PASSENGER EXPERIENCES

Meeting the Expectations of Modern Passengers

Honeywell

Customer experiences are composed of every interaction between an organization and its customers throughout their relationship. In industries of all kinds, this relationship is becoming more and more important to success.

Customers simply expect more – and not just more product for their money. They expect a more consistent and fulfilling experience from the moment they begin searching for a product like air travel to long after the flight is over.

When customers book air travel, they don't just buy tickets. They buy an experience. So for airlines, business aviation operators and others, the quest is on to maximize that experience. They must transform the way flight works to build a new, more customercentered future for air travel. Doing so requires seeing each step of the experience from the viewpoint of the customer.

86%

of buyers are willing to pay more for a great customer experience.

73%

of buyers point to customer experience as an important factor in purchasing decisions.¹

- 3 The Customer Expectation Framework
- 4 Staying Connected in the Sky
- 5 Entertainment at 30,000 Feet
- 6 Reduced Turbulence for Smoother Flights
- 7 Faster Turnarounds for More On-Time Arrivals and Departures
- 8 Air Quality and Temperature Control for More Comfortable Cabins
- 9 Spotlight on Airliners
- 10 Spotlight on Helicopters
- 11 Spotlight on Business Jets
- 12 Honeywell Solutions for Comfort and Passenger Experience
- 13 User-Focused Communication Systems
- 14 Solutions for Reducing Weather Hazards and Turbulence
- 15 Tools to Achieve Better On-Time Performance
- 16 Systems for Optimized Temperature and Air Quality

THE CUSTOMER EXPECTATION FRAMEWORK

What do customers expect today? The answer has changed rapidly of late, and that change is due mainly to the internet.

Customers expect all experiences to be as easy, as fast and as good as what they experience online. It doesn't matter if orchestrating a transcontinental flight is vastly more complex than streaming a video - customers expect constant access and information anywhere and anytime, personalized service and an organization that predicts or responds to their needs.

Building the best customer experience requires being user centered and focusing on what passengers value. It also means reducing friction during any and all transactions and encounters.

Here's what that means in the world of air travel. Recent studies have shown that among what passengers value most highly are connectedness to work, relationships, entertainment and information, and on-time arrivals and departures.² Other studies, meanwhile, indicate that despite how common it has become, many people remain nervous about flying.³ Finally, air quality and temperature control have an enormous impact on the comfort and experience of passengers.

Thus the aviation industry can best focus on user needs and reduce friction points in these four important areas of passenger comfort and experience:

- Connectivity
- Turbulence
- On-time arrivals and departures
- Air quality and temperature control



3.4. https://flyfright.com/statistics/



Nearly one in three adult Americans is either anxious about or afraid of flying.⁴

2. https://aerospace.honeywell.com/en/~/media/aerospace/files/infographics/n40-2233-000-000_connectivitysurvey-ig.pdf

STAYING CONNECTED IN THE SKY

Passengers now care more about cyberspace than physical space, preferring a reliable and always-available internet connection over better seats. Sixty percent of passengers consider inflight Wi-Fi a necessity, not a luxury.⁵

While some planes have been Wi-Fi capable for years, many existing options still fall short on reliability, coverage, speed and accessibility. That means modern aircraft fail to deliver the experience passengers desire most.

To remain competitive, airlines and those offering private or business air transport need to improve high-speed broadband access for passengers. According to our 2016 Connection Survey, 21% of travelers have already abandoned their preferred airline for an option with better in-flight Wi-Fi, and 68% of travelers book their flights based on Wi-Fi availability.⁷

Innovations in satellites and airborne routers give airlines the opportunity to upgrade their current airborne connectivity speeds to be up to 100 times faster. Similar solutions have become available for business jets, personal aircraft and helicopters. With a full embrace of these new options, organizations can give passengers a better high-speed connection with fewer interruptions throughout their flight.



5. https://www.inmarsataviation.com/en/benefits/passenger-experience/the-future-passenger-experience.html 6.7. https://aerospace.honeywell.com/en/sites/connected-aircraft

60% of travelers say they would be disappointed or frustrated on a plane without Wi-Fi.

84% say it's important to have an experience identical to what they have at home or at the office.

90% say it's essential to experience a reliable, fast connection throughout their flight - anywhere in the world.

Honeywell 2016 Connection Survey⁶

ENTERTAINMENT AT 30,000 FEET

The first in-flight movie was shown by Aeromarine Airways in 1921. Passengers aboard the amphibious plane watched a film called Howdy Chicago as the airplane flew around Chicago.⁸ We have come a long way since then.

Today, in-flight entertainment is offered as an option on almost all wide-body aircraft. Narrow-body aircraft, due mainly to storage and weight limits, offer much more basic in-flight entertainment options or none at all. Depending on the plane and the carrier, airliners use a mix of LCD drop-down screens, on-demand seat-back screens, and bring-your-own-entertainment on smartphones and tablets powered by Wi-Fi.

The best of these entertainment systems are tied into cabin management systems, which integrate a wide variety of functions and focus on reliability. Some technology has come so far that passengers can enjoy state-of-art displays, streaming devices and surround-sound systems, so their experience is exactly the same from the living room to the cabin.



REDUCED TURBULENCE FOR SMOOTHER FLIGHTS



Weather and turbulence are among the top concerns for modern air travelers. According to travelers in a Honeywell survey, the number-one concern is weather causing flight delays, and the number-three concern is turbulence.⁹

Recent technology innovations should calm these concerns. These innovations include:

- The use of volumetric 3D scanning
- Pulse compression technologies that provide vastly improved weather detection
- Predictive hazard warnings for lightning, hail, wind shear and turbulence

For pilots, these technologies offer a number of benefits that help them provide a smoother, more comfortable ride.

The most advanced technology allows automatic scanning of 2 degrees in front of the aircraft at a variety of tilt angles - captur weather data vertically from zero to 60,000 feet and ahead up to 320 nautical miles. This clear view of weather conditions and potential hazards along the flight path helps pilots:

- Calculate the best responses to weather and turbulence, wh reducing or eliminating unnecessary route deviations.
- Course correct in real time for safer and more comfortable flights.
- Predictive hazard detection can keep pilots better informed of air turbulence so they can make safer, more informed route decisions.

elp SIMPLIFIED OPERATION

160 ing	To help pilots focus on providing the smoothest possible flight, these technologies are fully automatic and require no manual adjustments to systems or antenna. They can:
b	- Detect general weather on the flight path, with constant updates of the latest hazard assessments.
nilo	- Eliminate ground clutter via internal terrain databases.
inte	- Automatically correct for the earth's curvature, to ensure the clearest, most accurate view of the weather ahead.
ed	All of this benefits the passenger by delivering a smoother and more turbulence-free flight, leading to increased comfort and satisfaction.

FASTER TURNAROUNDS FOR MORE ON-TIME ARRIVALS AND DEPARTURES

Building a truly powerful customer experience involves creating more moments of satisfaction and delight for customers, or in the case of air travel, passengers.

Many of today's passengers have come to expect delays. Even with business jets, personal aircraft or helicopters, delays can be common. This creates an opportunity for operators who can avoid delays to create pleasant surprises for passengers.

> One of the best areas to improve passenger experience isn't found in the air. It's located on the ground: getting a plane turned around faster and more efficiently.

Today's customers demand excellence in every part of the brand experience, making it vital for airlines and other operators to extend improvements to passengers' experience on the ground. Smooth flight experiences can be ruined by lengthy stays on the tarmac or other turnaround issues. In addition to charting more effective flight paths, operators can reduce delays and improve on-time performance with more efficient ground handling and by understanding and planning for maintenance needs. The end goal is to always keep passengers happy and on track for their connecting flights or final destinations. That means putting data to work to get aircraft in on time, maintained and back in the air in a timely manner.

Connected technology is now giving operators new tools to improve turnaround time, helping flights stay on time - and thus improving the passenger experience. Connected solutions give crews better insights into:

- Operational efficiency
- Fleet management
- Flight safety

They do this by transmitting aircraft and ground handling data in real-time to key stakeholders (airports, pilots, maintenance teams and ground crews) to give a complete view of the turnaround process and a wealth of data for improving on-time performance, resource planning and the customer experience. Passenger experience was one of the top reasons for airlines to invest in the Connected Aircraft, with 76% of respondents listing it as "Extremely Important" or "Very Important."¹⁰

AIR QUALITY EMPERATURE CONTROL FOR MORE COMFORTABLE CABINS

The atmosphere through which airliners and business jets fly is extremely thin and very cold, so while the quality and temperature of the air seems to passengers to be a comfort issue, aircraft environment control systems are in fact a form of life support.

AIR

As long as aircraft have flown at high altitudes, pressurized air Modern predictive analysis is beginning to improve the systems have been necessary. Most use a mixture of recirculated management of both air and temperature on aircraft by providing cabin air and bleed air - outside air brought in for the engines better assurance that systems are in working order and that the but diverted for use in the cabin. The recirculated air provides varying atmospheric conditions they're exposed to won't cause moisture, which is scarce at 30,000 feet. Engine compressors failures during the current or upcoming flight. compress the bleed air so it has enough oxygen for both the engine and to be useful in the cabin. While it is cold outside the aircraft at cruising altitude, the compression heats air far above 44% comfortable temperatures. It must then be cooled before use in the cabin.

Some modern aircraft designs do not use bleed air at all but rely on electronic compressors that pull air directly from outside.

TEMPERATURE

Keeping the temperature in an aircraft comfortable is a significantly greater challenge than doing so in a building. The temperature outside an aircraft changes drastically during flight. An airliner might take off in 90-degree weather, but at cruising altitude experience minus 40 degrees or colder.

Considering these challenges, it's remarkable what environmental control systems (ECSes) can do. ECSes contain a number of subsystems such as cabin pressurization systems, ventilation systems, pneumatic control valves, heat exchanges and more. In newer aircraft designs, many of these are being replaced with electric components.

believe that recirculated air in a plane spreads germs or viruses¹¹. In fact, air cabins use high-quality filters similar to those used in surgeries, and air is replaced or refreshed far more often than air in most indoor environments.

SPOTLIGHT ON AIRLINERS

Connected technologies can help airlines deliver better passenger comfort and experiences through in-flight broadband connections, reduced turbulence and quicker turnaround times.

SATELLITE COMMUNICATIONS

Passengers have made it clear: They expect consistent, faster in-flight connections. Traveler loyalty lies with Wi-Fi. Sixty-eight percent of travelers book their flights based on Wi-Fi availability.¹² Satellite-based solutions can enable airlines to offer broadband Wi-Fi connections to meet these demands.

Satellite communications can also allow operators to track and gather data from connected systems to help them improve the overall flight experience.

WI-FI AS A REVENUE OPPORTUNITY

As competition drives seat prices and margins down, ancillary revenue is becoming more and more important for airlines. Airlines must learn to think like retailers. Eighty-five percent of passengers can be influenced to make a purchase in a connected cabin if they can be sure the products they want will be available. 13

Capitalizing on this opportunity will require high-speed broadband Wi-Fi. Uneven implementation of Wi-Fi across a fleet will hold back many of these ancillary revenue opportunities.

TURBULENCE

Turbulence is one of the top-three fears that passengers hold in regard to flying. Airlines can help to mitigate these fears and gain increased passenger loyalty by giving pilots advanced connected solutions to avoid turbulence.

Technology that uses volumetric 3D scanning and pulse compression can improve weather detection, while advanced systems can provide predictive hazard warnings for lightning, hail, wind shear and turbulence.

ON-TIME ARRIVALS AND DEPARTURES

To keep passengers happy and on track, pushing back from the gate in a timely manner for on-time departures and arrivals is critical. Unfortunately, maintenance issues routinely cause airlines to be grounded - even minutes before departure. One way to achieve better on-time performance is with connected technologies that give better insights into maintenance, allowing airlines to be more informed of issues, alert proper personnel more guickly and turn planes around faster.

ANCILLARY REVENUE OPPORTUNITIES FOR AIRLINES¹⁴

- Broadband access: Access fees are currently the largest source of broadband-enabled ancillary revenue.
- E-commerce: Experts estimate that e-commerce revenue could add up to \$6.8 billion by 2035. Passengers will soon become accustomed to browsing digital catalogs for in-flight shopping.
- Passenger advertising: Advertising forms a huge opportunity, as airline passengers represent a largely captive audience that is often in the cabin for long periods of time.
- Premium content: Airlines can charge for live sports or news, or they can charge for access to premium on-demand content beyond what's available on the in-flight entertainment system.



12. https://aerospace.honeywell.com/en/sites/connected-aircraft

13.14. https://www.inmarsataviation.com/en/benefits/revenue-opportunities/the-skys-the-limit.html

SPOTLIGHT ON HELICOPTERS

Helicopters can also take advantage of connected technologies to offer operators and passengers more comfort and a better overall experience.

HIGH-BANDWIDTH CONNECTIONS

Internet connectivity is now a must-have, not a luxury. For air ambulance, search-and-rescue and other missions, emergency personnel must stay in contact with ground crew, hospitals and others. The ability to send health information ahead, for example, can help doctors on the ground prepare for emergency procedures.

For sightseeing or tourism, passengers are demanding the ability to connect while in flight. And for business travel, connectivity is essential for enabling passengers to email, conference and share files.

Offering high-speed connections on helicopters has traditionally been challenging. The rotor blades have interrupted satellite signals. Today, however, lightweight options are now available that use high-data-rate software to mitigate issues with rotor blades.

TURBULENCE AND WEATHER

Weather can be especially challenging for helicopters, which are often flying vital missions with tight time frames, and in some cases with passengers in critical condition. The ability to provide a smoother flight can benefit passengers and potentially improve mission success.

Modern weather radar systems can enhance pilot awareness by combining weather and terrain data to provide a more intuitive horizontal and virtual view of upcoming conditions. This can allow pilots to course correct in real time for safer and more comfortable flights. Systems that automatically correct for terrain or vibrations reduce pilot workload and improve cockpit efficiency

TURNAROUND

The speed of a turnaround can be the difference between saving or losing a human life for certain helicopter missions. Speeding turnarounds can also improve passenger experiences and operator success, while helping control costs.

Connected technology is now making it possible to improve aircraft turnaround time by providing predictive and prescriptive health and usage monitoring to help keep helicopters available. Connected technology and communication can also increase operational efficiency in ground handling to further speed turnarounds.



SPOTLIGHT ON BUSINESS JETS

Passengers choose business aviation to get a more luxurious, personalized and convenient experience than regular airlines, so updating the comfort and experience aboard a business jet is vital. Operators must keep up with technology - especially when passengers are conducting important business midflight.

SEAMLESS CONNECTIVITY

Modern business requires more than a phone line. Email, file transfer and video conferencing have all become common and essential. Luckily, operators can now offer the ability to fly across states, oceans, countries and continents while maintaining connection to the same Wi-Fi network. Passengers can stay connected and use their mobile devices like they do

on the ground - with the same sort of reliability and speed they get at their home and office.

TURBULENCE

The ability to avoid turbulence can greatly increase passenger comfort and experiences. For operators that rely on repeat business, it can also build loyalty. For those piloting their own private craft, it can provide a safer and more enjoyable flight.

Modern weather radar technology enhances awareness for pilots, offers simplified operations and gives them advanced hazard detection. This means that flying in a business or private jet has never been safer or more comfortable.

TURNAROUND

Faster turnarounds can boost profits or provide huge cost savings for jet owners. Connected technology is now making it possible to improve turnaround times. Operators get the communications they need to arrange efficient ground handling while still in the air. Predictive and prescriptive maintenance solutions can help operators better plan maintenance so it doesn't impact a turn.



HONEYWELL SOLUTIONS FOR COMFORT AND PASSENGER EXPERIENCE

Honeywell began putting temperature controls on cars, trains and airplanes in the 1930s. This heritage in thermostats, sensors and potentiometers helps support our aircraft environmental controls today, but it is only a fraction of what we can offer the aircraft industry when it comes to comfort and passenger experience solutions.

We have communications and connectivity solutions based on the reliability and power of satellite communications. We offer Connected Aircraft solutions that provide safer flight paths and greater maintenance efficiencies. Most importantly, we understand the high-stakes world of aviation, where a failure in environmental control or a lack of situational awareness can threaten lives. We blend our heritage in hardware with advanced software to offer thousands of products and services that can help you deliver better passenger experiences worldwide.



USER-FOCUSED COMMUNICATION SYSTEMS

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I-FI THROUGH IE CONNECTED RCRAFT	Honeywell Jetwave ¹¹ hardware of multiple markets. For airlines, it enables a fast and it solution with speeds up to 50Mb For business jets, JetWave enable do on the ground to work, commu JetWave is also available for the r
I-FI FOR ELICOPTERS	Trom the aircraft. The Aspire™ 200 satellite communications signal, I satellite communications signal, I Now, regardless of the mission - \
ABIN ANAGEMENT AND NTERTAINMENT	passengers and ground crews are The Ovation Select ® cabin man entertainment for business and p ground communications and a w experiences in the sky and offer b
DNNECTIVITY RVICES	Unsure of how to make the latest Connectivity service can help. W get and stay connected during fli We also offer the GoDirect Toolk communications equipment. The

connects aircraft to Inmarsat's GX Aviation service and is available for

reliable in-flight internet solution strong enough to power entertainment ops.

les passengers to stay connected and use their mobile devices like they nunicate, and stream video and music.

military, providing a high-bandwidth communications channel to and

nunications system overcomes the challenges of helicopter satellite R) software package mitigates the impact of the rotor wash on the bringing faster speeds and higher bandwidths than competing systems. VIP transport, oil and gas, emergency medical, or others - pilots, re constantly connected, no matter where they operate.

nagement system offers cabin management and in-flight private jets. Ovation gives your cabin systems control, passenger air-tovide array of entertainment offerings so you can create theater-quality business passengers a seamless work environment.

t satellite communications a part of your platform? Our **GoDirect® Cabin** With options for business aviation, airlines and defense, we can help you light.

kit, which can help your maintenance teams troubleshoot and service e app can aggregate diagnostic information to provide fast, reliable es and avoid hardware-related connectivity problems.

DLUT ONS FOR REDUCING WEATHER HAZARDS AND TURBULENCE

ENHANCED GROUND PROXIMITY WARNING SYSTEMS	Honeywell the 1970s (EGPWS) i The Mark (TAWS) rec
	(CFIT) and
	Our Surfa visually sh wake turbi
GROUND SAFETY SOLUTIONS	SmartRun reduce the going too
	SmartVie onboard d to-unders ⁻
COLLISION AVOIDANCE SOLUTIONS	We pionee and comm collision av avoidance of which h Dependen
WEATHER RADAR AND HAZARD DETECTION	The IntuV pulse com zero to 60, 26% impre GoDirect weather da

Neather Information Service provides an electronic flight-bag app to assist the flight crew in making strategic, in-flight decisions with respect to weather information by providing up-to-date weather data.

l developed the first Ground Proximity Warning System (GPWS) in and introduced the Enhanced Ground Proximity Warning System n 1996.

EGPWS exceeds Class A terrain awareness and warning system quirements and provides protection against controlled flight into terrain l wind shear.

Indications and Alert System (SURF IA) is the first system to ow pilots whether their aircraft will come into contact with dangerous llence from other aircraft.

vay[®] and SmartLanding[®] software improve flight safety and help e risk of a runway excursion by alerting crew members if the aircraft is fast or too high, or is going to incur a long landing.

synthetic vision synthesizes flight information from multiple atabases, GPSes and inertial reference systems into a complete, easytand 3D rendering of the forward terrain.

ered the Traffic Alert and Collision Avoidance System (TCAS) for military nercial aircraft more than a half-century ago and have delivered more voidance systems than anyone else. Today, our <mark>SmartTraffic® collisior</mark> system (CAS) 100 offers three models of commercial TCAS, all ave sufficient processing capacity to incorporate future Automatic t Surveillance-Broadcast (ADS-B) In functionality.

[®] **RDR-4000** 3D weather radar uses 3D volumetric scanning and pression technologies to provide a complete view of the weather from 000 feet across a 320nm detection range. IntuVue has demonstrated a ovement in weather hazard detection over conventional radar systems.

uses in-air pilot-sourced weather information to provide real-time ata and a more robust view of weather than ever before.

TOOLS TO ACHIEVE BETTER ON-TIME PERFORMANCE

GROUND HANDLING	 GoDirect Ground Handling can help you manage the ground handling process effectively and efficiently. is intuitive and user friendly, with simple-to-use screens and graphical prompts. It assists the ground handle in managing the aircraft turnaround process, while providing accurate, real-time information to operations on the status of each tail and the likelihood of it pushing back on time. Smoother control and coordination More on-time performance Better gate and ground traffic planning
CONNECTED AND PREDICTIVE MAINTENANCE	 GoDirect Connected Maintenance is a nose-to-tail solution that analyzes aircraft data and delivers diagnostics as well as predictive and prescriptive alerts. Provides notifications with prescribed maintenance actions to help maintenance crews pinpoint faults Goes beyond the capabilities of solutions that focus only on system health monitoring and trend analysis

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SYSTEMS FOR OPTIMIZED TEMPERATURE AND AIR QUALITY

We offer a wide range of electronic and electro-pneumatic systems for environmental control, air and thermal management, including specific offerings for defense, business jets and airlines. Our solutions combine our expertise in building solutions for spaceflight, our heritage in temperature controls and our understanding of aviation to produce advanced solutions that keep flights comfortable.

Our solutions include:

ENVIRONMENTAL CONTROL, AIR AND THERMAL MANAGEMENT SYSTEMS

- Environmental control systems (ECSes)
- Cabin pressure control systems (CPCSes)
- Onboard oxygen-generation systems (OBOGSes)
- Cryogenic cooling systems
- Air separation modules
- And more



Honeywell Aerospace 1944 East Sky Harbor Circle Phoenix, AZ 85034 aerospace.honeywell.com

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