



# **DIGITAL CABINS**

**5 WAYS IT WILL  
REVOLUTIONIZE  
THE PASSENGER  
EXPERIENCE**

**altran**

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## EXECUTIVE SUMMARY

**Innovations in aircraft interiors will have a deep impact on passenger experience but also on airlines. 5 benefits will contribute to an overall improvement in cabin conditions.**

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### ON-DEMAND

The “smart plane” of the future may not even offer seat-back entertainment, but instead boast a turbo network that fuels possibly hundreds of smart devices on board.

### REAL-TIME

The ability to be connected on the ground and increasingly up in the air - combined with airlines’ growing commitment to digitally-led service innovation - will allow passengers to be in the know about the progress of their journey in real-time.

### DOOR-TO-DOOR EXPERIENCE

Connected airlines of the future will look beyond simply providing a “smart” inflight experience and aim at extending that service across the entire trip - from the moment you leave home to the moment you arrive at your destination.

### AIRCRAFT OPERATIONS AND CABIN IMPROVEMENT

In our increasingly connected world, the possibilities for the future of “smart” aircraft are endless. Cabin interiors will continue to evolve thanks to the entire aircraft systems development.

### UNIQUE AND PERSONALIZED TRAVEL EXPERIENCE

Future aircraft cabins will propose passenger unique experience of travel through the following benefits:

- Personalized inflight entertainment
- Captive audience
- Virtual reality
- Perfect airlines seat
- Sleeping rooms
- Sensory experience

## INTRODUCTION

**Consumers are demanding ever more speed, mobility, control and relevance during travel. These demands for a connected and digital experience are driving both Aircraft Manufacturers and Airlines to invest in scalable infrastructure, updated technology standards, and new operating models.**

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In the meantime, the race to connectivity is accelerating: industry experts forecast that **over 20,000 aircraft cabins will be connected by 2025**. As an example, the Airbus A350 XWB, known as “the only digital native aircraft,” is 100 % equipped with in-flight connectivity and is uniquely designed to integrate systems, while making the most effective use of space and weight to provide a seamless door-to-door connected experience.

Smoother communications between connectivity nodes in the aircraft mean passengers could potentially control their own environment - lighting, window shades, seat movement and climate - directly through their smartphones and personal devices, with crews tapping the technology to optimize cabin systems, operational efficiency and personalized service.

There have been great improvements in passenger experience throughout the aviation industry, but customers are still looking for that smooth and easy travel experience, where they feel valued and important.

This paper offers a glimpse into the 5 technological takeaways that will revolutionize passenger experience in the coming decade.



# 1

## BRIDGING THE GAP BETWEEN DREAMS AND REALITY

Expectations of airline passengers are not shaped only by how well an airline performs compared to its direct competitors. They are also fueled by standards set by experiences that consumers have in other sectors, as innovative products and services arrive in all industries. This means airlines need to tune into the customer from a holistic perspective when designing the passenger experience.

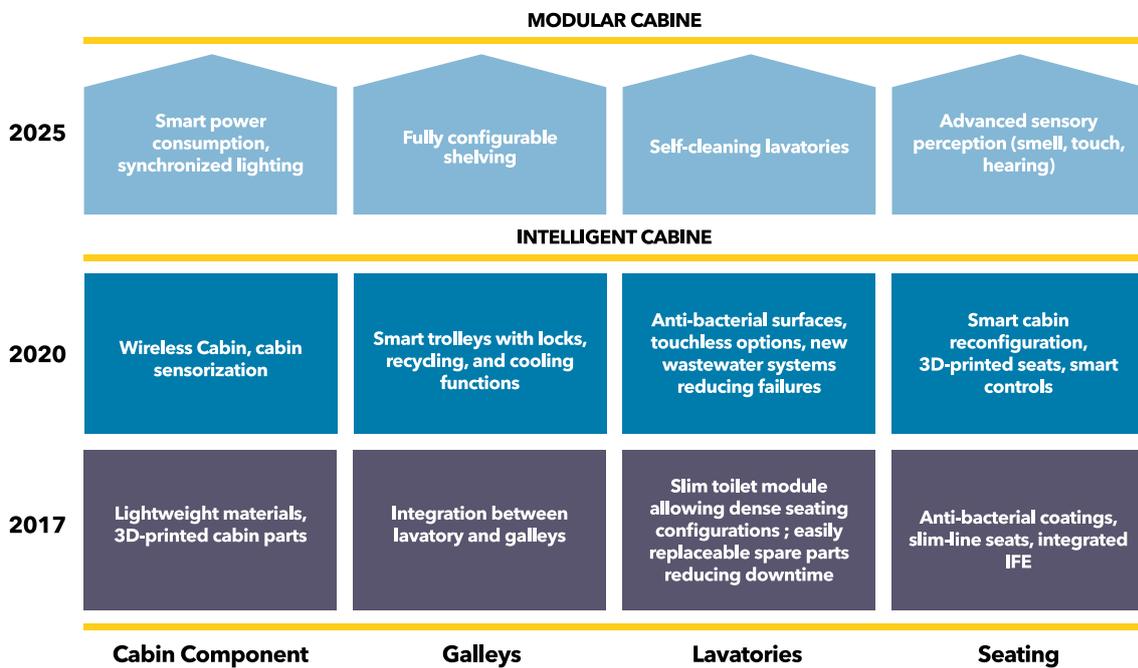


FIGURE 1 - TOTAL COMMERCIAL CABIN INTERIOR MARKET : TECHNOLOGY TRENDS IN COMMERCIAL CABIN INTERIOR, GLOBAL, 2017-2025 (SOURCE FROST & SULLIVAN)

→ **SPECIFIC CUSTOMER NEEDS ARE OVERLOOKED**

Most aviation experiences are designed first and foremost for business or first-class passengers. Aviation companies do not design equally for all customers. Air travelers' high expectations of what airlines were providing began to change as the level of service on flights diminished. Airlines were hit with high fuel and labor costs and greater competition led to lower airfares, all of which contributed to both lower levels of service and individual fees for various optional services.

→ **FRAGMENTED EXPERIENCES**

In recent years, most major airlines have turned to increased product fragmentation in an effort to drive unit revenue. For paying a lower fare, basic economy travelers accept a variety of inconveniences, including seats in the back of the plane and tickets that are nonrefundable and non-changeable. Airlines argue that such fragmentation is a boon for passengers, enabling them to decide where along the matrix of comfort vs. cost they want to fall. They also say it makes money.

→ **KEY PLAYERS' INVESTMENTS TO IMPROVE CABIN EXPERIENCE**

From the operator perspective, one of the key objectives is to keep the customer loyal and the key factor is how passengers remember the flight experience. High-quality inflight entertainment and, increasingly, communications, have become central to the passenger experience. Combined with better comfort and passenger-centric services, airlines have a great opportunity for promotion and ancillary revenue generation.

"37% of airlines have already allocated a budget to implement the internet of things."

- *SITA 2015 Airline IT Trends Survey*

Airline operators are driving innovation through digital transformation programs, demanding further automation and improved passenger experience through digital technologies and analytics.

In the meantime, numerous suppliers are developing smart cabin interior products and passenger monitoring technologies.

**Here are five areas that we believe will contribute to improving the passenger experience and make flying seem like a unique experience.**

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### 2.1. ON-DEMAND

The on-demand economy has generated a sense of entitlement to fast, simple and efficient experiences as it taps into consumers' appetite for greater convenience, speed, and simplicity.

As mobile device use becomes more and more ubiquitous, expectations for airline connectivity will continue to rise. Many travelers wouldn't dream of boarding a flight without their smartphone or tablet, and as this trend continues to grow, airlines must adapt. The "smart plane" of the future may not even offer seat-back entertainment, but instead boast a turbo network that fuels possibly hundreds of smart devices on board.

For instance, a growing number of airlines - including Virgin America, Air New Zealand, Japan Airlines, Norwegian, Azul - allow passengers to order meals, snacks and drinks via the in-seat IFE system in between regular meal services, while Qantas and EVA Air offer passengers the option to purchase duty-free via the Panasonic eX3 IFE systems.

These on-demand services enable retailing throughout the duration of a flight rather than a limited time when the flight attendant walks the aisle.

Crews will be able to interact with the passenger in unprecedented ways thanks to the prevalence of smart devices that will provide airlines with data on preferences ahead of time, allowing them to prepare services.

### 2.2. REAL-TIME

The ability to be connected on the ground and increasingly up in the air - combined with airlines' growing commitment to digitally-led service innovation - allows passengers to be in the know about the progress of their journey in real-time.

Some flyers have already started using personal sensors to track baggage, and it's a trend that will continue to grow. Passengers can track their luggage via a signal transmitted to their smartphones, giving them the power to know where their bags go after leaving their hands and the confidence to board their flights with the comfort of knowing that their luggage is safe in the cargo pit. As this technology continues to develop, lost baggage could become a thing of the past.

As an example, in 2011 Delta became the first airline to make the baggage process more transparent for passengers by launching its "Track Checked Bags" service.

### 2.3. DOOR-TO-DOOR EXPERIENCE

Customers' journeys actually begin before they arrive at the airport, and continue after their flight has landed. You need to find ways to engage with the customer before and after they interact directly with you. Help customers prepare for their time at the airport when they are at home, and give them a meaningful airline experience outside the aircraft. Too many companies fail to cater to the specific needs of their customers outside of the traditional tent-pole journey touch points. Faced with increased competition and a need to differentiate, this is a missed opportunity.

Connected airlines of the future will look beyond simply providing a "smart" inflight experience and aim at extending that service across the entire trip - from the moment you leave home to the moment you arrive at your destination. Improved connectivity across the entire travel experience could facilitate much advancement, including the ability to instantly update your transportation or hotel if a flight is running late, the ability to order food and have it waiting at the gate when you arrive or even the power to log requests with crew members before getting on board.

Indeed, passengers, spoiled by user-centric apps on their smartphones, are pushing airlines to evolve their app into a "digital travel companion" in order to extend their service beyond just flying passengers from A to B.

This approach is most visible today in the digital partnerships that airlines such as United and American have forged with Uber. In mid-2014, Uber announced it would open up its application program interface (API) so any app developer could integrate the on-demand car service into their app. Basically, all it takes is adding a few lines of code and an Uber button is part of the app.

Moving on, let's think about how connectivity advancements in the coming years may affect the travel experience for passengers, both in and outside the aircraft.

### 2.4. AIRCRAFT OPERATIONS AND CABIN IMPROVEMENT

In our increasingly connected world, the possibilities for the future of "smart" aircraft are endless. Cabin interiors will continue to evolve thanks to the entire aircraft systems development.

→ **SPEED ISSUE RESOLUTION:** The smart plane of the future has the potential to smooth cabin operations and improve the customer experience in numerous ways, including issue resolution. If something isn't functioning properly - a seat that won't recline, for example - information can be shared automatically with crew on the ground, so they can prepare the fix at the next destination. Additionally, vouchers can be automatically sent to any inconvenienced passengers.

→ **IMPROVE CABIN CONTROL:** Advanced sensors are another possibility for the connected plane of the future. These tools could be employed to control temperatures at individual seats, adjust cabin humidity or smells, even predict when passengers will feel dehydrated, prompting crew members to proactively bring water. Sensor use, when applied appropriately, could help crew members stay more attuned to flyers' needs and thus deliver a heightened experience.

→ **DIGITALIZATION OF AIRCRAFT OPERATIONS AND CABIN:** Airlines and suppliers are increasingly focusing on the digitization of aircraft operations and cabin to bring new efficiencies and enhance the passenger experience. Lufthansa Technik has launched its "Cabin 4.0" project, which uses intelligent automation to simplify procedures in the cabin for both passengers and flight crews. The project aims to digitize manual tasks using state-of-the-art sensors, giving flight attendants more time for personal service.

## 2.5. UNIQUE AND PERSONALIZED TRAVEL EXPERIENCE

With higher margins in the aftermarket, aircraft integrators are further developing their aftermarket value proposition. A case in point is the launch of the AIS division to offer tailored equipment, upgraded solutions, and innovative cabin interior products. Furthermore, both Airbus and Boeing are prioritizing cabin innovation projects, driven by their respective innovation hubs, "A3" and "Boeing HorizonX."

Airlines are increasingly outsourcing high-value cabin interior functions such as design, certification, and engineering. At the same time, cabin interior manufacturers are investing in the development of the same capabilities, considered imperative for future growth in sales.

Aircraft integrators, airlines, and cabin interior suppliers are collaborating with automotive suppliers to revitalize cabins with fresh visions and styling techniques. Recent examples of this include Boeing's collaboration with Adient Plc, Airbus' collaboration with Pagani, and Lufthansa Technik's work with Mercedes for business jet design.

### → PERSONALIZED INFLIGHT ENTERTAINMENT

One area where mobile can become truly transformative is inflight entertainment, with personal devices becoming gateways to a whole range of up-in-the-air services.

While built-in in-flight entertainment systems are unlikely to vanish, particularly on long-haul flights, they can work in tandem with the passengers' own devices.

By syncing with handsets, their seats know a passenger's preferences and can even restart a movie at the exact place where they left it in the previous flight.

Some airlines are doing away with embedded entertainment systems altogether.

They're opting for passengers' handsets to deliver inflight entertainment -- a move that crucially reduces aircraft weight and frees up cabin space.

No Internet connection is required, passengers just connect their devices to an in-plane network.

### → CAPTIVE AUDIENCE

Passengers might be more interested in binge-watching their favorite TV series instead of booking airport transfers or ordering an extra cup of coffee.

Airlines can save the weight and maintenance costs of legacy seat-back entertainment systems and still provide differentiated experiences.

For example, they can now create custom portals that offer a unique brand and advertising opportunity for the airlines.

Virtual reality could offer not only entertainment but also help calm those afraid of flying.

### → VIRTUAL REALITY

New generation in-flight entertainment isn't going to be enjoyable without a comfortable environment to experience it in.

Providing a nice, relaxing atmosphere in a cramped metal tube is always going to be a challenge, but moves are afoot to improve that.

LED lighting has already proven effective during night flights, even apparently reducing jet lag.

Virtual reality technology could give passengers a whole new sensory experience.

For example, while they are watching a film on board, customers could be virtually transported to be sitting in a real movie cinema, or even simulate lying on a beach.

Thinking about allowing the passenger to escape from the cabin and experience something like walking in the rainforest for a couple of hours. There could also be some opportunities for additional revenues for the airline to create spaces where people can book a couple of hours for a peaceful and relaxing experience.

→ **PERFECT AIRLINE SEAT**

Imagine boarding a plane and the seat recognizing who you are and remembering exactly how you like to sit, in what configuration, and setting up your entertainment playlist based on your personal preferences and what you were watching at home before you came to the airport.

Seats will be made even more comfortable with advances in cushioning and the development of more breathable materials with antibacterial properties

Extra comfort is coming thanks to the constant accumulation of incremental ergonomic improvements.

These are the things that passengers barely notice on their own but put together make a difference between a good and a great travel experience.

Many of the industry's creative energies are currently devoted to creating the perfect airline seat.

→ **SLEEPING ROOMS**

Travelers are used to comparing hotels and checking reviews on TripAdvisor. Innovation in the cabin experience could lead to more differentiation between the experience provided not just on different aircraft types, but on different airlines.

→ **SENSORY EXPERIENCE**

Cabin interiors could be improved, so that lighting, heating and cooling work together to create a more natural environment and enable customers to better regulate their body rhythm and reduce jet lag.

You can use lighting as a tool to create the right ambience for boarding, dining and sleeping, as lighting has a huge impact on space perception and the passenger experience. Passengers can control every single aspect of their environment - the sound, the light, the temperature, the smell.

The aircraft cabin of the future will include climate-controlled seats that allow passengers to set the temperature as needed, and also mold to the body for a more comfortable flight. Active noise canceling systems will be installed to help make the cabin quieter for everyone, while ambient overhead lighting will simulate sunlight more accurately, helping to reduce jet lag on long international flights.



CATEGORY	DESCRIPTION
LAVATORY	<ul style="list-style-type: none"> <li>• Self-cleaning lavatory - Lavatory that use ultra-violet rays to remove bacteria after every use</li> <li>• Passenger mobility lavatory (PRM) - Lavatory designed for passengers with reduced mobility, offering large entryway for maneuverability and allowing safe transfer</li> <li>• Slim toilets that enable dense seating configuration in cabin</li> </ul>
RECONFIGURABLE CABIN	<ul style="list-style-type: none"> <li>• A low-cost alternative to differentiated seating classes in an aircraft</li> <li>• Airline crew, during turnaround between two flights, can fold up flexible seat rows by releasing a floor lock mechanism, which will enable adjustment of seat pitch among various sets of seats that are placed over the railing</li> <li>• Enables fuel savings during the flight, thereby reducing the airline's operating costs significantly</li> </ul>
SMART SEAT TECHNOLOGY	<ul style="list-style-type: none"> <li>• Enables flight crew to track status of seats via an app, making it easy for them to detect seats that are not in the correct position during take-off and landing</li> <li>• With sensors installed in various parts of the seat, the technology can track status of parts, enabling the aircraft operator to gauge future maintenance requirements</li> </ul>
ANTI-BACTERIAL SEATS	<ul style="list-style-type: none"> <li>• Coating can remove 99% bacteria in the three hours and can be sufficiently wiped down quickly to offer improved hygienic conditions on board</li> </ul>
3D-PRINTED CABIN PARTS	<ul style="list-style-type: none"> <li>• 3D-printing reduces the number of parts used and creates continuous units, offering weight and cost savings</li> <li>• 3D-printed seats, air ducts, wall panels, dividers, backlit signs, trays are growing in acceptance</li> </ul>
SMART WINDOW SHADES	<ul style="list-style-type: none"> <li>• Windows that act as touchscreen and project information about the flight directly on the window</li> </ul>
CABINS WITH PRIVACY PARTITIONS	<ul style="list-style-type: none"> <li>• Business class suites that offer amenities and comfort matching first class with privacy partitions arranged in an effective way</li> </ul>
HEADREST	<ul style="list-style-type: none"> <li>• Headrest wings that offer neck support to economy class passengers</li> </ul>
SMART TROLLEY	<ul style="list-style-type: none"> <li>• Trolley that can compress and recycle used tins, cups, and reduce waste volume by 30%</li> <li>• Trolley with electronic security system that can prevent theft</li> </ul>
SMART CABIN CLEANING DEVICE	<ul style="list-style-type: none"> <li>• Cabin cleaning device that removes bacteria on the seat and other exposed areas using UV radiation</li> </ul>
MOOD LIGHTING	<ul style="list-style-type: none"> <li>• OLED cabin lighting that improves aesthetics and enhances flight experience for passengers</li> <li>• Floor path lighting, seat lights, ceiling wash lights, dome lights, window lights, and stairway lights are synchronised to set the perfect ambience for passengers</li> </ul>
SQUARE BEAM READING LIGHTS	<ul style="list-style-type: none"> <li>• Plug-and-play reading lights designed for more privacy and to prevent light spill onto other passenger seats</li> <li>• Personal device as remote control</li> </ul>
POWER LINE COMMUNICATION	<ul style="list-style-type: none"> <li>• Concept that converts existing wire cables from power-only to both power and data transmitters</li> <li>• Aimed at retrofit programs</li> </ul>

FIGURE 2 - CABIN INTERIOR MARKET : INNOVATION IN CABIN INTERIOR, GLOBAL, 2017-2025  
(SOURCE FROST & SULLIVAN)

## CONCLUSION

**The aircraft of the future will incorporate technology offering passengers an experience centered on their mobility needs - creating seamless, personalized travel and innovations that will increase efficiency and maximize profit for airlines.**

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Acting as a central node gathering and sharing big data, we see aircraft “talking” to numerous objects/ devices (automated vehicles, hotels, passenger devices, air traffic control, other aircraft, a/c services) and using the information gathered to personalize travel for passengers, via deep learning and artificial intelligence, thus increasing efficiency for airlines.

With the intelligent, information-gathering node, aircraft will morph and re-configure utilizing smart robotics, kinetic architecture, bionics and collective intelligence.

Similar to today, the cabin of the future needs to balance passengers’ needs in terms of comfort with the efficiency airlines require.

Don’t expect all of these improvements to come along anytime too soon. Airlines will have to find ways to balance initiatives that make sense for passengers and those that can impact the bottom line. Still, it is fun to dream about where the next generation of aircraft are headed, and how much more comfortable they could be.

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## ABOUT THE AUTHOR

Adama DOLO is the manager of Local Expertise Center “Digital Cabin and Connected Aircraft”. He joined the Altran group more than 8 years ago as consultant in the aerospace industry. During his 15 years’ career, Adama has successfully designed and implemented digital cabin assets such as wireless IFE, Cabin Management System, Digital Cabin Assistant etc. He has also provided best practices in strategy, business development and management in the field of Digital Cabin, thanks to his deep knowledge and exceptional skills in this domain.

Amel Meddah is Marketing Manager for the Aerospace, Defense and Railway industries. She joined the Altran Group more than 12 years ago. Over her career she supported Altran Group Aerospace and Defense strategy development by providing best practices in strategy and marketing operations helping to better understand client’s needs.

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