NEXTT

The NEXTT Vision in a post-COVID-19 World

October 2020

IATA

ACI
AIRPORTS COUNCIL INTERNATIONAL

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1 Introduction

As a joint initiative of ACI and IATA, NEXTT (New Experience Travel Technologies) created a shared vision for the future of travel. NEXTT intended to leverage the latest technology developments to address the predicted capacity constraints that airports were facing. Although short-term growth projections have dramatically changed, the emerging themes of NEXTT remain highly relevant, firstly to provide immediate solutions required to mitigate COVID-19 risks when travelling, and to improve efficiency for airports and airlines, both of which have experienced devastating drops in revenue.

Advancement of off-airport processing activities, improving customer experience and efficiency with advanced processing, and increasing touchless interactions between passengers, airlines and airports with access to trusted real-time data remain the emerging concepts of NEXTT. These concepts, which improve customer convenience and reduce time spent on processes, are also playing a critical role in supporting the restart of the industry when new health risk mitigations must be accommodated.

Today, airports, airlines, governments and stakeholders in the supply chain are continuing to develop and assess best practices for the immediate future of travel with a greater focus on health and personal safety throughout the travel journey.

The COVID-19 pandemic and the impacts that it has had on travel, passenger trust and airport operations have further confirmed the validity of and the need for the concepts of NEXTT.

It is important to note that the NEXTT vision remains a long-term focus on the future of travel, although some of the concepts, such as biometric processing, are already extremely relevant today. Airports and airlines can find best practices for the immediate restart and recovery of business and operations during COVID-19 in the ICAO Take-Off Guidance, as well as in the IATA[1] and ACI[2] guidance. Many of the current COVID-19 risk mitigation measures are expected to be limited in time, re-evaluated and monitored under a fixed schedule. More effective, suitable, less disruptive and scientifically-supported measures will be implemented as they become available, and out-of-date measures removed.

[1] https://www.iata.org/en/programs/covid-19-resources-guidelines/
[2] https://store.aci.aero/form/aviation-operations-during-covid-19-business-restart-and-recovery/

The COVID-19 crisis has put greater focus on the need for a flexible approach and resilience. In turn, this brings an urgency to put available technology to use, to provide this flexibility and unlock the full benefits which are achieved with global coordination rather than isolated approaches.

The cargo industry demonstrated this flexible approach and resilience when substantial capacity constraints resulted from the imposed passenger travel restrictions. A harmonized approach to modify processes, e.g., loading cargo on aircraft and moving to paperless operations, overcame some significant challenges in exceedingly short time scales. The same approach should now be used for other areas too.

2 NEXTT concepts pre- and post-COVID-19

Off-Airport Activities

NEXTT envisaged that the future travel experience delights passengers with the options and control they have for their journey, especially as it relates to standard check-in procedures. Regulatory obstacles preventing 100% online or mobile check-in should be removed. Until we can overcome these challenges, airlines will be seeking to increase the proportion of passengers that can check in online or from a mobile device. The progressive shift from paper passport and non-interactive travel authorization to digital ID will be critical to enable this transformation. This service would allow for customer convenience and alleviate on-site constraints for the airport and the airline. Passenger travel journeys could be customized through integrated order management systems, allowing for shopping and booking of ancillary services prior to arriving at the airport. The future airport experience would encourage travel authorizations and customs procedures to be managed digitally, permitting checks to be made prior to the arrival at the airport.

While the immediate future of travel has changed significantly, it is important to note that the emerging concepts of NEXTT are even more important in the post-pandemic world. Although the purpose and definition of each concept has shifted slightly to address the new concerns raised by COVID-19, the concepts identified before COVID-19 remain. Technology has advanced swiftly over the course of the pandemic, and a new focus on health considerations in technology and process transformation has emerged.

Remote Processing

Advancing off-airport activities will continue to support capacity limitations but will also enable safer processing of passengers and employees from a health perspective. Passengers shall be able to perform any travel authorization processes and personalize their journey from any

location they wish, reducing the need for queueing at airport counters and interacting with staff, kiosks and other passengers.

Baggage and Cargo Drop-off

Secure entry gates within the city centres and locations to drop off and collect cargo and baggage will reduce the number of touchpoints in the airport facility. Shopping prior to arriving at the airport will not only create a customized experience for the passenger but will aid in physical distancing efforts by reducing interactions with airport staff and other travellers through an efficient and contactless exchange of goods.

Health Screening

When a health declaration is required as part of the immigration formalities, this information can be included in the passenger's digital wallet. Results of COVID-19 tests or vaccination performed ahead of the trip could also be added. In the future, if health screening at airports becomes mandatory, it should be performed by trained and qualified personnel under the responsibility of the public health authority. This process would be done off-airport.

Advanced Processing

The NEXTT journey envisages utilizing technology for identity management, automation and robotics to create attractive experiences for passengers and staff, while also advancing the interests of aviation security. Data management will create a seamless journey for passengers by leveraging biometrics, customs controls, risk assessments, baggage handling and tracking. Airport, airline and passenger efficiency will greatly increase because of optimized coordination through automated touchpoints.

Digital Identity

In the post-pandemic world, there is an even greater need for connected and contactless processing. A key principle and measure highlighted in the recent ICAO Council Aviation Recovery Taskforce (CART) Report and Recovery Guidelines[3] is the increased use of advanced technologies to facilitate contactless processing of passengers at various stages of their journey.

Digital identification will be leveraged when applicable, including but not limited to check in, document check, self-service bag drops, access to security checkpoints, border controls, risk assessment and boarding. Airports and airlines will promote touchless check-in processes by investing in touchless kiosk technology. Advanced processes, which eliminate the traditional check in, will create a new array of data points that can provide predictive analytics for airports and airlines and can mitigate potential crowding risks.

[3] https://www.icao.int/covid/cart/Pages/CART-Report---Executive-Summary.aspx

Electronic Bag Tags

Complimenting the priority to adopt digital identification for passengers, the use of electronic bag tags is also playing a key role. The value of reducing the passenger and staff touchpoints to tag bags has led to many more airlines enabling the use of electronic tags.

Baggage Reconciliation

The widespread cancellation of flights this year, caused by imposed travel restrictions, led to an increased number of passengers' plans changing at the last minute. It is well recognized that one passenger's actions may have costly implications for all the other passengers on the flight and the airline if a passenger's bag needs to be offloaded. With 100% screening of hold baggage and the international recognition of the standards and processes used, several States revisited the current regulations on the reconciliation of passenger and baggage.

Allowing the baggage of 'no-show' passengers to remain on the flight enables airlines to focus on providing the desired routing of the bags to match the needs of the limited number of passengers who had missed their flight and avoid the implications that a flight delay has on many other passengers. Additionally, this avoids the unnecessary increased manual handling involved in offloading a bag. More widespread acceptance of this interpretation of current baggage handling regulations would bring significant benefits to passengers and the industry.

Interactive Decision Making

The concept of interactive decision making has always been that future travellers have better control and that their travel experience would be more personalized because of better communication and coordination of data sources. Interactive decision making becomes even more key in a post-COVID-19 world, where customers need up-to-date and accurate information about travel requirements and passenger travel authorizations include health information.

Likewise, airports would experience enhanced understanding of the needs of their passengers because of the collaboration offered with open API (Application Programming Interface) platforms.

Other elements such as tracking technologies and situational awareness would increase reactivity of the passenger to changes made during their travel journey. Ground handling of aircraft would have optimum efficiency, creating faster turn-around times.

Customized Experience

In the airport of the future, passengers will continue to take control of their journey through interactive decision making. Passengers would be able to customize their travel journey prior to their arrival at the airport. From purchasing parking to selecting retail and concession options to arrive at their gate, advanced API integration will allow for a personalized and contactless experience from curb to gate.

Providing information to customers is also critical during recovery and restart. Many different travel restrictions and health measures exist globally. APIs can exchange information between all stakeholders to ensure that passengers are well prepared for their journeys and know exactly what information and certification is required, as well as what to expect throughout their journeys.

Managing Passenger Flows

It has always been envisaged that predictive analysis, coupled with passenger flow monitoring, would enable airports to manage resources more efficiently to be deployed when and where needed as peaks occurred. This is even more relevant, as airports and health authorities strive to reduce queues and crowds. Modelling shows that physical distancing requirements are only sustainable until approximately a third of capacity; therefore, quick processing, walk-through solutions and effective management of peaks through the use of predictive modelling and flow monitoring would become critical.

Cargo Tracking

The cargo industry would also experience streamlined operations using digitalized tracking and information exchange that would enable quick and seamless action to ensure efficiency. Technologies such as artificial intelligence, machine learning, business intelligence, drone and blockchain would connect the cargo and freight processes.

The airline business model changed overnight, in response to COVID-19. Borders for passenger traffic were closed but the demand for cargo operations remained. Passenger flight schedules could no longer be the indicator of cargo capacity and the frequency of operations for a particular route was driven by cargo rather than passenger volumes. Network visibility became vital. Customers were seeking to understand how they could move their items, while service providers needed to understand current and future demand. This is not new but with reduced flights in the network and an increase in shipments of health-related items, having visibility of both cargo capacity and demand in real time was critical for all involved. The industry was compelled to quickly deploy digital platforms which enabled ad hoc and regular users to understand capacity availability and make bookings. Operating with the 'quick fixes' to improve network visibility currently requires manual intervention. This is possible with the current flight volumes.

As flights return to pre-COVID-19 levels, the effort is to scale these digital practices and reduce the need for manual inputs such that cargo schedules and capacity availability are accurately known and visible to customers. Physical document exchange between cargo facilities and digitalized operational decisions and information exchanges will not only advance efficiency but encourage safe and secure exchange between stakeholders. All aspects of the cargo journey, including customs, will shift to a digital process. Widespread acceptance of a single standard will provide a common approach and faster adoption of paperless solutions. As we look into the future, efficient, sustainable and touchless digital solutions shall be embedded within cargo operations. It is essential that digital infrastructure is also put in place for customs and facilitation processes globally in order that the cargo network may function effectively.

Predictive Analysis

The COVID-19 crisis has put the entire planning system through a major stress test and is demanding greater flexibility in operations and resilience to handle sustained unpredictability.

With passengers booking at shorter notice, managing demand requires excellence in collaborative decision making and highly effective operations control centre procedures. Increased cleaning regimes and more stringent waste disposal measures have also impacted turnaround times, leading to an even greater need for coordination and flexibility.

The NEXTT vision aims to achieve a fully coordinated aircraft turnaround with multiple sources and stakeholders able to work from a single airport operations plan. The benefits of achieving this are now even more valuable.

A Focus on Health

The element of health incorporates the health and safety of passengers, employees and guests, and the role of the airport and airline is to uphold this concept. In the short term, this is essential to regain passenger trust and will provide governments with enough confidence to re-open borders and stimulate demand going forward. As detailed in the CART Take-Off guidance[4] for air travel through the COVID-19 crisis, all areas with potential for human contact and transmission should be cleaned and disinfected, as prescribed by public health authorities, with frequency based on an operational risk assessment.

To address the current and future contagion concerns, airports will leverage cost-effective technology solutions likely to include autonomous robots to provide continuous sanitization throughout the airport and maintain cleanliness throughout the facilities.

When gaining authorization to travel, passengers may be required to declare their health status. This can be done through digital solutions combined with on-site rapid walk-through testing. When combined with other risk assessment data, passengers will be cleared for travel. Thermographic technology will identify passengers and employees with possible fever. Dedicated platforms will ease contact tracing for health authorities to contact potentially infected persons. Coordination between airports, airlines and the medical community will be critical to assess and defend against the ongoing threats of widespread illness.

Sustainability in the Post-Pandemic World

It is imperative that the immediate business restart efforts and future actions of the aviation industry focus on sustainable implementations in the post-pandemic world. Sustainable recovery considers economic, social and environmental factors, and is the only way forward to secure long-term resiliency. Not only does this create businesses that can weather future storms, but it returns public trust to the aviation sector.

[4] https://www.icao.int/covid/cart/Documents/CART_Report_Take-Off_Document.pdf

The airports of the future will have new understanding of sustainability, which includes energy, water, infrastructure, operations, supply chains, revenue sources, investments and people. Investing in decarbonization methods can create long-term vitality and support economic viability of the industry. In many cases, the most sustainable solution may be to do more with existing technology, infrastructure and systems. Elsewhere, the unique circumstances and regulations may create a need for new infrastructure In all cases, particularly with the current acute financial and operational challenges, full consideration of the long-term sustainability of solutions should be given to ensure damaging quick fixes aren't deployed.

Increased efficiency of the aircraft operation can promote cost savings for carriers and reduce carbon emissions. Artificial intelligence (AI) technology that visualizes aircraft operations at the gate or stand-through video camera can analyse ground handling procedures and recommend action from the carrier to ensure that turn-time is maintained. These corrective actions can increase operating efficiency by preventing delays, which sequentially reduces carbon emissions by reducing the amount of time that equipment is idling or being operated. In addition to the energy savings at the gate, each aircraft's fuel use on the ground can be reduced by optimizing taxiing processes both in terms of unnecessary time waiting to access a stand or runway and the use of tow trucks rather than the aircraft's engines.

In the longer term (10 to 20 years), radically new aircraft concepts are likely to appear, using clean energies such as renewable electricity and hydrogen and featuring unconventional shapes, e.g., blended wing bodies or "flying wings". Large new research and technology programmes that have been created in the framework of public COVID-19 crisis support will push these developments forward. Airports will adapt their infrastructure and install the necessary energy supply lines in time to accommodate the new aircraft types.

Airports are increasingly becoming intermodal hubs with train connections that can be used with a flight ticket. This trend is reinforced with some governmental requirements to replace ultra-short haul flights with trains. Providing services which enable customers to seamlessly connect between transport modes, facilitate greater uptake in use of the most energy efficient mode to suit each customer's needs–whether it is stepping into another aircraft, a train or other ride-sharing vehicle.

3 NEXTT Journeys post-COVID-19

Turning to the 'journeys' within the NEXTT vision, we can look at the types of technological solutions and processes that are already starting to be deployed or will emerge in the post-COVID-19 world.

<u>Throughout the Journey</u>

Passengers will experience a fully digitalized and personalized journey when travelling, starting before they arrive at the airport. Advanced bookings and arrangements can be made to include off-airport travel authorizations, seat and service selections, baggage drop-off, purchases and health validation.

Health or test certificates issued by health authorities can be held as part of a digital wallet. Passengers' digital passport would be checked against the records of travel authorization granted by the requiring States. If such authorization were found missing, passengers would be informed and prompted to comply within the allocated timeframe.

Providing up-to-date information to passengers is now more critical than ever, including health requirements and restrictions at origin and destination and information about facilities available at origin and destination airports.

Solutions such as mobile apps and exchange of data through APIs, based on industry standards such as Aviation Community Recommended Information Services (ACRIS)[5] and Airline Industry Data Model (AIDM),[6] will be critical to enable passengers to navigate their journeys.

Off-Airport

Rapid health test centres will be available off-airport, and remote bag drop, or collection services will become more prevalent to avoid touchpoints.

Bags will be tagged electronically, eliminating the need for paper tags and interaction at the airport.

Bags will be disinfected automatically as they are transported or injected into baggage systems.

At Departure Airport

While at the airport, biometric verification of identity and health status will be conducted at walking pace for a completely uninterrupted and touchless journey. Closed-circuit television (CCTV) will provide safety and security risk assessments, including fever detection of passengers using artificial intelligence and machine learning.

Kiosks and other process points will be touchless, activated by biometric recognition, including voice or motion, and able to seamlessly interact with mobile technologies.

Common touchpoints throughout the airport journey will become touchless as airports utilize technologies such as motion, voice or remote activation.

New technologies for disinfecting surfaces, such as ultra-violet (UV) light, will be commonly deployed with autonomous robots, and also built into systems such as security screening and bag handling systems.

Security screening will become a self-service walk-through process for most passengers, and will use technology, throughout the airport, that is capable of screening for multiple threats. Solutions to avoid pat downs and hand search of baggage will be deployed, leveraging advanced screening technologies, explosive detection and AI for threat detection.

Mobile touchless payment solutions for food and retail outlets will be widely deployed, such as self-scanning and mobile ordering, to avoid personal interactions.

[5] Aviation Community Recommended Information Services (https://aci.aero/about-aci/priorities/airport-it/acris/)
[6] Airline Industry Data Model (https://www.iata.org/en/programs/passenger/industry-data-model/)

Digital wayfinding and indoor mapping will also help to guide passengers through the airport to avoid unnecessary contact.

In-Flight

Connectivity continues in-flight, where passengers can track their baggage status and make arrangements for their connecting airport. While at their connecting airport, passengers will be notified in real time, through mobile communications, of their baggage transfer and the provisions for the rest of their journey.

At Connection Airport

One-stop security will be more commonly deployed using interactive decision making to reduce touchpoints for passengers and bags at transfer.

On-Arrival

Immigration and customs arrivals procedures will be seamlessly conducted as passengers are pre-vetted based on travel and profile patterns, including verification of health declarations. Biometric recognition will allow the rapid clearance of passengers for entry, including where validation of a walk-through health screening is required. AI will be used to predict arrival patterns to prevent crowding.

At Destination

Once at their destination, passengers can continue to receive notifications to aid in the rest of their journey through digital provision of maps, ground transport and hotel information, and local safety and health advisories.

Throughout the Journey

Passengers will be fully aware of their baggage movement throughout their travels because of the bag identification (Bag ID) assigned to their luggage.

Off-Airport

Baggage delivery service options will be available to suit the passenger's needs, including collection from and/or delivery to origin/home/office using a third-party logistics service, bag drop points at designated locations in the community, or at the airport. Paper baggage tags will be replaced by the Bag ID, reducing the number of touchpoints. Bag collection and delivery will be a completely contactless experience.

At Departure Airport

At the departure airport, the airline receives the bag from the selected delivery method and the passenger stays updated on the journey of their bag. Automated movers transport and load the bag, as the contactless exchange continues.

In-Flight

Passengers will have complete visibility of their baggage's status and can make changes to their delivery options through their selected online application.

At Arrival Airport

Once at the arrival airport, customs processes are effortless because passengers will be pre-vetted and e-declarations completed in advance.

At Destination

Travellers will continue to receive notifications regarding the status of their baggage delivery up until confirmation is provided that their baggage has been safely delivered at their selected location.

Throughout the Journey

Digitalized data sharing across the supply chain will be the cornerstone of the cargo journey. Data used in a variety of ways will improve decision making, risk mitigation, contingency planning and enhancing customer satisfaction. Network visibility is achieved by publishing cargo schedule and capacity updates in real time. Cargo services will be booked directly via online platforms,

providing customers with a transparent view of service levels and quality. Customers will be fully informed about trade lane specifics, customs processes and potential restrictions for the commodity. Real-time information on the status of assets, commodities, parcels, environmental conditions, locations and people will be monitored throughout the value chain. Warehouse Management Systems will be able to suggest predictive measures to safeguard the integrity of shipments.

Off-Airport

For cargo delivery, customers will have access to drop points throughout the city, as airports become increasingly connected to urban areas.

At Departure Facility

At the departure facility, autonomous vehicles and robots will efficiently deliver and process cargo. Smart tags and active sensors will be read at the cargo facility and automatically validated with the advanced booking information. Commodity-specific information will be compared in the Acceptance Management System against known and highlighted risks, container specifications, export or import requirements, CITES[7] information or phytosanitary requirements, if applicable. Compliance inspections will be triggered, based on risks of the supply chain as a whole and those controls triggered by data within the specific shipment record. Security screening will use supply chain risk analysis to determine the most appropriate measures to deploy. The screening process will leverage technology to perform multiple actions in a touchless process, and robotic systems will perform an automated build-up and break-down of cargo in combination with augmented reality (AR) which would provide enhanced information on the goods and their required handling.

At Departure Airport

Cargo will be loaded onto the aircraft based on the aircraft's status to ensure efficient use of resources. Once loaded onto the aircraft, the cargo's status would be notified to stakeholders and crew.

In-Flight

Cargo will be continuously monitored in-flight and any alarms can be mitigated in-flight.

At Arrival Airport

Customs processing and clearance will be a virtual process because of data sharing of the shipment record. Once at the arrival airport, robots will be used to efficiently perform cargo break down and prepare for the final mile.

At Destination

Drop and collection points will be located within city centres, allowing customers to conveniently pick-up their parcels. Small and medium-sized drones would replace trucks for cargo delivery at distribution centres.

[7] Convention on International Trade in Endangered Species of Wild Fauna and Flora

Throughout the Journey

Throughout the aircraft journey, collaborative information exchange will guide every action, creating a single Airport Operations Plan. Turnaround procedures can be planned in detail because of the data link communication between aircraft, pilots, the operations control centre and air traffic control.

Off-Airport

Digital and cloud-based tools will use real-time information to grant awareness, visibility and flexibility when planning aircraft arrival and mitigating potential delays. Increased efficiency on the ground will translate to more sustainable operations in view that noise, emissions, energy consumption and waste will also be reduced. Aircraft servicing needs can be planned prior to its arrival through access to the aircraft's status for disinfection and cleaning, fuel uplift, water, catering, air conditioning and maintenance issues.

Ground Movements

Once on the ground, enhanced taxiing systems will provide the most efficient guidance to the stand without need for holding, further reducing jet fuel burn, noise and pollution.

At the Stand

While at the gate, artificial intelligence will be used to deploy resources at the optimal time to avoid delays. Airbridges will be autonomous, reducing the need for staff in a crowded area, and bags will be loaded by autonomous robots. Aircraft will receive thorough cleaning using advanced cleaning technologies to provide safe and sterile cabins.

Flight crew will receive real-time information to enable them to take the most efficient route to the aircraft, at the closest possible time to departure, to avoid contact with others.

Stand Departure

Upon stand departure, the Target Off-Block Time (TOBT) will be managed and achieved because of live data sharing from multiple sources detailing the status of passenger boarding, cargo and baggage loading, ground servicing, estimated taxi times and optimal take-off sequence.

Departure

Once the aircraft has departed from the stand, the aircraft will taxi directly to the runway in the assigned sequence. Information exchanges with the aircraft would be maintained after take-off. The departure path will be guided by satellite-based navigation to create optimized climbing in any weather condition with reduced noise impacts.

4 Conclusion

In summary, the concepts of NEXTT continue to demonstrate applicability in the post-pandemic future by establishing resilience and flexibility for the aviation industry to adapt to changing conditions while improving efficiency.

COVID-19 has fundamentally changed how the aviation industry responds to the threat of global pandemic and virus transmission. Airports and airlines will continue to include consideration and emphasis of the health and welfare of passengers and employees as they navigate through future growth and operations.

By establishing a standard of adopting and implementing cutting-edge technology to increase digitalization, the concepts of NEXTT–off-airport processing activities, advanced processing and interactive decision making–will continue to advance efficiency on all aspects of the passenger, cargo, baggage and aircraft journey.

Furthermore, the development of the technologies aimed at addressing predicted airport capacity constraints will support the implementation of health measures and leverage their use for a greater focus on health in the air travel journey.

Finally, the immediate business restart efforts and future actions of the aviation industry need to focus on sustainable implementations in a post-COVID-19 era. More than ever, close cooperation among the airlines, airport operators and governments is vital. Airlines will need to revise their current passenger processes, airport operators may need to assist in redesigning airport facilities, including gate areas, and governments may have to adapt applicable rules and regulations. The increased use of automation, such as self-scanning and biometrics, should then be facilitated in this context.