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Agenda Item 8: Other matters

BIOMETRICS AND BORDER CONTROL

(Presented by the European Civil Aviation Conference (ECAC))

SUMMARY

ECAC, within its consideration on the application of biometrics at border controls, has developed guidance on biometrics, its key processes and the issues that may need to be considered.

Action by the FALP is at paragraph 2.1

1. INTRODUCTION

1.1 Governments and Industry have a common challenge to develop capabilities that accurately identify individuals in a cost effective and efficient manner.

1.2 A number of Contracting States have already developed automated border controls (ABCs) which utilise biometric technology to facilitate the movement of passengers across the border.

1.3 ECAC has developed guidance, presented in the **Appendix**, on biometrics and border controls. This guidance seeks to provide an overview of the key processes involved and to identify issues that may need to be considered prior to the deployment of automated border controls that utilise biometrics.

2. ACTION BY THE FALP

2.1 The FALP is invited to:

a) note the information, and

b) recommend that this guidance be considered for inclusion into the ICAO Facilitation Manual.

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APPENDIX

BIOMETRICS AND BORDER CONTROL

Introduction

1. To balance security and facilitation objectives, Governments and Industry have a common challenge to develop capabilities that accurately identify individuals in a cost effective and efficient manner. Biometric recognition systems are considered by many as a key element of the vision to facilitate passengers smoothly through Border Controls.

2. The rapid increase in the number of electronic machine readable travel documents (e-MRTDs) containing biometric data, and the introduction of automated border controls (ABCs), some of which gather biometric data at the time of enrolment, have enabled a number of countries to pre-enrol large numbers of low-risk passengers.

3. This paper seeks to provide basic information on biometrics; what they are; the key processes involved and other issues which may need to be considered. Although the primary intent is to focus on the field of e-MRTDs, this paper may also be valuable to those seeking to develop biometrics for other travel documents e.g. Crew Member Certificates.

What are biometrics?

4. Biometrics are a way of recording, measuring and comparing unique physical or behavioural characteristics. Our physical biometrics include our fingerprints, face, irises and veins. Our behavioural biometrics are those actions we perform, such as the way we walk, our voice, even the way we sign our signature. Being unique, physical and behavioural biometrics can be used to verify our identity.

5. ICAO and ISO have developed specific standards for biometrics for inclusion within e-MRTDs. The face is accepted as the primary biometric, and should be included within every e-MRTD; the iris and/or fingerprint are optional secondary biometrics.

What are the benefits to using biometrics?

6. Biometric images have enabled many countries to develop ABCs which utilise the biometric to confirm the passenger's identity.

7. With the availability of biographical information and biometric images within e-MRTDs, many countries have been able to facilitate entry of low-risks passengers through ABCs without the need for the passengers to pre-enrol. There are also a number of ABC schemes which do not necessarily rely on the possession of e-MRTDs but instead require pre-enrolment.

8. ABCs can offer participating passengers efficient passage through Border Controls and enable countries to redeploy their staff to consider higher risk passengers. Coupled with additional tools, such as 'Watchlists', the ABCs form a secure verification system which can allow countries the ability to monitor a number of border transactions simultaneously, yet interact with passengers at any time.

Biometric processes enable the automatic checking of rights or eligibilities which are granted to individuals.

Facial Images

9. Facial recognition systems analyse the facial image contained in an e-MRTD and seek to match that with the person presenting it.

10. The facial image camera reflects light off the surface of the passenger's face, which is registered by a digital sensor as an array of pixel values. ABCs compare pixel values of the compressed facial image in the e-MRTD with the pixel values of the passenger and analyses the distances between features such as the mouth and the nose.

11. Both two dimensional and three dimensional cameras can be used for facial recognition, but their deployment depends on the number of pixels used to capture the image, which affect the image quality. Best Practice calls for a minimum resolution of 120 pixels from eye to eye. Typically three dimensional facial recognition devices use two or more cameras to provide a three dimensional image to facilitate facial recognition.

Fingerprint Images

12. The pattern of ridges which make up our fingerprints are unique but unfortunately, are not permanent. The fingerprint image may change if a finger is damaged. Additionally, there have been a number of studies which indicate that fingerprint provider's age is also a factor to be considered. Fingerprints of minors may change with an increase in age, and therefore it is not recommended that fingerprints are taken from minors under the age of 5 years. The quality of a person's fingerprint image may diminish as they become older. This is attributed to a decrease in fingerprint moisture content and general 'wear and tear'.

13. Electronic and optical sensors exist to capture fingerprint, which are known as capacitive and image capture devices respectively. Capacitive devices measure resistance or capacity according to the contact that the fingerprint ridges make with the sensor. Image capture devices capture the image of the fingerprint whilst on a transparent surface. Both devices can incorporate a degree of 'liveness' testing, by detection of a pulse, temperature, total reflection technology (Infrared spectroscopy) or other appropriate methods.

Iris Image

14. The iris, which is the coloured patterned part of the eye, is a unique personal characteristic which does not change with age or illness. To take an iris image, a near-infrared light is typically used to illuminate the iris, and an image is taken of the pattern of the iris and the location on the iris where the patterns exist. Iris systems call for a great deal of co-operation from the passenger at the time of enrolment as it may take some time to initially locate the iris. The optimal resolution of the equipment utilised and the variance of other light sources in the environment that enrolment area is situated in will also play a factor in the speed of enrolment.

15. Iris recognition devices seek to locate the iris using landmark features. The iris once illuminated allows the pattern to be located and the image is compared to that which is available.

Technology which accepts multiple biometrics

16. There has been a rise in the number of countries deciding to include multiple fingerprint images in their national documents. Within the European Union, Regulation (EC) 2252/2004 amended by Regulation (EC) 444/2009 requires Member States to include, from 2009, two fingerprint images as well as the facial image in e-passports and travel documents.

17. Whilst the availability of an additional biometric is a welcome addition in confirming identity, ABCs may require greater server capability if checks are to be performed on both facial and fingerprint images simultaneously.

Key Processes

18. There are a number of key processes which need to be conducted to allow passengers to use ABCs and to enable confirmation of the users' identity;

- When applying for an e-MRTD or enrolling in an automated border crossing scheme, a passenger provides a biometric sample. Failure to take high quality enrolment images can result in lower levels of identity verification and deliver inaccurate results.

- Once the image has been captured, the biometric is preserved by converting it into a format that can be recognised by biometric sensors. The data is then stored within a chip, barcode or within a database.

- At the time of using ABCs, the passenger provides the requisite biometric. During this time, one of two authentication processes are deployed;
    - 'one to one' involves comparing the passengers' biometric to that contained within the e-MRTD or a separate token. This is known as verification.
    - 'One to many', known as identification, is when a biometric sample is compared to those samples contained within a database. As biometrics are unique, the authentication process seeks to confirm that the sample provided is a close match.

- The system should seek to mitigate against False Acceptance rates, where one biometric sample is incorrectly matched with another biometric sample, or False Rejection rates, where the system fails to recognise a match with a pre-existing biometric.

- Basic Access Control (BAC) is a security mechanism designed to only open the personal and document details stored in the chip upon the production of a decryption key. Additionally designed to prevent the unauthorised reading of the chip's contents over distance, called skimming and eavesdropping, the e-MRTD has to be opened before the decryption key can be generated from data contained within the document's machine readable zone.

- Extended Access Control (EAC), whilst not yet an ICAO standard should be implemented by European Union Member States before 28 June 2009. As previously mentioned, ICAO identifies the fingerprint and the iris as secondary biometrics. Given that these biometrics are perceived as more sensitive personal data, ICAO recommends that access to such should be restricted. The use of EAC seeks to achieve this, and only grants authority to inspect systems by e-MRTD issuing states that possess the necessary certificates, which are exchanged via the Public Key Infrastructure (PKI).

- ABCs allow passengers' biographical and biometric data to be cross-checked against relevant databases, often called 'Watchlists'. The system should also be able to detect whether e-MRTDS have been altered, are defective, or have been withdrawn by the issuing authority.

- In some instances, the passenger may need to make a declaration or provide further information prior to being granted entry or exit. Unless ABCs are designed to give the passenger the opportunity to provide this electronically, individual examination by Border Control staff may still be necessary.

- The final stage, once the passenger's identity has been through the authentication process, and other checks have been conducted, is for the system to admit the passenger, to present an authorisation for admission or to deny admission. In the later instance, there should be appropriate signage available directing the passenger to the nearest Border Control official.

Issues for consideration

How reliable are biometrics?

19. Whilst they are difficult to steal, copy or compromise, biometrics are not 100% foolproof. Systems can be spoofed using impersonation techniques and gates can be breached by tailgating, or by someone climbing over or under them. When designing a biometric system, it is important that the system is thoroughly tested for sign of weakness and action taken to mitigate against these, either through the deployment of further technology or manual intervention.

Infrastructure and scalability

20. ABCs should be installed in a secure position which allows countries to monitor all admissions and exits, and allow interaction with the passenger when necessary.

21. If space within the airport is at a premium, countries should initially consider utilising the existing infrastructure to make the best use of space, although ABCs facilities should ideally be placed to accommodate the highest levels of anticipated traffic.

22. Where practical, the system should allow young, elderly or persons with reduced mobility to use it.

23. Design plans should consider both the worst and best case scenarios; ensuring that the chosen location allows for manual fallback procedures in event of system failure and physically meets future requirements to facilitate increasing numbers of passengers.

24. ABCs should be positioned to allow for maintenance. In event of system failure, there should exist the ability to remove trapped passengers and to ensure that the gates fall back in a closed mode to preserve the borders security.

25. Good signage and a user friendly operation will go some way to ensuring that ABCs reach their full potential in facilitation.

Data Privacy

26. All personal or document data handled by ABCs must be kept securely at all stages of the process. ABCs should be resilient against attempts to skim or eavesdrop on data being read from the e-MRTDs.

27. All stored data should be secure and handled in accordance with data protection and privacy legislation. No personal data should be passed to a third party without explicit permission from the individual concerned.

28. It is recommended that countries publish clear information on their data retention and access control policies in leaflet format.

29. Both passengers and members of staff should be fully aware of their individual roles and responsibilities during the process.

30. Where participation in the scheme is voluntary, participants should be able to withdraw from the scheme and have their details deleted upon request.

Security

31. The issuing states document production, application and issue procedures should be of a high standard and should not be susceptible to fraud.

32. ABCs should be supervised to prevent fraud, abuse and to aid passengers in need of assistance.

33. All e-MRTDs readers should be certified and secured to government regulations. Consideration should be given to what information is sent across networks.

What are the financial implications of adopting a biometric recognition system?

34. There is likely to be a high cost involved in implementing biometric systems, as such systems will require gates, kiosks, networks, enrolment facilities, marketing schemes as well as the continued maintenance costs. However certain official processes may be enhanced as a consequence of adopting a biometric recognition system (see paragraph 8).

Interoperability

35. Compliance with ICAO and ISO standards should allow for electronic reading and verification of e-MRTDs from different issuing authorities.

36. International interoperability, involving operational processes and technical issues, endeavours to ensure that, to the greatest extent possible, the passenger’s experience is similar at both the point of embarkation and arrival. Political agreement should be reached between countries if international interoperability is to come to fruition. As well as undertaking any required technology adjustments, consideration needs also to be given to legal, privacy and policy issues. It shall also be necessary for participating countries to protect their systems against any harmful interference to the infrastructure.

Contingencies

37. It is imperative that systems are monitored so to raise an alert to any failure in the performance of the system. If the technology fails, contingency plans should exist to enable passengers to be cleared without confusion or delay whilst ensuring that the integrity of the border is maintained.

38. Once alerted to a system failure, it is important that the ABCs are able to close and all passengers are subject to normal manual processing. Gates should allow any trapped passengers to return to the arrivals hall to be processed as appropriate.

39. Such plans should also be apparent to the passenger, airlines and airport authorities. If fall-back procedures are not properly considered, they could result in higher transaction times, increased congestion at arrival points and an increase in complaints.

Marketing and Communications

40. It is important to consider a Marketing and Communication strategy to prospective users of ABCs. This could include;

- Training
- Literature in multiple languages
- An explanation as to why the system was introduced
- What the benefits will be for the control authorities and the passengers
- Who is eligible to use the system
- Instruction leaflet, which guides the enrolee through interaction. Consideration should be given to using graphics to describe such interaction.
- Contact information for queries and complaints
- Press releases
- On hand assistance at participating ports

ECAC Biometric survey results

41. A number of ECAC Member States have already developed ABCs which utilise biometric technology to facilitate the movement of passengers across the border. Information on these is contained within the regularly updated Summary of Biometric Survey. For further information on the introduction of ABCs and lessons learnt from their experience, Member States are advised to contact the relevant authorities.

Other Guidance available

42. Other guidance on biometrics is available from:

• ICAO standard 9303 - http://mrtd.icao.int/
• ISO Sub Committee 37 - http://www.itl.nist.gov/ and http://isotc.iso.org/
• IATA PEMG - http://www.iata.org/workgroups/pemg.htm

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