



**Analysis of Issues in Aviation Security
and
Proposals for the Future**

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Introduction

In order to sustain and improve trust in the air transport industry, security stakeholders implement a range of countermeasures for terrorism. The conditions under which aviation security has operated since the 9/11 attacks in the US has been particularly severe and the role required of aviation security has continued to grow.

When we discuss aviation security, there is a voice advocating “the more stringent process is better and there is no need to consider passenger experience”. On the other hand, there is another point of view “security screening is a part of passenger journey and it should be as smooth as possible, it is an airport service”. The view would differ by States, by airports and by individuals. At each States, the present social circumstances, history and standards are different and there is no single right answer to this view. Yet these two seemingly different opinions are not totally opposing each other but sharing the same concern. Therefore, I believe it is possible to find good balance.



Against this backdrop, we are constantly called upon to answer the quest “*How best to implement effective security measures while also facilitating the security processes?*”

This paper divides that question into three sections for analysis in order to produce proposals for the future.

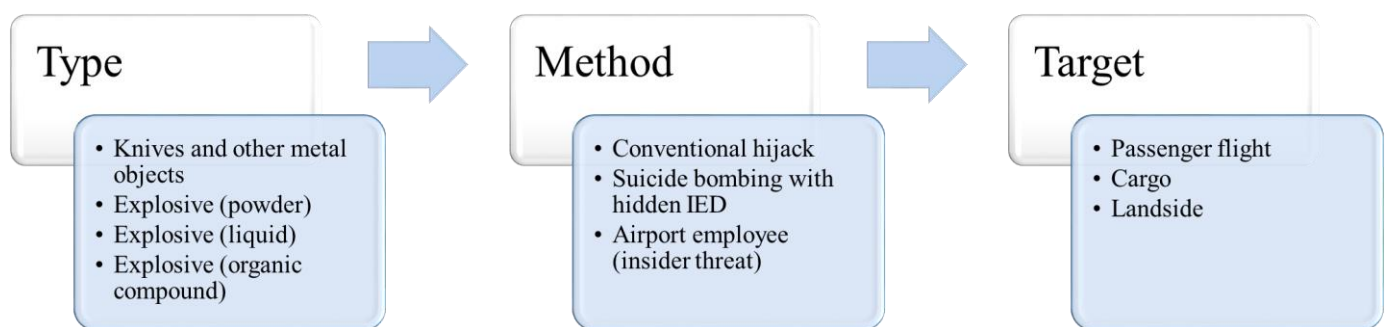
Section 1: Terrorism on Aircraft and Changing Threats

Major Aircraft Terrorism Attacks and Changing Threats

The number of terrorism attacks have not declined since the 9/11 attack. In fact, the types of attacks, methods of concealment and targets have diversified. Conventional hijacking weapons such as knives and guns, have been replaced by improvised explosive devices (IED) as the mainstream. There is a greater risk of attack by concealment of an IED in carry-on baggage, hold baggage, and cargo, and the methods of concealment have become more elaborated. From plots masterminded by terrorists posing as passengers, we also have seen cases where airport employees have been involved, and terrorists appear to be looking at more deceptive approaches to intrusion into airports.

(Major Terrorism Attacks and Attempts in Recent Years)

Aug 2006	Transatlantic aircraft plot	This was an attempt to smuggle a liquid explosive onto an aircraft disguised as an ordinary drink container sold in the UK, and to detonate the explosive.
Dec 2009	Northwest Airlines Flight 253 attack	The terrorist smuggled explosives that would not be found by metal detectors in his underwear and attempt to detonate.
Oct 2010	Transatlantic aircraft bomb plot	Explosives were discovered in air cargo bound for the US. The explosives was contained in printer ink cartridges.
Feb 2016	Daallo Airlines Flight 159 attack	It was thought that the explosive was smuggled on board an aircraft in a laptop and airport staff involvement was suspected.
Mar 2016	Brussels Airport attack	In both cases, the targets were “soft targets” on the airport landside.
Jun 2016	Atatürk Airport attack	



Emergence of New Threats

IEDs are a type of threat which pose the greatest risk to aviation at present. Furthermore, there are growing threats which need to take appropriate countermeasures such as;

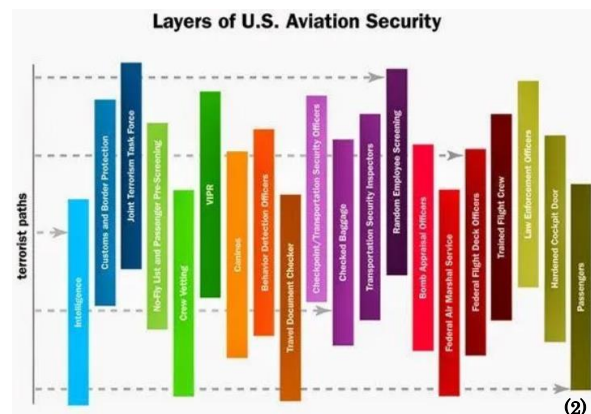
- CBR (Chemical, Biological, Radioactive)
- Drone
- Cyber Attack

Section 2: Aviation Security Today

The Need for a Multifaceted Approach

While the development of countermeasures for the threats requires time, new methods of attack continue to rapidly emerge. Rather than reducing many threats with a single measure, we need to take a comprehensive approach using multiple layers.

The U.S Transportation Security Administration (TSA), for example, ensures passenger safety with 20 layers of security which include intelligence information and behavior surveillance. In security systems today, we need various stakeholders to work together and effectively implement a multilayer security approach such as above example.



Aviation Security Issues that should be addressed by Airports

In the recent ACI World's mid-term global forecast, it predicts 30% increase in passenger traffic between 2018 and 2023. With the ongoing increase in passenger numbers, airports need to adopt appropriate measures against the threat of terrorism while also facilitating security process.

Many of the multilayer security processes are not visible to passengers and do not create bottleneck. Yet passenger screening which is one of the layers remains as an unavoidable process for all passengers and still causes a major bottleneck today.

I would like to analyze the major issues surrounding passenger screening faced by airports and deepen the discussion to explore our options.

a. Limited Resources

The cost of investment in screening technology continues to increase. Airports shoulder immense costs in purchasing and maintaining security equipment such as Explosive Detection Systems (EDS), EDS for cabin baggage (EDS CB), Body Scanners, Explosive Trace Detection equipment (ETD), and Explosive Detection Dogs (EDD).

It is also important to note the high turnover rate of security staff. When considering the importance of their work, security staff deserves appropriate social recognition.

(Major factors in high turnover)

Remuneration	<ul style="list-style-type: none"> •Wage issues and long working hours relative to the level of responsibility.
Motivation	<ul style="list-style-type: none"> •Routine work, trouble with passengers and complaints.
Responsibility	<ul style="list-style-type: none"> •Perfection required in screening and great social impact when incident occurs.

b. Existing and Emerging Threats

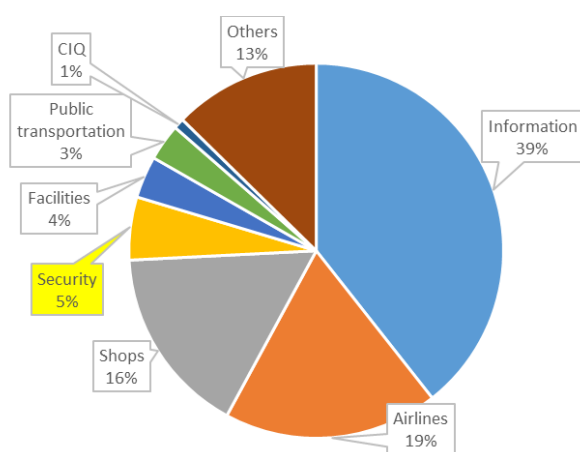
Looking at the trends in terrorism methods and current threats, hijacking with scissors, and other bladed objects may no longer be in the mainstream with the reinforcement of cockpit doors etc.

However, we are required to continue to engage in carrying out stringent measures to the conventional threats and at the same time, we need to implement new countermeasures on top of another for the emerging threats.

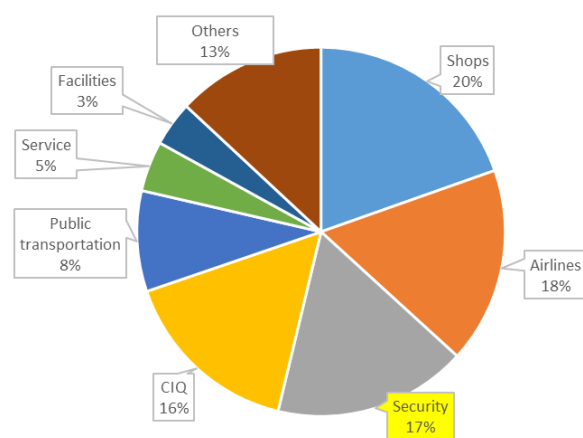
c. Stressful Nature of Security Screening

Despite the fact that passengers are subject to screening at the checkpoints, those checkpoints, because of their very nature, have been ranked low on passenger experience.

As an example, in 2018, at Narita International Airport, there were only 12 cases of positive feedbacks on security from our passengers while 104 cases of feedbacks involved complaints. This accounts for nearly 20% of all the negative feedbacks. Most of the negative feedbacks involved congestion at the screening checkpoints, trouble during the screening process, security staff attitudes and disposal of prohibited items.



(Positive feedbacks at Narita Airport in 2018)



(Negative feedbacks at Narita Airport in 2018)

Approach to Aviation Security Issues at Narita International Airport

In Japan, the airlines make contract with private sector security companies for passenger screening. However, with nearly 100 airlines, Narita International Airport Corporation (NAA) has taken over the initiative and is engaged in tackling the issues of advanced equipment implementation cost and securing staff resources.

Hardware Initiatives at Narita Airport

The list below shows the approach which NAA is currently making endeavor.

Initiatives	Results
Introduction of automated security lanes (in phases)	<ul style="list-style-type: none"> Increased screening efficiency, lighter workload on personnel Reduced passenger waiting times
Introduction of EDS for cabin baggage (in 2019)	<ul style="list-style-type: none"> Strengthened security Eliminate the process to remove laptops from baggage
Introduction of One ID (in 2020)	<ul style="list-style-type: none"> Reduces passenger waiting times Reduces need for human resources
Introduction of security robots	<ul style="list-style-type: none"> Raise customer security awareness Reduces need for human resources
Proving trials of AI technology in detecting prohibited items	<ul style="list-style-type: none"> Strengthened security Increased screening efficiency, lighter workload on personnel
Proving trials of behavior analysis surveillance camera system	<ul style="list-style-type: none"> Strengthened security



Screening checkpoint image at Narita International Airport

Service Initiatives at Narita International Airport

Long term, stable employment of security screening personnel is the most important element to maintain and improve aviation security. When skilled screening personnel leaves the job, it not only adversely affects screening quality, but also poses a risk in terms of controlling sensitive security information. Therefore, NAA tries to create initiatives that achieve stability in the retention of screening personnel. NAA is also aware of the importance of maintaining and improving motivation of the personnel in order to enhance the quality of screening, thus NAA approaches this from various perspectives.

a. Partnering with Security Companies

Improve working environment

- Conduct anonymous surveys of all screening personnel.
- Screen personal feedback of satisfaction with salaries, treatment, overtime, motivation, etc.
- Analyze reasons for high staff turnover and prioritize measures to be taken.

Assistance in recruiting

- Assistance provided with creating recruiting pamphlets and posters for security companies.
- Cooperate with recruiting drives by security companies and publicize the appeal of working at Narita International airport.

Setting new pay scale

- Model under consideration that NAA undertakes the operations by contracting operations to the security companies.
- Based on above model, NAA will be able to review the pay scale in order for screening personnel to set out a career path.

b. Improving Motivation for Screening Personnel

i. Screening Skill Contest

In 2016, NAA began holding contests for passenger screening companies where the winner is selected based on their screening skills, efficiency and customer service. This contest provides an opportunity to learn the techniques of other security companies while also increasing motivation and screening quality.



ii. Good Job Cards

Another initiative involves airport employees handing out "Good Job" cards to security personnel who demonstrate outstanding service in security screening where passenger complaints are many and compliments are few.



iii. Organizing Security Company Joint Events and Workshops

NAA holds events for screening personnel where participants exchange information across corporate boundaries. We also offer opportunities to learn screening techniques used at airport abroad in workshops conducted with airports around the world.

The Role that Airport should Play

There are many security stakeholders at airports carrying out tasks of their each responsible areas and tackling issues from their own perspectives.

From Total Airport Management (TAM) point of view, airport operators need to engage in discussion with the entities to prioritize and effectively find solutions for total optimization. The role of the airport operator is to remain objectively and proactively being aware of problems from TAM point of view and respond timely in order to strengthen and facilitate security in the face of changing aviation security environment.

Section 3: The Future of Aviation Security

Key Factors for the Future of Aviation Security

Security measures should be flexible and innovative in the rapidly changing threat environment. As we look ahead of the future of aviation security, the main stream of travelers will be younger generation who are familiar with Information and Communication Technology (ICT). They are born with smartphones in their hand and they can proactively use SNS and provide personal information without hesitations. The needs to fulfill their expectation are;

- i. Simplifying
- ii. Speed-up
- iii. Selectable-options

While keeping above in mind, both to enhance security measures and improve passenger experience, the key factors are as follows;

a. Advancement of Screening Process with Development of Technology

Technological innovation is one of the most important factors in countering threats and improving the efficiency of airport operation. For example, if European Civil Aviation Conference (ECAC) Standard C3 certified EDS CB spreads worldwide, restrictions on LAGs (Liquid, Aerosols, and Gels) may be eliminated.

At present, the development of devices such as walk-through scanners and x-ray equipment using AI technology is also underway. In the future, screening will be conducted in a walk-through and stand-off style and will be automated except for the resolution process.

Facial recognition systems and advanced image processing technology in particular also hold the potential for great expectations in security and operational efficiency improvements through the combination of behavior detection technology and passenger risk information.

b. Risk-based Passenger Screening

Risk-based passenger screening is a part of the ACI Smart Security concept and a technique for differentiating individual passengers for screening in the following ways.

- i. Real-Time Differentiation
- ii. Advanced Data-Driven Differentiation

Assessing passenger risk levels based on data and analysis of behavior is a States-led process, but includes the ability to acquire passenger risk information gathered both outside and inside the airport.

TSA Pre Check program, for example, if travelers would like to simplify the screening process at the airport, they can choose to use the program by registering their personal information in advance. Providing passengers with such selectable options will be taken favorably especially for younger generations who weigh more on time efficiency. The framework for utilizing the risk information method can improve and facilitate security further.

c. Recognition of Equivalence of Security Measures

Recognition of equivalence of security measures such as One Stop Security (OSS) provides the framework that enables transfer screening to be exempted through a State-to-State validation process. OSS can not only improve the passenger experience but also allow the airport to focus its resources on screening on departure screening.

State-to-State frameworks are a prerequisite for the OSS initiative. Likewise, at the airport level, we could mutually recognize equivalence of security measures between airports or potentially consolidate screening process by applying the concept of sharing and validation of security measures.

Proposal for Security Flow in the Future

In devising a vision for the future, it is important to create a thorough security chain in the overall off airport → on airport → transfer airport flow. At the same time, the security process should be kept in the background away from passengers' awareness as much as possible to improve the passenger experience.

Bearing in mind the three key factors mentioned above, I would like to share my vision on the security flow balancing between security and passenger experience that airports could look to for the future. In particular, I feel that there are many possibilities for further facilitating the transfer screening process. I should also add that cooperation between international organizations and States, airlines, industry and other stakeholders will be essential to realize this flow.

1. Off airport Check-in

- i. Advance Passenger Information (API) is provided when checking in online at home or outside the airport.
- ii. Facial profile registration is done using a smartphone camera when checking-in online.

2. Off airport Baggage Drop and Screening

- i. Hold Baggage checked-in and baggage-drop at a location outside the airport (railway station, etc.) or an approved delivering service provider picks the baggage from the home much like an "Uber" service.
- ii. Screening could take place at the airport or at a location outside the airport without the attendance of the passenger.

3. Airport Public Area

- i. Passenger facial profile is crosschecked with behavior detection camera system at the airport.
- ii. The behavior detection camera system would be installed all over the airport facility and the suspicious behavior of passenger which exceeds certain criteria would be reflected in risk information.

4. Screening Checkpoint

- i. Risk information gathered by advanced passenger information data and suspicious behavior data would be reflected in the screening process.
- ii. The screening process would vary depending on the determined passenger risk level.

5. Transfer Airport

- a. One Stop Security
- b. Recognition of Equivalence of Security measures “At the airport level”

Recognition of equivalence of security measures would take place with mutual airport validation of screening equipment including algorithms, screening procedures, and documents related to security measures. Once the above is completed, image data and other screening data from the recognized airport of departure would be provided to the transfer airport. This would enable the data from the departure airport to be screened and analyzed during off-peak times at the transfer airport and passengers cleared by the results could bypass screening or be subject to a scaled down screening process.

This does not mean the complete exemption of transfer passenger screening because that would take place at the transfer airport based on screening image provided by the departure airport. Therefore, it is different to OSS.

If the framework also provides risk information in addition to sharing this data on screening results, it would offer the advantage of greater facilitation of screening at the transfer airport.

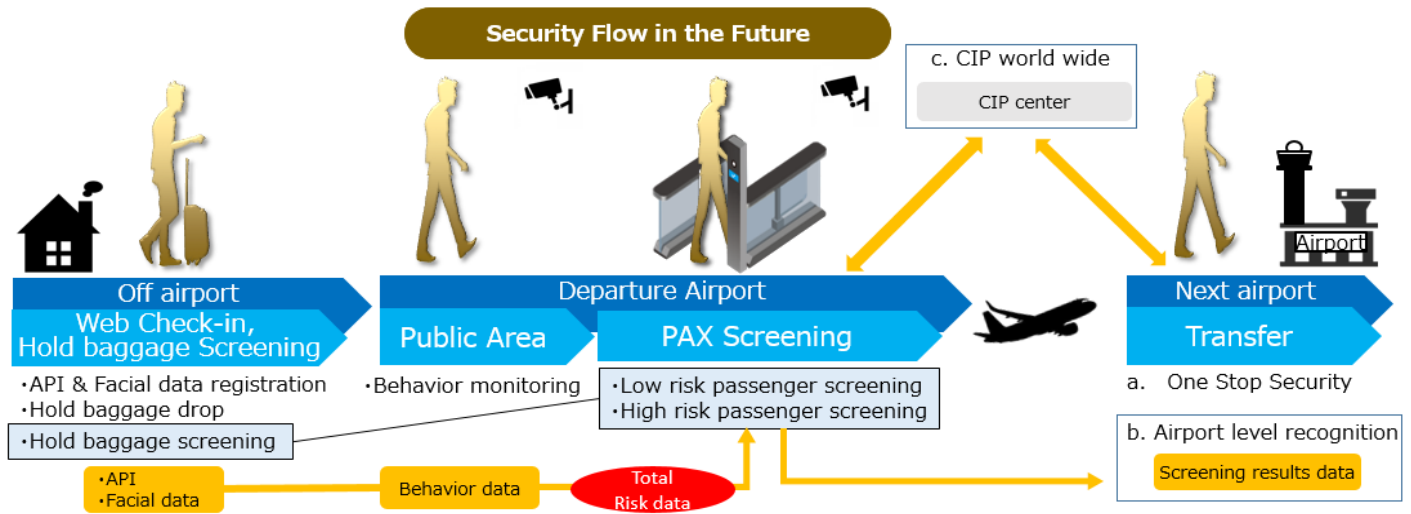
- c. Worldwide Centralized Image Processing

The Centralized Image Processing (CIP) is one of the ACI's smart security concepts. CIP has already been implemented at the airport level, and the image process takes place at a centralized processing room which could be outside of the screening checkpoint. The screening image result is immediately sent to each screening lane, and only the resolution process is performed at the screening checkpoints.

I believe there is a potential for the image screening process to be expanded beyond the national framework, and the possibilities for implementing and consolidating the image process by establishing a common worldwide CIP center which is certified by each States.

This initiative has many issues to overcome, such as regulation, certification, screening equipment, data handling and responsibility. This proposal could potentially eliminate the need for “transfer screening”.

(The following diagram summarizes the above flow 1~ 5, and also describes the merits and issues.)



	Off airport	In Airport	Transfer airport
Merits	<ul style="list-style-type: none"> Hold baggage process is completed 	<ul style="list-style-type: none"> Low-risk passengers do not require stringent screening Risk based screening enables human resources to be concentrated on high risk passengers 	<ul style="list-style-type: none"> Exempt or fast-track screening Passenger experience will be enhanced by many States or airports joining the chain
Issues	<ul style="list-style-type: none"> Need to establish certification system for delivery service provider Need to establish secured supply chain from off airport baggage drop to the airport 	<ul style="list-style-type: none"> Risk level assessment is varied by States Handling of risk information and privacy issues Method to incorporate risk level into screening process 	<ul style="list-style-type: none"> Need to create a framework for mutual recognition at the airport level Method to share sensitive information between airports and it's data protection. Airport facility and security equipment issues CIP certification mechanism

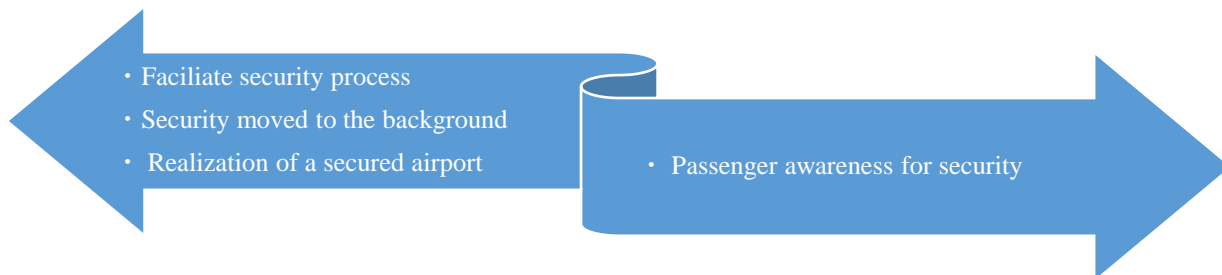
Raising the Issues Facing the Vision for the Future

Technological innovation and a risk-based approach will produce a more comfortable process with screening less apparent in the passenger's awareness. Further in the future, the present screening checkpoint may become something of the past and passenger screening may be completed without he/her noticing.

However, we should remember that there are people who undervalue the security. The more we facilitate security processes and offer safety, the greater the possibility of the passenger getting wrong idea. Some might say “security has nothing to do with my trip; security is guaranteed without any efforts.” To counter such misconception, it is more important than ever to ensure that the passenger understands that they are ultimately responsible for recognizing the need for security.

For example, to raise passenger awareness on the security, it is one way to show passengers with general information on “how airport security is maintained”, “known incidents”, “number of security personnel and its associated cost” etc. Looking ahead, the security process will become less visible on the surface in the future, yet visible measures such as patrolling by security staff with EDD should remain as an effective deterrence.

What I truly hope as a one of the stakeholders engaging in the daily aviation security works, is that passengers understand the necessity of the security. This mutual understanding between passengers and security personnel can create pleasant environment where security staff can have pride for his/her work while passengers can receive sophisticated service in return, thus leading to realize true passenger experience.



Conclusion

The environment surrounding aviation security is constantly changing. Producing answers to the quest of “*how best to implement effective security measures while also facilitating the security processes?*” is not an easy task.

Fortunately, there is little adversarial competition between airports on the topic of aviation security and it is one of those rare fields where we are all headed in the same direction. I believe we should take full advantage of that fact and work together for the endless quest of the security.

In conclusion, I would like to summarize my ideas for achieving a vision for the future in answer to the issues facing airport operators.

- Cooperation between security stakeholders
- Proactive involvement of airport operators in issues
- A study of the off airport→in airport→transfer airport security flow
 - ◆ Off airport : Promoting submission of passenger information in advance
 - ◆ In Airport : Utilizing cutting edge technology and risk based approach
 - ◆ Transfer Airport : Eliminating duplicated screening by OSS, CIP, Data sharing
- Establishing a framework for security related information sharing
- Improvements to the human resource environment
- Raising security awareness of passengers
- Sharing of best practices and visions for the future among security stakeholders

PostScript — my humble wish

I would like to thank ACI Asia-Pacific for giving me the opportunity to write this research paper. Since aviation security involves sensitive issues and limited disclosure of details, therefore the research remains conceptual in certain respect. However, we need to step into sensitive discussion for the development of aviation security vision for the future. As I have written in the introduction paragraph, the approach to aviation security is diverse and there is no single solution. This is why aviation security is exciting and challenging for us.

The ACI Asia-Pacific Young Executive of the Year program provides opportunities for young experts in this field like myself to express our visions and break through ideas. I have a desire to further utilize this excellent opportunity to get together with the same young generations of experts from other airports in Asia-Pacific region to share and discuss each vision and idea for innovations in our field of work.

I believe the young generation of experts will lead the discussion to design and shape the future framework and policy of aviation security. What one could imagine and challenge are perhaps limited but by staying connected, we can collaborate to plan and build a better future.



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