA partner Adient has teamed up with Boeing to create a modular seating platform for the 787. Hawaiian Airlines is the launch customer for the 1-2-1 outward-facing herringbone layout that takes inspiration from the 1FA 'booth'.

Adient's Space For All (SFA) design uses the space between the bulkhead seats and the bulkhead wall separating economy from business class to create an extended flat surface to use as a lounge seat or a common space for children and adults. With the seat armrests in the raised position, SFA provides the front row passengers with over 17 sq ft of shared flat bed space. Bulkhead row seats can also be converted into beds.

Two's Company

Virgin Atlantic recently announced that some of its new Airbus A350-1000 airframes would be fitted out for the leisure market, serving destinations such as Barbados and Orlando.

The reduction in need for seats in upper class created an opportunity to introduce a new onboard social space called 'The Booth'. This is a semi-private space with lounge-style seating for two, separated by a single-leaf table and designed in collaboration with London-based design agency Factorydesign.

While it may be true that first class service we have known for decades could be on the way out, this should not be confused with a concept that passengers no longer want a luxury offering.

Throughout the pandemic many customers have managed without some of the luxuries they had previously come to rely on, from eating out to meeting up with friends and loved ones.

The opulent luxury of its heyday may be a thing of the past, but for a society that has 'gone without' (and has disposable income) the premium offering could be in more demand than ever. With campaigners lobbying for reductions in air travel, a family may opt for one long overseas holiday every two years instead of numerous short breaks.

In this scenario, that single trip would be far more eagerly anticipated and travellers may well feel motivated to spend extra to ensure their journey is as luxurious as they can afford. Customers will always aspire to a 'first class' service, no matter how it is branded. ☛

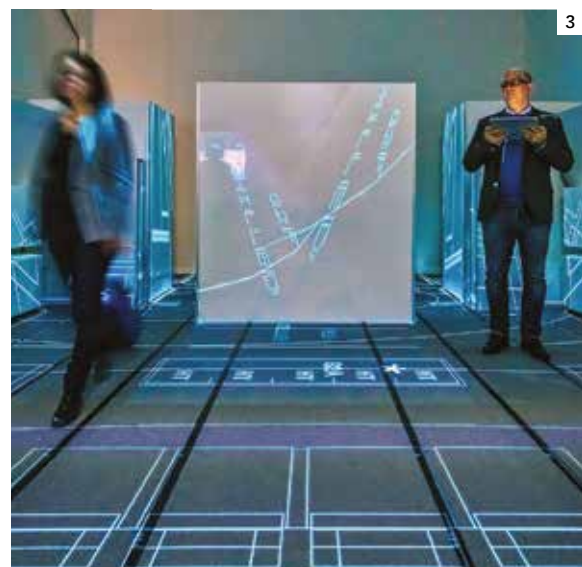


18%



Between 2008 and 2018 the number of first class seats on British Airways flights fell 18% from a peak of 560,000 per year

Airbus



Career PATH

Tell us how you got to be where you are today

Nobody is sure why, but 'aeroplane' was the first word I spoke as a child and I have always been happiest at an airfield or in the air.

I became an aviation journalist more than 20 years ago and eventually learned to fly in 2006. As a young writer, I was very lucky that an experienced editor took me under his wing and offered me a metaphorical 'foot on the ladder'. This is something that I've always been grateful for and I've devoted a lot of my time towards groups and charities that provide aviation opportunities for young people.

When was your first flight?

It was in October 1986, I was 11 years old and it was in Douglas DC-3 Dakota G-AMRA, which belonged to Air Atlantique at Coventry Airport. I later I went to university in Coventry and began volunteering at the airline. In 2009, I became its commercial operations director. Sometimes I would look out of my office window at G-AMRA and just smile.

What is the most interesting part of your job?

That is very easy to answer – the people. I've been incredibly privileged to meet and/or interview some fascinating people over the



Steve Bridgewater, Aircraft Cabin Management's new editor, on being organised, tomato juice and gazing out at cloudscapes

years. In a job like this, we get to speak to people from all types of backgrounds and over the years I've learned that regardless of whether you're a 'hangar rat' or an Air Commodore you have an interesting story to tell, and I invariably walk away from an interview having learned something new.

What would be your alternative career?

In the past I've worked in the aviation preservation and museum industries, and this is something I retain a passion for. I often tell people: "I don't have a job, I have a hobby that I get paid for."

What is your flying routine?

As opposed to my wife, I like to be 'really' organised. If she's travelling alone she'll happily turn up at the gate as the final boarding call is made so she gets frustrated that I'm usually the first one to board!

I always like a window seat and I still get that rush of excitement as I see the ground disappearing as we leave the runway. There is something both magical and humbling about gazing out atop a cloudscape.

What is your favourite on-board meal?

Believe it or not my little treat to myself is tomato juice. I never seem to drink it anywhere other than in an airline cabin so I always associate it with flying.

What content would catch your eye on the IFE system?

I rarely watch films in the cabin because I struggle to concentrate for that long. I tend to get distracted by the view outside the window or talking to fellow travellers. In fact, I seem to have a habit of making friends with the crew and will often be found chatting in their rest area



and catching up on industry gossip. When I'm in my seat, I tend to catch up on the news channels, sample any new music that appeals to me or watch a 30-minute comedy.

How do you see the aircraft cabin evolving in the future?

I think we are on the cusp of a cabin revolution. Advances in technology and streaming mean the cabin experience can now be tailored towards individual needs.

In the coming months and years we will also see increasing numbers of eVTOL urban air mobility vehicles in our skies and it will be fascinating to see how their cabins evolve to meet the demands of an entirely new market. Will they be flying offices, relaxation zones, family friendly areas or party palaces? I suspect they will be all of these and more. ☺





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