

ICT Applications in Aviation

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INTRODUCTION

Globalization of the social economy will further increase during the 21st century. The mission of international air transportation will become more important, and all airports around the world will have a significant role to play. Furthermore, it is predicted that air transportation demand in the world will double over the next 15 years.

In the meantime, since the September 11, 2001 terrorist attacks on the United States, the environment surrounding the aviation industry has become very severe and has caused adverse impact to the entire aviation industry. Security at airports has been reinforced in all aspects, significantly deteriorated on-time performance, caused mass congestion at the airport, and caused a drastic increase in aviation management and operational costs.

Owing to these issues, the aviation industry in recent years has seen a need to improve both convenience to passengers and security measures, and at the same time improve on-time performance in the most economical manner.

In connection with this trend, the International Air Transport Association (IATA) has been promoting the Simplifying Passenger Travel project to facilitate the process of international travel for next-generation air transportation. Information and communication technologies (ICTs) have an especially significant role to play here, for it is only with the strategic, widespread, intensive, and innovative use of ICT in future airport development policies and programs that the ambitious agenda of passenger convenience and airport security becomes much more possible to achieve. But this involves the need not only to unleash the potential of ICT per se, but also the need to ensure that an enabling environment and capacities that can facilitate its aviation applications are in place.

BACKGROUND

To find out how ICT applications can facilitate air passenger convenience and aviation security, one can evaluate the extent to which the needs of air passengers and the airport authority are met.

Air Passenger Needs

Travel Planning

Through any 3G mobile phone, one can use the in-built videoconferencing facility with his business partners or friends to discuss a travel plan. Once an itinerary has been agreed, one can access the Web site of travel agents and ask for quotes from different airlines regarding routes and accommodation types.

Through e-mail and/or short message service (SMS) messages from the travel agent, the traveler can use his PC, mobile phone, or personal digital assistant (PDA) to find out a plan most suitable to him.

One can then purchase electronic air and rail tickets through the Internet banking service (using his e-certificate). In cities like Hong Kong, mobile e-certificates are issued to individuals to authenticate the online identity of subscribers, and to provide a secure and trusted environment for the conduct of online transactions, such as secure e-mail services, online government services, online entertainment services, online stock trading, and online banking services.

Nowadays in places like Japan, one can also send electronic passport information to an Authorized Agent for the purpose of getting an entry visa for the destination countries. Having matched the data provided by the air traveler to other systems such as law enforcement and intelligence databases, the authorized agent would issue an electronic visa to the traveler in a short time. Also, the traveler can have the choice of traveling hands-free. This means that one can arrange with the concerned airline before travel so that a delivery company would pick up the traveler's baggage at an agreed time before departure.

Commencement of Traveling

Before Departure

On the day before departure, the traveler may need to buy some gifts, and he can access one of the virtual shops at the airport and pick it up on the day of departure.

Assume that a traveler wants to travel hands-free, a delivery company would be asked by the airline to contact

him for the purpose of picking up his baggage for delivery to the airport. In order to check the airline and flight number from the e-ticket, the driver could check the traveler's mobile phone by means of his portable identity (ID) terminal. When the driver does this, the ID terminal automatically sends the baggage information to the airline's computer system. Upon arrival at the airport, the baggage will then be transferred to the baggage handling system for security inspection and subsequently delivered to the aircraft.

Departing for Airport and E-Check In

On the day of departure, when the traveler arrives at the rail station, he can pass through the rail ticket gates simply by holding his mobile phone in contact with the designated scanner so that the built-in IC chips could be scanned.

On moving into the passenger terminal, while the traveler is waiting for his friends at an Internet cafe, he may use his PDA or 3G mobile phone to watch a movie. When it is time for boarding, the group would expect to check in quickly through the automatic check-in kiosks, which are installed with one of the International Civil Aviation Organization (ICAO)-endorsed biometrics for passenger identification and passport control.

Arrival at the Destination Airport

When the destination airport is installed with an advance passenger information (API) system, the API data (collected from a passenger's machine-readable e-passport) will be sent by the airline to destination airport, enabling the customs/immigration officials at the airport to organize their clearance process in advance of the arrival of the flight. One instance is the eAPIS Online Transmission System, developed by the United States Customs & Border Protection for commercial operators to submit Advance Passenger Information System (APIS) data and Master Crew Lists (MCLs). With this system, the customs/immigration officials at the destination airport are able to focus on previously selected passengers, significantly reducing the wait time for the majority of passengers and enhancing the quality of the clearance process regarding the inspection of suspected aliens or illegal immigrants.

Upon arrival at the destination airport, one may want to learn about the tourist promotion programs; this can be obtained via the electronic translation facility provided at the airport. By means of his PDA, the passenger can download useful tourist information for getting around in the destination.

Aviation Security Needs

Identity Verification

In air travel there is an increasing need for accurate and efficient verification of passenger identity. Technologies which allow for stronger access control and strengthened document integrity will be welcome by most airports. In May 2003, the use of contactless technology was endorsed as the next generation of data storage for passports by the Air Transport Committee of the ICAO Council (ICAO, 2003a).

In recent years, there has been a steady increase in the testing and piloting of biometrics. Biometrics are unique, measurable characteristics or traits of a human being for automatically recognizing or verifying identity (OECD, 2004). The primary purpose of biometrics is to allow for identity verification (also called authentication) or "confirming identity" (ICAO, 2003b), where a one-to-one match is intended to establish the validity of a claimed identity by comparing a verification template to an enrolment template.

In the context of international travel, facial recognition, fingerprint, and iris scan appear to be the three primary candidates (Mariano, 2001; Fonseca, 2002; *Aviation Daily*, 2002; Krempf & Smith, 2002; Pietrucha, 2002; Basu, 2002; Cooley, 2003; Fisher, 2003; Mainichi Shimbun, 2003; Swissinfo, 2003).

The stability and uniqueness of the fingerprint are well established. The largest application of fingerprint technology is in automated fingerprint identification systems (AFISs) used by police forces in over 30 countries. Iris identification technology involves the acquisition, analysis, and comparison of the unique details contained in the intricate patterns of the furrows and ridges of the iris. This non-intrusive technology offers a high reliability rate for one-to-one verification. Facial recognition technology utilizes distinctive features of the human face in order to perform a biometrics match. Even though two individuals may look alike, the unique physiological patterns of their facial features will be different. A comparison of these three ICAO-endorsed biometrics is shown in Table 1.

Better Resource Utilization

Some countries start implementing trusted passenger programs to expedite the security screening of passengers who participate in such programs, thereby allowing security screening personnel to focus on those passengers who should be subject to more extensive screening (U.S. Congress, 2001).

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