Smart Airport – Transforming Passenger Journey and Experience

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Hong Kong Airport Authority
20 Years of Strong Growth

Passenger Traffic:
- 1998: 28.6 million
- 2017: 72.9 million
- Growth: 155%

Cargo Traffic*:
- 1998: 1.65 million tonnes
- 2017: 5.05 million tonnes
- Growth: 206%

*Including air mail
Cargo traffic: No 1 in the world since 2010

<table>
<thead>
<tr>
<th>Rank</th>
<th>Airport</th>
<th>Total Cargo (Tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hong Kong International Airport (HKG)</td>
<td>5,049,898</td>
</tr>
<tr>
<td>2</td>
<td>Memphis International Airport (MEM)</td>
<td>4,336,752</td>
</tr>
<tr>
<td>3</td>
<td>Shanghai Pudong International Airport (PVG)</td>
<td>3,824,280</td>
</tr>
<tr>
<td>4</td>
<td>Incheon International Airport (ICN)</td>
<td>2,921,691</td>
</tr>
<tr>
<td>5</td>
<td>Ted Stevens Anchorage International Airport (ANC)</td>
<td>2,713,230</td>
</tr>
<tr>
<td>6</td>
<td>Dubai International Airport (DXB)</td>
<td>2,654,494</td>
</tr>
<tr>
<td>7</td>
<td>Louisville International Airport (SDF)</td>
<td>2,602,695</td>
</tr>
<tr>
<td>8</td>
<td>Tokyo Narita International Airport (NRT)</td>
<td>2,336,427</td>
</tr>
<tr>
<td>9</td>
<td>Taiwan Taoyuan International Airport (TPE)</td>
<td>2,269,585</td>
</tr>
<tr>
<td>10</td>
<td>Paris Charles de Gaulle Airport (CDG)</td>
<td>2,195,229</td>
</tr>
<tr>
<td>11</td>
<td>Frankfurt Airport (FRA)</td>
<td>2,194,056</td>
</tr>
<tr>
<td>12</td>
<td>Singapore Changi Airport (SIN)</td>
<td>2,164,700</td>
</tr>
</tbody>
</table>

Note: Include airmail.
Source: ACI Preliminary 2017 World Airport Traffic Rankings (9 April 2018)
### International passenger traffic: 3rd in the world

<table>
<thead>
<tr>
<th>Rank</th>
<th>Airport</th>
<th>International Passengers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dubai International Airport (DXB)</td>
<td>87,722,023</td>
</tr>
<tr>
<td>2</td>
<td>London Heathrow Airport (LHR)</td>
<td>73,187,198</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Hong Kong International Airport (HKG)</td>
<td><strong>72,462,116</strong></td>
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<tr>
<td>4</td>
<td>Amsterdam Airport Schiphol (AMS)</td>
<td>68,401,146</td>
</tr>
<tr>
<td>5</td>
<td>Paris Charles de Gaulle Airport (CDG)</td>
<td>63,697,227</td>
</tr>
<tr>
<td>6</td>
<td>Singapore Changi Airport (SIN)</td>
<td>61,574,000</td>
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<tr>
<td>7</td>
<td>Incheon International Airport (ICN)</td>
<td>61,520,572</td>
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<tr>
<td>8</td>
<td>Frankfurt Airport (FRA)</td>
<td>57,122,348</td>
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<tr>
<td>9</td>
<td>Bangkok Suvarnabhumi Airport (BKK)</td>
<td>48,811,600</td>
</tr>
<tr>
<td>10</td>
<td>Taiwan Taoyuan International Airport (TPE)</td>
<td>44,479,754</td>
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<tr>
<td>11</td>
<td>Istanbul Atatürk Airport (IST)</td>
<td>44,254,473</td>
</tr>
<tr>
<td>12</td>
<td>Kuala Lumpur International Airport (KUL)</td>
<td>42,354,534</td>
</tr>
<tr>
<td>13</td>
<td>London Gatwick Airport (LGW)</td>
<td>41,476,858</td>
</tr>
</tbody>
</table>

**Note:** Exclude transit passengers.

**Source:** ACI Preliminary 2017 World Airport Traffic Rankings (9 April 2018)
Air traffic will continue to grow

**Passenger Traffic**

- 2012: 56.5 million
- 2013: 59.9 million
- 2014: 63.3 million
- 2015: 68.5 million
- 2016: 70.5 million
- 2017: 72.9 million
- 2018: 76.5 million
- 2019: 80.0 million
- 2020: 83.0 million
- 2021: 85.0 million
- 2022: 87.0 million
- 2023: 89.0 million
- 2024: ≈ 90.0 million

**Cargo Throughput**

- 2012: 4.08 million tonnes
- 2013: 4.18 million tonnes
- 2014: 4.44 million tonnes
- 2015: 4.46 million tonnes
- 2016: 4.62 million tonnes
- 2017: 5.05 million tonnes
- 2018: 5.60 million tonnes
- 2019: 6.00 million tonnes
- 2020: 6.20 million tonnes
- 2021: 6.40 million tonnes
- 2022: 6.60 million tonnes
- 2023: 6.80 million tonnes
- 2024: ≈ 7.00 million tonnes

Note: For 1998-1999, only airmail handled by Air Mail Centre is available. Airmail handled by Cargo Terminal Operators is not available at current stage.
3RS is much more than building a new runway
Existing Facilities Also Under Expansion and Upgrading

New East Hall food hall

An additional check-in aisle with over 40 new counters, self-bag drop and other facilities

Themed Boarding Gate Areas

New roof garden

Redesigned seating area
Sky Bridge under construction
To connect Terminal 1 and North Satellite Concourse
Physical and Smart Infrastructure to Build a Smart Airport for Transforming Passenger Experience

Airlines
Government Bodies
Business Partners

Smartification for Airport Business & Operations

Technovation Platform

Experience Creation
Fast. Easy. Joyful

People, Policy, Process, Ideas
Mindset Change. Creative Thinking
Stakeholders Engagement

Technologies
iBeacon, WiFi, GPS, RFID,
Sensors, Big Data, Image Analytics…
Smart Airport Vision

EXPERIENCE THE FUTURE AT HKIA
5 Key Enabling Technologies to Realize Smart Airport Vision

- Big Data
- Intelligence
- Advanced Biometrics
- Mobile Technology
- Digital Twin
- Robotics
Smart departure enhancing travel experience

Single Token for Passenger Journey

Checked once

Check-in + Self-Bag Drop + e-Security Gate + Immigration + Transfer Security Gates + Self-Boarding Gate

Enrollment | Validation | Enrollment & Validation | Validation | Enrollment & Validation (collaboration with other airport) | Validation
Check-in | Security Checkpoint | Immigration | Security Checkpoint | Boarding

20180903CCD
Implementation of Biometrics e-Security Gate on Schedule

- Prototype system installed in April 2018
- First production trial of 4 x e-Security Gates and 2 x Manual Gates at South Hall in place
- Full installation will be completed by early 2019
- South Hall: 20 e-Security Gates + 8 Manual Stations
Multi-factor authentication for more stringent operational use cases

- Long Range Iris Scanning
  - Detection up to 2 m distance
  - Good to combine with Facial

- Palm Vein Scanning

- Finger Vein Scanning

  - Color LCD touch panel
  - Card reader
  - Status display lamp
  - Finger Vein authentication scanner
Going deeper than Identification - Emotion Recognition

Analyze and identify emotion of detected faces via Smart CCTV. Analysis result of each detected face includes confidence scores for seven kinds of emotion: anger, disgust, fear, happiness, neutral, sadness, and surprise.
Smart CCTV System

Revamp current CCTV infrastructure into fully digital at 4K resolution

Video Analytics Applications
Phase 1 Video Analytics (VA) Project

11 Applications

- Facial Recognition
- Crowd / Queue Management
- Retail Analysis
- Aircraft Parking Clearance
- Tailgating
- Intrusion Detection
- Left Passenger on APM
- Unattended Object
- Trolley Tracking System
- License Plate Recognition
- Vehicle Counting
Mobile Technology
Personalized Services throughout the Journey at HKIA

- Online Shopping and Food Ordering
- My Tag
- Indoor way-finding
- Customer Enquiry
- Service booking
- Car Park reservation
- Shopping
- Dining
- Flight Info
- Boarding Alerts
- Arrival Baggage Alerts

HKG My Flight

Hong Kong ICT Award 2018
Virtual Assistant Chatbot
Automate customer enquiry handling with artificial intelligence

Full coverage:
Flight, Services & Facilities, Shop & Dine

Link to My Flight Way Finding, if applicable

Chinese or English or even mixed

Type or speak your question
Smart Glasses -
VIP Recognition at Courtesy Channel

1. Guest recorded in VIP database

2. VIP process to airside via Courtesy Channel

3. Result will be shown on the glasses

Benefits of Smart Glasses
- Operation anywhere
- Free hands during operation
- Augment human decision
Robotics
Field Testing of Autonomous Electric Tractor (AET) - On-going

- Conducted **Phase 1** test at Parking Stand 304 (Cordoned off area) in May 2018
AET enhances road safety, improves efficiency and replaces mundane tasks by Hi-Tech jobs

- **Phase 2** road test at designed route (X-stand via west tunnel) just on going
Proof of Concept – Indoor Multi-function Robot

- Common autonomous platform + detachable functional unit on top
- Collaborative machine learning
Business Insight Plus Actions in addition to Data Collection

- Temperature, Wi-Fi Signal, Beacon Signal, Wi-Fi roaming quality ...
- Business insight plus actions in addition to data collection
- M2M communication, if practical
AI Capabilities - Video Analytics

- Viewing angle different from fixed CCTV cameras
- Identifying Abnormalities (e.g. facility damage, unusual crowd, suspicious item ..etc.) or special object of interest
Digital Twin facilitates Holistic Airport Management and Predictive Decision Making

Simulation

IoT

Applications

3D Reality

Enterprise GIS

- 3D Model
- Captured data

- AGIS, Workflow, Wayfinding, Spatial Analysis, etc.

- 2D 3D

- 3D model, geometry

- Asset Info Maintenance Status, Work Orders

- Asset Attributes

- BIM

- AAMS

- Asset Attributes
Reality Modeling on Game Engine Platform

*Resolution reduced already*
Asset Data Integration with Asset Management System

Asset data and record in the separated AAMS (Maximo)
- Manufacturer
- Model No.
- Installation Date
- O&M Manual
- Maintenance History

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Traffic & Passenger Flow Simulation
using Video & Passenger Flow Data
Integration with IoT – A Living Digital Twin
Collaboration with the Industry

Collaborate with the Airport Community and Business Partners

Collaborate with the Research Community

HKIA Technovation Conference
Together, we create a smarter airport for Hong Kong