

**For discussion  
on 17 March 2008**

**Legislative Council Panel on Economic Development**

**Consultancy Study on Hong Kong Airspace and Runway Capacity**

**Purpose**

This paper briefs Members on the findings and recommendations of the consultancy study on Hong Kong airspace and runway capacity, and the way forward in implementing the recommendations.

**Background**

2. Under the progressive liberalization policy, Hong Kong's aviation sector has been growing rapidly. Since the opening of the Hong Kong International Airport (HKIA) in 1998, actual air traffic volume at HKIA has grown by 81% to reach a total of 295 600 aircraft movements in 2007, or a daily average of 810 movements, which well exceed the 202 200 movements forecast for 2005 in the 1991 New Airport Master Plan. Much of the day-time aircraft movement slots at HKIA have been used up<sup>1</sup>, thus giving rise to calls for action on the part of the Government to increase our runway capacity.

3. To support the rapid growth in the demand for air traffic, the Administration has been working on various fronts to enhance the air traffic control (ATC) capacity with a view to enhancing the runway capacity. The Civil Aviation Department (CAD) has been enhancing its ATC capacity and efficiency through improving its ATC equipment, recruiting and training more controllers as well as streamlining flight procedures and applying new ATC technology. To cope with demand, the Government announced in May 2007 that the runway capacity would be increased gradually from the then 54 movements/hour to

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<sup>1</sup> For example, in December 2007, 95% of the aircraft movement slots at HKIA during 10 am to 7 pm were used up.

58 movements/hour in 2009, which will amount to a potential increase of 420 weekly movements during the peak hours<sup>2</sup>, or about 21 000 movements every year.

4. On 27 February 2008, the Financial Secretary announced in the 2008 Budget Speech that with the support of the Airport Authority (AA) and the industry, the Government was confident that the runway capacity at HKIA could be gradually increased to 68 movements/hour by 2015. To achieve this, CAD will reform its existing ATC philosophy, improve the flight procedures and operations, and review its ATC-related manpower resources. These measures have been derived from the recommendations of a consultancy study, the details of which are set out in paragraph 5 below.

### **The Consultancy Study**

5. To further enhance our runway capacity, CAD and AA commissioned the National Air Traffic Services of the United Kingdom, the consultant, to study the Hong Kong airspace and runway capacity in July 2007. The study, which was completed in December 2007, has made a total of 46 recommendations on enhancing the capacity of the existing two runways. The consultant estimated that with the successful implementation of the recommendations, the maximum runway capacity of the existing two runways could reach 68 movements/hour. The 46 recommendations are set out in the **Annex**, and the key ones are summarized as follows –

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<sup>2</sup> From 9:00am to 0:00 midnight.

(a) *Change in ATC Operating Philosophy*

Currently, the air traffic controllers are offered a high degree of flexibility in handling aircraft movements for a more liberal use of airspace. While the current operations can meet the existing traffic demand, CAD should adopt a more systemised and standardised approach<sup>3</sup> in its ATC operations with a view to enhancing and sustaining its air traffic handling capacity in the long term;

(b) *Restructuring of enroute airspace and terminal area operations*

The airspace should be re-sectorised and the number of inner holding stacks<sup>4</sup> should be increased to absorb traffic delays and alleviate the workload of the controllers handling enroute traffic<sup>5</sup>;

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<sup>3</sup> For example, at present, the air traffic controllers can flexibly adjust the heading, speed and descend profile of arriving aircraft so as to achieve the optimum arrival sequence for approach to land. This approach is particularly useful in accommodating shortcuts of aircraft. In order to achieve a greater traffic throughput, the consultant recommends that a more regimented ATC approach be adopted where the flight path, descend profile and final approach speed of arriving aircraft will be largely standardised so as to maximise the throughput of the same limited airspace.

<sup>4</sup> An arrangement where aircraft are kept in vertically separated race track holding patterns over the same position to absorb arrival delays.

<sup>5</sup> Those aircraft which have reached cruising level enroute to its destination.

(c) *Establishment of air traffic flow and capacity management position*

The new position should be created to enhance the existing local flow control arrangement<sup>6</sup> by monitoring and taking into account the tactical and strategic flow management arrangements in the PRD region;

(d) *Improvement in flight operational practices*

CAD should engage major airline operators in developing a set of agreed flight operational practices to reduce runway occupancy time, and standardise inbound and outbound speed regime with ‘batching’ of aircraft of similar weight categories to minimise wake turbulence spacing<sup>7</sup>, thus maximising the capacity of a given runway;

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<sup>6</sup> Flow control whereby the number of aircraft flying through a certain air route is restrained may be imposed by an air traffic control authority for safety reason on occasions such as adverse weather and inadequate handling capacity at the receiving airport. Given the airspace congestion problem in the PRD region, flights from Hong Kong have suffered from flow control imposed by the nearby authorities from time to time and CAD needs to adopt corresponding local flow control arrangements when such occurs.

<sup>7</sup> Wake turbulence is a phenomenon resulting from the passage of an aircraft through the atmosphere. Each aerofoil section (the wings on an aircraft) generates vortices as it moves through the air. To minimize the effect of this turbulence on the following aircraft, the International Civil Aviation Organization stipulated the minimum physical distance (nautical miles) or time (seconds) separation to be provided by ATC between each weight category of aircraft.

- (e) *Implementation of fully independent operations of the current two runways*

The present number of achievable runway movements is based on the two runways operating independently of each other, i.e. the north runway used for arrival and the south runway for departure. However, during inclement weather conditions, a dependant mode of operations<sup>8</sup> has to be introduced to cater for the eventuality of the arrival aircraft on the north runway having to carry out a missed approach procedure. The consultant is now investigating the possibility of revising the current missed approach procedure for the north runway to reduce the occasions for the dependant mode of operations which would cause a reduction in movement rate. This separate study will be completed in mid-2008;

- (f) *Provision of additional aircraft parking stands and improvement to airfield infrastructure*

The current number of frontal stands should be increased to reduce the need for towing aircraft around the apron with a view to minimizing the disturbance caused to the departing aircraft in the airfield;

- (g) *Enhancement of ATC staff strength and sickness cover*

In order to cater for a higher traffic load, sufficient ATC staff should be provided to cater for extended operating hours and sickness replacement; and

- (h) *Establishment of additional control positions*

To handle the expected traffic increase, additional operational positions should be established in both the terminal and enroute areas within the Hong Kong Flight Information Region.

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<sup>8</sup> A mode of operation whereby the use of one runway for take off or landing is dependent on the movement/position of aircraft using the other runway. This is due to possible conflicts between flight paths taken by aircraft using each runway.

## **Way Forward**

6. The enhancement of the runway capacity at HKIA requires the full cooperation of all the stakeholders. CAD is making preparations for integrating by phases the consultant's recommendations into its operations, and will work hand in hand with all stakeholders to coordinate the new ATC operating philosophy and operating procedures. It will also work with AA to improve the airfield infrastructure to support the anticipated traffic increase. The industry was consulted on the initial findings of the study in November 2007 and will be consulted on the implementation of the recommendations on 12 and 14 March 2008. The Aviation Development Advisory Committee was also briefed on the findings and recommendations of the consultancy study on 7 March 2008.

7. In the long run, it is important that HKIA can further increase the runway capacity to meet the forecast air traffic growth. In this regard, AA will start within 2008 studies on the engineering and environmental feasibility of building a third runway. Meanwhile, CAD will continue to liaise with the civil aviation authorities of the Mainland and Macao with a view to improving the use of airspace and the co-ordination of air traffic management in the Pearl River Delta region, which should also help further enhance our runway capacity.

## **Resources Implications**

8. In terms of hardware, the Administration has obtained funding approval of \$1,565 million from the Legislative Council for the replacement of the existing ATC system by end 2012, which will significantly enhance CAD's ATC handling capacity. Staffing-wise, it is envisaged that we would need additional air traffic management posts to implement the recommendations by the consultant. We are working out the required manpower resources which will be sought through the established procedures.

**Advice Sought**

9. Members are invited to note and comment on the contents of this paper.

**Transport and Housing Bureau  
Civil Aviation Department  
10 March 2008**

<b>Recommendations</b>	
<b>1 HK Airspace Restructuring</b>	
R2:	Review sectorisation to segregate overflying traffic from inbound/ outbound flights.
R3:	Establish a new en-route sector to be positioned over the northern section of the HK Flight Information Region (HKFIR).
R4:	Establish a high level sector to control overflying traffic of the HKFIR.
R5:	Review internal HKFIR route structure associated with new holding stacks, Standard Instrument Departures (SID) and Standard Terminal Arrival Routes (STAR).
R9:	Coordinate with adjacent Area Control Centre (ACC) the proposed establishment of a South East Asian air traffic flow management unit.
R11:	Establish Terminal Control Area (TMA) inner holds for Hong Kong traffic.
R18:	Establish a new hold for Macau.
R21:	Review the design of airspace to segregate arrival and departure streams.
<b>2 Air Traffic Standards &amp; Procedures</b>	
R1:	Introduce a more systemised operating environment within the HKFIR as described in the rest of the recommendations.
R7:	The current standing agreements principles between sectors should be further developed.
R13:	Development of standardised approach spacing
R14:	After discussion with local operators, implement a standardised speed regime.
R15:	In the existing environment, develop a standardised radar circuit and improve transfer between Approach (APP) and Final Approach Director (FAD) to assist in achieving accurate spacing.
R16:	Further develop the approach environment in line with the other airspace developments such as inner holds and an approach corridor.
R17:	Develop approach procedures that allow the landing rate to be maximised during inbound peaks.
R19:	Urgently develop procedures to remove inbound traffic from the departure position.
R20:	Implement a standard outbound speed regime.
R22:	Conduct a review of the existing go-around procedures to determine what changes are required to enable them to be considered as fully independent.



<b>3 Air Traffic Operations and Staff Resource</b>	
R6:	Establish a robust set of triggers for the combining and splitting of sectors.
R8:	Establish an air traffic flow and capacity management position in Hong Kong.
R10:	Establish a separate TMA Stream of controllers.
R12:	Establish and educate staff in a standardised approach environment.
R23:	Review of the modes of operation, based on the application of independent segregated mode and the types of operation felt to be most appropriate to Hong Kong.
R25:	Declare airport capacity on an hourly basis taking into account operational demand, mix of aircraft types, operational positions available and all other relevant factors.
R26:	Review Ground Movements Controller North (GMN) and Ground Movements Controller South (GMS) hours of operation, in particular during the evening period.
R29:	Regularly review Ground Movements Controller (GMC) capacity, including towing to ensure that GMC workload is within acceptable limits and suitably balanced.
R30:	Review the use of taxiways for departures to minimise GMC workload while maximising flexibility for Air Movements Controller (AMC) to achieve the optimum departure sequence.
R32:	Consider the requirement for a third GMC as part of any midfield development.
R33:	Consider providing a full time Situation Data Display (SDD) on GMC.
R34:	<p>Continue the desk redesign process to improve the visibility from the control positions. Extend the scope of the work to:</p> <ul style="list-style-type: none"> <li>▪ Examine the positions of the desks in order to maximise the visibility of important locations on the airfield;</li> <li>▪ Review the benefits of bridging over the walkway;</li> <li>▪ Consider the inclusion an assistants position alongside GMC;</li> <li>▪ Ensure that data transfer is acceptable, possibly by the use of “shoots” between positions.</li> </ul>
R39:	Introduce a new Approach position to control the inner stacks.
R40:	Review the opening hours of positions in the light of the increased traffic and of changes to operational roles.
R42:	Develop an implementation plan for the proposed changes, including evaluation and training requirements.
R43:	Develop a systemised ATC operational environment and foster a uniform “Hong Kong” method of operating.

R41:	Ensure that sufficient sickness cover and staffing contingency is provided to enable service delivery to be maintained as far as reasonably possible.
R44:	Expand current competence assurance program.
R45:	Hold regular stakeholder meetings covering all areas of common interest.
R46:	Develop a plan for future work to support the implementation of these changes and establish the basis for future developments beyond the scope of this study.
<b>4 Airport Authority Infrastructure and Operations</b>	
R27:	Ensure that towing issues are integrated into future airfield developments and engage with airline operators in planning stand preferences, lounge locations, etc. to meet airline and AA objectives as far as possible while minimising the impact of towing on the operation.
R28:	Review the times of the nightly runway closures to meet the demands for traffic increases in the shoulder periods.
R35:	Continue the efforts to reduce Runway Occupancy Times (ROT) using appropriate techniques including: <ul style="list-style-type: none"> <li>▪ Regular ROT surveys and review meetings;</li> <li>▪ Pilot briefing and active attention to the problem with specific airlines;</li> <li>▪ Increase controller awareness through briefing and training of the benefits of actively intervening on the AMC positions in situations where a missed approach could be prevented.</li> </ul>
R36:	Review short term stand availability including: <ul style="list-style-type: none"> <li>▪ Possible additional use of multiple use stands;</li> <li>▪ Consider the possible use of remote holding.</li> </ul>
R37:	Urgently review the provision of additional stands for any increase in the runway declaration above the existing value of 54 movements per hour, including appropriate contingency allowances.
R38:	That AA and CAD jointly develop an operating strategy for the north apron prior to the satellite opening to maximise the efficiency of the north apron operation and to keep GMC workload balanced.
R31:	Consider the introduction of a Heathrow style Runway Holding Areas (RHAs) to minimise GMC workload and improve flexibility for AMC.
R24:	Review possible enhancements to the airfield and airspace operation and that AA, CAD and operators jointly agree a 5-7 year program of implementation, together with staged increases in capacity as the enhancements become available.