

## CHAPTER 1 AIRPORT MASTER PLANNING PROCESS

### Introduction

- 1.1 An airport master plan provides recommendations for the future development of an airport, often over a 20-year horizon. The master plan serves as a blueprint that guides the development strategy and direction for an airport and as a ready reference for the airport community and other stakeholders.
- 1.2 As Hong Kong International Airport (HKIA) is an international gateway, its master plan must factor in not only the latest developments in air transport activity and the competitive landscape of the aviation industry, but also all relevant global, regional and local economic developments, including the recent financial crisis and global economic downturn. The strategic importance of the airport, long construction lead time required under a live airport environment and the interlocking effects of new facilities on airport operations combine to make planning critical. Airport Authority Hong Kong (AAHK) meets this challenge with a three-tier planning process, comprising an annual budget; a rolling five-year plan; and a 20-year master plan that is updated every five years. Under the three-tier planning process, and in light of its business strategies and operational requirements, AAHK reviews and explores the requirements for additional infrastructure to fulfil future air traffic demand, including where to locate these new facilities and how to effectively integrate them into the airport's operations.
- 1.3 Development of a master plan usually starts with projection of air traffic demand, a review of the airfield configuration (which mainly comprises the runway and taxiway system), air traffic movements (ATMs, also known as flight movements; each one defined as a single takeoff or landing), and the practical maximum capacity that the configuration can provide. Following the development of a forecast for the ATMs and their distribution over a single day, a review is done on the optimal development and location of the passenger processing terminal<sup>1</sup>, passenger concourse<sup>2</sup> and aircraft parking apron. This impacts the location and development strategies for surface access (road and rail), landside transportation systems, and aviation support facilities and infrastructure (including cargo terminals, aircraft maintenance, catering, etc.).
- 1.4 The planning process recognises and incorporates environmental, economic, operational, construction and other technical aspects, while ensuring overall safety standards and the integrity of airport operations.
- 1.5 HKIA's 20-year master planning process can be summarised as follows:
- Development of a 20-year air traffic projection for HKIA;
  - Stock-taking of current inventory of airport facilities/infrastructure;

---

<sup>1</sup> A passenger processing terminal is the facility that processes passengers before departure (incorporating functions such as check-in, security screening, immigration clearance, etc.) and after arrival (incorporating functions such as immigration clearance, baggage reclaim, customs inspection and transfer to ground transportation).

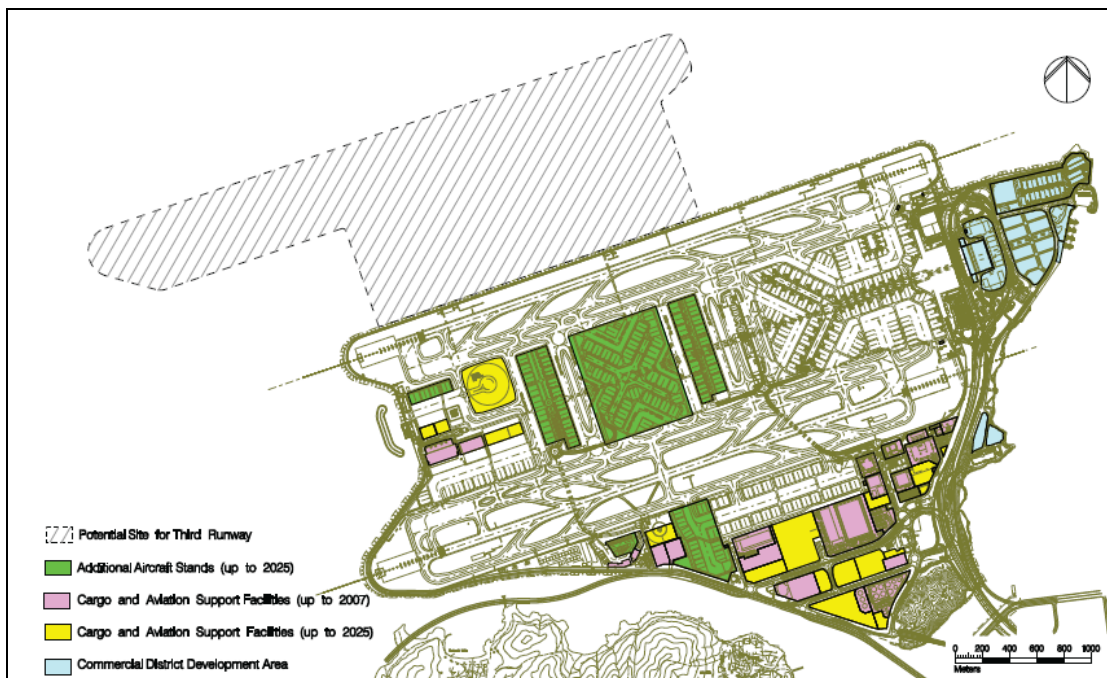
<sup>2</sup> A passenger concourse is the area where the aircraft boarding gates are located for passengers to embark and disembark the aircraft.

- Development of “Busy Hour Demand Forecasts” for airport facilities/infrastructure;
- Translation into future airport facility/infrastructure requirements;
- Evaluation of supply/capacity shortfalls;
- Development of various airport layout concepts;
- Evaluation of multiple criteria;
- Preliminary engineering and environmental feasibility assessments;
- Recommendations on the preferred airport layout plan; and
- Cost and economic benefit analysis.

**Continuation of Master Plan 2025**

1.6 The following diagram shows the airport layout plan derived under the HKIA Master Plan 2025 (MP2025) planning process. This indicative concept layout of HKIA has been reviewed under the current planning process.

**Figure 1.1 : HKIA Master Plan 2025 – Potential Land Use Plan**



1.7 Released in December 2006, HKIA MP2025 recommended that a thorough examination of the airspace and runway capacity should be undertaken to arrive at a definitive practical maximum air traffic movement level for the airport. In 2007-2008, as the prelude to the HKIA Master Plan 2030 (MP2030), AAHK appointed the United Kingdom’s (UK) National Air Traffic Services (NATS) to examine the practical maximum capacity of HKIA’s existing two-runway system.

**Development of MP2030**

1.8 Following the completion of NATS’ review, to ensure a transparent and objective planning process, AAHK’s professional and management experts have commissioned

nine independent consultants to research into different strategic aspects of airport development, which have been consolidated into the Master Plan 2030. Brief descriptions of these aspects are set out in Figure 1.2:

**Figure 1.2 : Consultants Appointed for the Development of HKIA Master Plan 2030**



### 1.9 ***Airport Facilities Planning***

Consultant: AECOM

AECOM (formerly known as Maunsell) is a global provider of professional, technical and management support services to a broad range of sectors: transportation (including airports), facilities, environmental, energy, water and government. With approximately 45,000 employees around the world, AECOM offers a blend of global reach, local knowledge, innovation, and technical excellence in delivering solutions that enhance and sustain the world's built, natural, and social environments. AECOM has been involved in HKIA's previous master plan studies dating back to the New Airport Master Plan carried out in the early 1990s.

Work Scope

AECOM undertook a comprehensive assessment of the existing airport's operational requirements and constraints, in order to achieve an optimal balance between airport operations, aviation support and airport-related development in the planning of facilities capable of meeting future air traffic growth at HKIA. It has also reviewed and

recommended optimal airport layout and land use development plans incorporating the possibility of building a Third Runway along with its associated supporting facilities and infrastructure.

### **1.10 Primary Air Traffic Forecast**

#### Consultant: IATA Consulting

International Air Transport Association (IATA) is the trade association of the world's international airline industry. IATA Consulting is part of the commercial division of IATA. IATA Consulting serves the entire aviation industry and delivers tailor-made business solutions to airlines, airports, cargo and civil aviation authorities, and air navigation providers.

#### Work Scope

IATA Consulting prepared air traffic forecasts for HKIA for passengers, cargo and ATMs up to 2030 in order to facilitate the preparation of the HKIA MP2030. The IATA Consulting air traffic forecasts covered three scenarios (High, Base and Low Cases) and took into consideration the financial and economic downturn at the end of 2008. The consultant has also looked at the following key air traffic drivers and their impact on HKIA:

- Economy;
- Air Services Agreements;
- Trade agreements;
- Travel policy;
- Tourism;
- Modal competition;
- Cross boundary infrastructure development;
- Airport strategies; and
- Airline strategies.

### **1.11 Airspace and Runway Capacity Analysis**

#### Consultant: National Air Traffic Services

National Air Traffic Services (NATS) is a leading and experienced provider of air traffic management services in the UK. It provides air traffic control services to aircraft flying in UK airspace, and over the eastern part of the North Atlantic. In 2009, NATS handled 2.2 million flights carrying around 200 million passengers.

The services provided by NATS are as follows:

- Operate and maintain a nationwide communications, surveillance and navigation network;
- Provide engineering support to all operational units;
- Carry out advanced research and development;
- Develop ground-breaking software for current and new systems; and

- Provide world-class training for air traffic controllers and engineers.

NATS has been involved in the airspace and air traffic management of London's Heathrow Airport. It has also assisted the British Airports Authority (BAA) in the planning for a Third Runway and is currently looking at ways to add capacity based on the existing two-runway system at Heathrow Airport.

#### Work Scope

NATS' involvement came in two phases. The first phase involved the review of the existing airspace and runway system at HKIA, with the primary objective of identifying a set of technical solutions and recommendations to maximise the capacity of the existing two runways to meet air traffic demand growth. The second phase concerned exploring the option of a Third Runway and the associated gain in capacity from the perspectives of technical feasibility, airspace and air traffic control procedure. Possible alignments of the proposed Third Runway at HKIA were evaluated for taking forward in the HKIA MP2030 development, taking into consideration various factors such as runway capacity, meteorological conditions, terrain constraints and, operational issues such as compliance with International Civil Aviation Organisation (ICAO)'s Manual on Simultaneous Operations on Parallel Runways (SOIR), Instrument Landing System issues, runway mode of operations, air traffic crossover, wider Pearl River Delta (PRD) airspace issues, etc.

### **1.12 Preliminary Engineering Feasibility & Environmental Assessment**

#### Consultant: Mott MacDonald

Mott MacDonald Hong Kong Limited (formerly known as Mott Connell Limited) is a multi-disciplinary engineering and environmental consultancy firm providing engineering design services. It has been involved in the following engineering design projects at HKIA:

- Passenger Processing Terminal 1 (T1) (opened in July 1998);
- North Satellite Concourse (opened in January 2010);
- SkyPier (opened in January 2010); and
- Hong Kong Business Aviation Centre Hangar No.2 (opened in September 2007).

#### Work Scope

The consultant provided engineering, environmental impact evaluations, cost and programming input of the various airport expansion options and preferred airport layout plan.

Preliminary engineering design was carried out for various facilities of the optimal airport layout plan provided by AECOM, including preliminary specifications of the Third Runway and its taxiways, aircraft apron, airfield navigational aids and lighting, passenger processing terminal and concourse, landside transportation access system, etc. Other infrastructure requirements such as the supply of aviation fuel, gas and electricity, the treatment of storm water, sewage, and waste generated on site were also identified.

The environmental work stream identified the scope and scale of the potential environmental impact associated with HKIA expansion, allowing further preliminary consideration of key “differentiating” environmental issues and possible mitigation and compensatory measures, and facilitating a qualitative comparison of the available three-runway alignment options. Key environmental considerations were: aircraft noise, air quality, water quality/hydrodynamics and marine ecology, in particular the potential impact on Chinese White Dolphins.

### **1.13 Initial Land Formation Engineering Evaluation**

#### Consultant: Meinhardt

Meinhardt (Hong Kong) Limited is a multi-disciplinary engineering and environmental consultancy firm providing engineering design services. Meinhardt has been involved in the following projects at HKIA:

- Hong Kong Aircraft Engineering Company Limited Hangar No.2 and No.3A (opened in December 2006 and September 2009 respectively);
- T1 East Hall extension (previous phase opened in March 2004, current phase from April 2010 to mid 2013); and
- T1 enhancement work (from February 2006 to 4th quarter of 2010).

#### Work Scope

To facilitate the work relating to preliminary engineering feasibility, an initial land formation engineering evaluation was conducted to examine the feasibility of various construction options for land formation over the contaminated mud pits north of the airport island. The consultant also carried out a preliminary assessment of the environmental impact, programme impact and costs associated with the proposed land reclamation options.

### **1.14 Preliminary Air Quality Impact Analysis**

#### Consultant: Arup

Arup is a leading international business, planning and design consultancy providing building design, economics and planning, infrastructure design, management consulting, and specialist technical services such as air emission modelling. Arup has been involved in aviation development work for more than 50 years, and has worked on a wide range of projects at more than 100 airports throughout the world.

#### Work Scope

Arup prepared a preliminary air quality review that evaluated the cumulative impact on representative Air Sensitive Receivers (ASRs) along North Lantau and at HKIA from projected future growth in airport operations along with the emission projections

considered in the Environmental Impact Assessment (EIA) reports from future operations of the nearby projects - including the Hong Kong Boundary Crossing Facilities (HKBCF); the Hong Kong Link Road (HKLR) of Hong Kong – Zhuhai – Macao Bridge (HZMB); and Tuen Mun – Chek Lap Kok Link (TMCLKL). The analysis was based on a hypothetical scaling up of HKIA's two-runway operations to the same level as that of the three-runway option. The consultant also compared the cumulative air quality impact for a future year under maximum operating conditions with the current Air Quality Objectives (AQOs) for Hong Kong.

### **1.15 Preliminary Aircraft Noise Impact Analysis**

#### Consultant: URS Corporation

URS Corporation (URS) is an architectural and engineering design firm, with over 300 offices worldwide. Its airport consulting services group has six key practice areas: Planning, Environmental, Civil Design, Architectural Design, Systems Design and Program/Construction Management. URS has implemented projects at more than 500 airports worldwide, in addition to a wide variety of assignments performed directly for airlines, the US Federal Aviation Administration (FAA) and state aviation departments.

URS' airport and aviation noise practice is considered an industry leader in assessing and addressing the impact of aircraft and airport operations on communities in the airport environs. It has performed numerous studies at airports of all sizes across the US and abroad involving airport noise modelling and analysis, land use compatibility planning, and operational and land use noise mitigation measures. URS undertook the aircraft noise study for the previous EIA update of HKIA, which was published in 1998. Other representative airports where URS has performed environmental or noise studies include:

- Dallas Fort Worth International Airport;
- Phoenix Sky Harbor International Airport;
- San Francisco International Airport;
- Denver International Airport;
- Washington-Dulles International Airport;
- Lambert-St. Louis International Airport;
- Memphis International Airport;
- Austin-Bergstrom International Airport;
- Palm Beach International Airport;
- Orlando International Airport; and
- Aeroporto di Venezia Marco Polo.

#### Work Scope

This consultant provided a projection of the HKIA Noise Exposure Forecast (NEF) contours for the Third Runway development alternatives based on NATS' airspace and runway capacity evaluation and recommendations. With the projected flight track designs, aircraft operational forecasts, runway utilisation and practical assumptions of evening noise mitigation measures, the FAA Integrated Aircraft Noise Modelling software was used in the projection to generate a forecast of NEF contours for HKIA at design capacity under a three-runway option.

### 1.16 *Economic Impact Analysis*

Consultant: Enright, Scott & Associates

Enright, Scott & Associates (ESA) is a research and strategy consulting firm based in Hong Kong. They assist corporate, government, and multinational organisations to understand and benefit from changes by combining thought leadership based on rigorous research with hands-on knowledge of the corporate world to provide advice on the forces that influence business and economic development.

Work Scope

An economic impact analysis was undertaken to address the economic impact of expanding HKIA on Hong Kong as a whole. The objectives of this analysis were to:

- Assess the economic impact of the proposed airport expansion from a Hong Kong perspective; and
- Provide a thorough analysis of the capital costs and economic benefits of expanding HKIA under the two-runway and three-runway options.

The analysis also focused on the following key questions:

- What is the current economic contribution of HKIA to the Hong Kong economy?
- What will the economic contribution of HKIA to the Hong Kong economy be in 2030 based on two runways?
- What will the economic contribution of HKIA to the Hong Kong economy be in 2030 with a Third Runway?

### 1.17 *Preliminary Financial Assessment*

Consultant: The Hongkong and Shanghai Banking Corporation Limited (HSBC)

Established in Hong Kong and Shanghai in 1865, The Hongkong and Shanghai Banking Corporation Limited (HSBC) is the founding member of the HSBC Group – one of the world’s largest banking and financial services organisations – and its flagship in the Asia-Pacific region. It is the largest bank incorporated in the Hong Kong Special Administrative Region (HKSAR) and one of the HKSAR’s three note-issuing banks. HSBC is a wholly owned subsidiary of HSBC Holdings plc, the holding company of the HSBC Group, which has around 8,000 offices in 87 countries and territories and assets of approximately US\$2,418 billion.

HSBC’s infrastructure practice has been consistently ranked as the leading project finance advisor for the Asia Pacific region, and leading bank for capital raising. HSBC has a strong track record of delivering client solutions in Hong Kong, across the region and globally. These include advising on the new Hong Kong airport financial consultancy before the opening of the Hong Kong International Airport, AsiaWorld Expo, Sky City Hotel, Ocean Park, the securitisation of government-owned toll tunnels and bridge in Hong Kong, as well as acquisition financing for BAA Airports in the United Kingdom.



### Work Scope

HSBC was commissioned to assess AAHK's financial capability to undertake two development options: the two-runway option and the three-runway option. The work involved was as follows:

- Evaluate the financial model and the assumptions in MP2030 to ensure the validity of the projections;
- Assess the financial feasibility of MP2030 by performing analytical tests and sensitivity analyses;
- Quantify the amount of funding required to undertake the implementation of MP2030;
- Advise AAHK on whether it has the financial resources to complete MP2030 implementation; and
- Consider and analyse the feasibility of different financing options for MP2030 implementation.

### **Advice from the Airport Community**

**1.18** AAHK has sought advice from the airport community through the Airport Infrastructure Planning and Development Users Working Group (AIPDUWG). AIPDUWG comprises representatives from the Board of Airline Representatives, Airline Operators Committee, Carrier Liaison Group, airlines, Hong Kong Airport Service Providers Association, Civil Aviation Department, Hong Kong Airline Pilots' Association, passenger services handling agents, ramp handling operators, general and express cargo terminal operators, general aviation, maintenance services providers and in-flight catering services providers. Throughout the master planning process, the AIPDUWG held regular meetings to discuss potential operational and technical issues related to HKIA's further development. The Working Group's comments and suggestions are invaluable for the safe and efficient design of future airport facilities.