

A first look at the advantages of building a new ecosystem of smart cabins

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Abstract. The construction work of smart civil aviation is an important initiative to promote the high-quality development of the civil aviation industry. The Civil Aviation Administration (CAA) attaches great importance to cabin-oriented Internet applications, and building smart cabins will become an important direction for differentiated development of airlines. This paper takes the Roadmap for the Construction of Intelligent Civil Aviation proposed by CAAC as the starting point, initially analyzes the advantages of building a new ecosystem of intelligent cabin, as well as the possible problems and risks, and puts forward suggestions for airlines.

1 Introduction

Covid-19 caused a sharp decline in global aviation operations over the past three years, but it also pushed forward the digital transformation of civil aviation and the application and development of smart civil aviation.

During the "14th Five-Year Plan" period, in the context of the construction of new digital infrastructure for civil aviation and intelligent civil aviation, the CAAC attaches great importance to the construction of intelligent passenger cabins, and will focus on the gradual transition from the current "LAN" service, which is based on the choices of airlines, to "Internet" service, which is based on the choices of individual passengers, and will include it in the list of services. It will gradually shift the focus from the current "local area network" service, which is mainly chosen by airlines, to the "Internet" service, which is mainly chosen by passengers, and will be included in the Civil Aviation Administration "I do practical things for the public" practical activities. [1]This requires airlines to continuously improve their technological self-innovation capability, strengthen cooperation with carriers, the Internet and other industries, and focus on the construction of smart cabins while accelerating the application of 5G, big data, artificial intelligence and other technologies in the aviation field, in order to enhance cabin protection capability and improve airline revenue by creating a new ecosystem of smart cabins.

The new eco-system of smart cabin is a cabin protection system that provides highly intelligent services to passengers based on the travel characteristics of the crowd in the digital era, with the cabin as the scene and ground-air interconnection, big data, artificial intelligence and other technologies as the driving force during the flight phase of the air route.

On the one hand, the new eco-system of smart cabin can provide passengers with cabin Wi-Fi by means of 5G ATG and other communication technologies to meet passengers' social, shopping, entertainment and business needs; on the other hand, it can continuously explore and strengthen the application of digital intelligence scenarios by means of Internet technologies, so as to realize the transformation from providing a single air Internet service to the overall solution of the new eco-system of integrated cabin. The new ecology of integrated intelligent cabin can be realized gradually through the establishment of "cabin network platform". The "cabin network platform" (hereinafter referred to as the platform) can be understood as an airline company's own platform that integrates the development of "cabin Wi-Fi+Internet+Big Data+Artificial Intelligence", provides diversified Internet contacts, and integrates cabin safety and security, and cabin service guarantee. The following is a summary of the new ecosystem of smart cabins. The following is a preliminary exploration of the advantages of the new eco-system of smart cabin:

2 Improvement of cabin safety and security capabilities

Ensuring cabin safety is a top priority for airlines. Airlines need to continuously explore cabin safety issues through scientific and effective paths. Building a new ecosystem of smart cabins may improve the ability to guarantee cabin safety.

2.1 It is conducive to improving the risk-resistant capacity of airlines' public health.

The normalization of the epidemic has brought about more stringent aviation control requirements, effective

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prevention and control of public health risks in flight transportation has become more and more important, and airlines need to reduce the spread of diseases in the cabin through the digitalization and intelligent transformation of the cabin in order to improve the risk-resistant capacity of public health in air transportation. Intelligent cabin in the future may appear in the following scenarios: during the epidemic, passengers through the platform to order or cancel meals, reducing the non-essential contact between the flight attendants and passengers; passengers through the platform to understand the real-time restroom queuing situation, reducing the non-essential contact between the passengers and passengers; such as found in the air suspected outbreak of epidemic, the cabin crew can immediately start the relevant prevention and control procedures, to achieve the air-ground seamless connection, to arrange for the transfer of staff and testing, etc.

2.2 It helps to improve the ability of cabin crews to deal with sudden illnesses on board.

Reduced oxygen levels, changes in air pressure, turbulence and psychological or physiological stress during aviation flights can have an impact on human health, so aviation flights may bring about potential health problems or sudden deterioration of certain conditions. Common in-flight emergencies include sudden cardiac arrest, epilepsy, and acute abdominal pain. The cabin crew can transmit passengers' vital signs from the air to the ground at the first time through the "ground-air interconnection + Internet", and realize remote video consultation with ground medical personnel to save passengers with sudden illnesses on board in a timely manner, and help them to turn a critical situation into a safe one.

2.3 It helps to reduce injuries caused by bumps.

During a long-distance flight, the weather conditions of the flight path prepared before the flight will change with time. Cabin crew can browse real-time route weather information through the platform to arrange cabin service plans in advance, reducing injuries caused by improper work plan arrangements; passengers can turn on the bumps warning function on the platform to check whether they are seated and fasten their seat belts in a timely manner before the bumps, reducing injuries caused by lagging information.

Clear air bumps are unpredictable bumps, and preventing them by previewing or receiving information in advance is basically unattainable. At present, the only feasible way to prevent it is to reduce the non-essential movement of on-board personnel. The platform enables efficient communication between cabin crew and passengers, which not only allows cabin crew to provide personalized and precise services to passengers, but also reduces unnecessary movements between cabin crew and passengers, thus reducing the number of major injuries caused by "unnecessary movements".

3 Improving cabin service capacity

Cabin service is an important manifestation of the service level of airlines. Due to the limitations of time, space, facilities and other conditions, the phenomenon of monotonous cabin service and serious homogenization has appeared in various airlines. Building a new ecosystem of smart cabin may redefine the concept of cabin service.

3.1 "Cabin Wi-Fi allows passengers to experience the thrill of surfing the Internet at high altitude, which can effectively enhance the flight experience.

Passengers can realize instant messaging, sending and receiving emails, network meetings, in-flight office, online shopping, online movie watching, games and entertainment in the cabin. Khudhair H. Based on the investigation of the flight process, Y found that in-flight entertainment is one of the main factors affecting customer service experience.^[2] The cabin is no longer an information island, and the flight journey is no longer boring. It can be said that "cabin Wi-Fi" has opened a new journey of aviation digitalization.

3.2 The platform brings travelers a new way of personal interactive experience, which is more in line with modern air travel consumption behavior.

Professor Zou Jianjun of Civil Aviation Administration of China (CAAC) mentioned in the ATT forum that air travel consumption behavior is accelerating the transformation of "simplifying the complexity and simplifying the complexity", and the autonomy and intelligence of the whole process of service is the main direction of the transformation.^[3] With the support of intelligent technology, the service satisfaction of the whole process of air travel has improved compared with that without technology intervention. Especially in the three links of baggage claim, cabin service and waiting for flights, the most obvious satisfaction improvement is presented, which fully reflects the value and practical significance of the application of intelligent technology in the cabin. The platform allows passengers to choose the service content more independently, so that cabin crew can also provide passengers with more efficient, accurate, rich and personalized services.

3.3 The level of maintenance and protection of cabin service equipment will be significantly improved.

Airlines can establish a structural database for cabin service equipment, retrofit sensors, etc., and deeply integrate the cabin network system with the aircraft maintenance system. Firstly, it is convenient for aircraft maintenance personnel to retrieve complete data of cabin equipment, carry out efficient and accurate maintenance of cabin equipment, and improve the comfort of

passengers; secondly, it is convenient for cabin crew to clearly understand the current status of cabin equipment, communicate with passengers in a timely manner, and adjust the seats for passengers or make compensation for passengers according to the company's relevant policies. A higher level of cabin service equipment maintenance is conducive to improving the brand image of the airline.

4 Enhancing the economic efficiency of airlines

In recent years, due to the impact of the epidemic, demand in the aviation market has been weak, the number of flights has been reduced, and the debt ratio of airlines has remained high. However, in the long run, the global epidemic situation is improving, the economy and tourism business recovery, civil aviation demand is also an inevitable trend. Airlines surviving the epidemic will usher in a new round of opportunities and challenges, and building smart cabins may become a strategic place for airlines, and smart cabins will become a new revenue growth point.

4.1 The provision of "in-cabin Wi-Fi" helps to increase flight occupancy.

On January 13, 2021, CAPSE released the "Domestic Airline Cabin Wi-Fi Research Report", which shows that 23,000 valid samples show that "cabin Wi-Fi" is one of the most popular cabin amenities that attract most passengers to prefer flights, and 98% of the passengers interviewed said that they need cabin Wi-Fi. As shown in Figure 1.

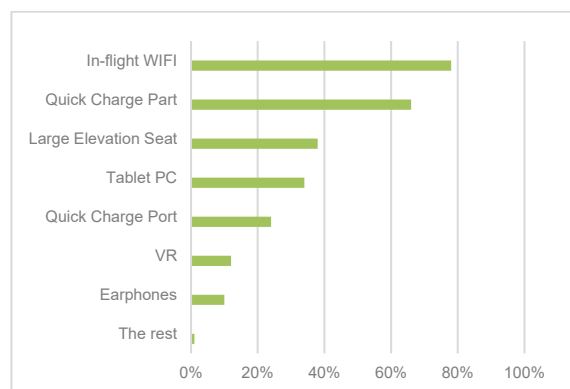


Fig. 1. Attracting passengers to preferred flight cabin facilities and equipment

"Network speed is the key to passengers' experience of Internet access in the air. At present, China Telecom said that after the completion of the 5G ATG air-to-ground cloud network, the peak bandwidth of a single aircraft will be as high as 1Gbps, so that passengers can enjoy high-speed bandwidth Internet experience at a height of 10,000 meters. This will truly solve the urgent need for passengers to access the Internet in the air.

4.2 Turn the platform from a "cost center" to a "profit center".

According to CAPSE research, 63% of travelers are willing to pay for "in-cabin Wi-Fi", which can be in the form of cash, mileage, advertisement time, etc. For frequent flyers, they prefer mileage redemption. While non-members prefer to pay for WiFi, a higher percentage of them choose to redeem their miles. Therefore, in-flight WiFi may be an incentive for travelers to apply for the airline's frequent flyer card. Depending on the amount of mileage redeemed for WiFi benefits, it may be possible to influence member stickiness. [4] Converting travelers' willingness to pay for in-flight Wi-Fi into "real value" may increase the airline's revenue.

Airlines can try to convert travelers' in-flight time into platform consumption time. Airlines can partner with a wider range of service providers to build in-flight transaction platforms using innovative marketing models, big data and artificial intelligence to allow passengers to spend time immersed in flight, and airlines to profit from the experience. According to CAPSE's research on the "Ranking of Passenger Usage of In-Cabin Wi-Fi", as shown in the chart below, the platform can sell products such as: online cinema, destination hotel bookings, tourist attraction tickets, specialty products, online e-books, gaming products, in-flight duty free, airline souvenirs, etc. The platform can also offer differentiated services to customers, such as in-flight duty-free, in-flight duty-free, and in-flight souvenirs. Airlines should apply information technology more widely in this area, working with hotel, rental, insurance and other suppliers to build a more comprehensive distribution system using the resources of related industries. [5] Airlines can use high-level big data programs to analyze consumers' travel preferences to develop digital marketing strategies. [6] Of course, it can also provide customers with differentiated marketing and service methods, such as "blind box" ticket sales, click-through revenue, paid services and so on. In this way, the platform may reshape the new pattern of aviation marketing. As shown in Figure 2.

In addition, according to CAPSE's "China Airline In-Flight WiFi Trend Survey", young people born after 2000 will become the main force of aviation consumption, and their consumption habits are different from those of the post-80s and post-90s, which is worthwhile for airlines to study and explore. This will be of great help to accurately occupy travelers' minds and increase their stickiness. As shown in Figure 3.

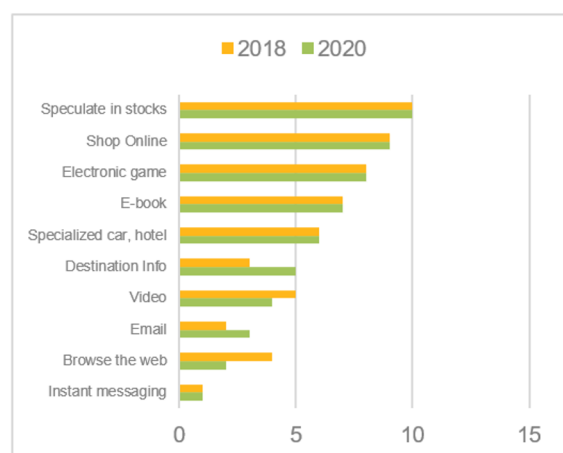


Fig. 2. Ranking of passenger usage of cabin Wi-Fi as a percentage of passenger use

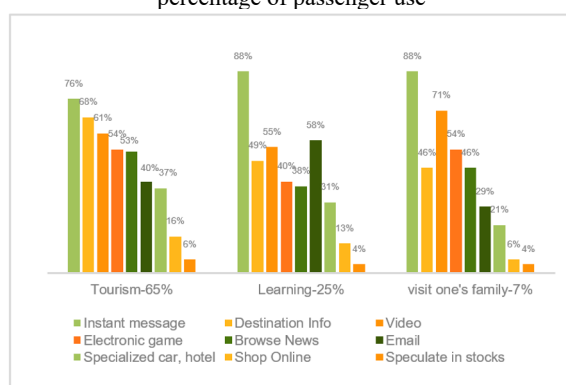


Fig. 3. Differences in the purpose of in-flight WIFI use among post-00s travelers

5 Risks and problems

At present, some domestic airlines have initially realized the cabin intelligent operation, but it is only in the initial stage, the development is not sufficient and there are many problems. Combined with the current operational experience, the following risks and problems may exist in building a new ecosystem of smart cabin:

5.1 Data security risks

Airlines will acquire a large amount of data when building smart cabins. While airlines utilize big data for deep mining and analysis, and process, extract, encapsulate and apply the rich passenger data to their services, they will also face challenges in terms of data security risks. Issues such as data leakage, data rights litigation, and data ownership will all become security risks for airlines. Airlines need to continuously strengthen top-level design, adopt data compliance and protection measures, address data security pain points, and properly handle security incidents and data rights lawsuits.

5.2 Resource constraints

The construction of smart cabin is the main direction of the future high-quality development of airlines, and its

development is based on digital transformation, which is a huge and complex systematic project that needs to be supported by a large amount of funds, R&D teams and other resources. In the current situation of erratic epidemics and difficult development of airlines, it is difficult to support the development of digital transformation by relying only on airlines' R&D expenses extracted from their operating revenues. If the construction of smart cabins can be supported by government programs, financial funds or special science and technology funds, then the construction process of smart cabins will be greatly accelerated.

5.3 Not Enough Research

Domestic research results, patents and literature related to smart passenger cabin are relatively few, and there is not much valuable reference data. Most of the literature that can be retrieved domestically is of the overview type, which can only generally understand the current status of the application of domestic smart passenger cabin, and there is little research on the key technologies of specific application scenarios. With the continuous development of domestic smart passenger cabin, a variety of technical problems will be exposed. This requires the relevant fields to strengthen the research on key technologies of smart cabin to cope with the technical difficulties that may arise. If airlines want to gain lasting vitality in the competitive aviation market, they need to improve their independent innovation and R&D capabilities, strengthen cooperation with related enterprises, and do relevant research on building a new ecosystem of smart cabins.

To summarize, building a new ecology of smart cabin has a far-reaching impact on improving the market competitiveness of airlines. Domestic airlines are advised to think deeply about how to improve their risk-resistant ability in the context of the normalization of epidemics, and how to better ensure cabin safety, improve service quality and obtain new revenue growth points in the context of the digital era. Airlines should actively participate in the construction of intelligent civil aviation, do a good job of strategic planning for the operation of the new ecosystem of intelligent cabin, enhance passengers' sense of well-being in the development of civil aviation, and strive to achieve milestones in the early stage of the digital transformation of the industry by 2025, so as to promote the construction of intelligent civil aviation in the 14th Five-Year Plan period of China.

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