

For Information

Legislative Council Subcommittee to Follow up Issues Relating to the Three-runway System at the Hong Kong International Airport

Motion Passed at the Meeting on 12 April 2016

Introduction

At the Subcommittee meeting held on 12 April 2016, the following motion was passed –

“As the overall runway capacity of the Hong Kong International Airport (HKIA) under a Three-runway System (3RS) operation was based on the Pearl River Delta (PRD) Region Air Traffic Management Planning and Implementation Plan (Version 2.0) (the 2007 Plan) signed by Hong Kong, the Mainland and Macao, this Subcommittee requests the Government to provide this Subcommittee with the content of the 2007 Plan concerning the basis for coming up with 102 air traffic movements per hour.”

This paper sets out the Government’s response.

Background

2. The National Air Traffic Services (NATS)¹ was commissioned by the Airport Authority Hong Kong in 2008 to conduct the Airspace and Runway Capacity Study (ARCS) to assess the maximum practical hourly capacity of the 3RS.

Basis for runway capacity derivation of the 3RS

3. The runway capacity of HKIA under 3RS is determined by a number of factors: surrounding terrain, minimum separation between aircraft operating on the runways, the mode of operation of each runway

¹ NATS is a British aviation expert consultant.

which may be arrivals only (A), departures only (D) or mixed mode (MM) comprising arrivals and departures.

4. Taking into account HKIA's special circumstances (for example, the surrounding terrain constraint, congested airspace, the aircraft mix at HKIA, etc.) and the need to comply in full with the International Civil Aviation Organisation (ICAO)'s safety and minimum separation requirements, NATS calculated the potential runway capacity for each of the three runways considered individually.

5. After studying various possible modes of operations, NATS concluded that the primary mode of operations of the 3RS should be the one offering the highest balanced capacity between Departures and Arrivals, which would see the North/Centre/South runways operating in A/D/MM respectively, giving 33 + 35 + 34 movements per hour, i.e. a total of 102 movements per hour. This is the highest balanced capacity that can be achieved for the 3RS under independent operation. The full ARCS Reports, which were made public in July 2011, can be accessed via HKIA's website: http://www.threerunwaysystem.com/tc/Information/Consultancy_reports.aspx. Paragraphs extracted from the ARCS reports which are of particular relevance to the above are at Annex A.

6. In summary, the maximum practical hourly capacity of the 3RS, i.e. 102 movements per hour, was derived by NATS via the ARCS in 2008, which had taken into consideration the projected flight tracks anticipated in the 2007 Plan. The projected flight tracks extracted from the ARCS Reports can be found in Annex B.

Civil Aviation Department
May 2016

Extracted from NATS ARCS Phase 1b Report

11 STAGE 3: THREE RUNWAY OPERATIONS

11.1 Initial Investigation of Modes of Operation

The modes of operation are described for each runway from North to South.

Mode of Operations may be Arrivals only (**A**), Departures only (**D**) or Mixed Mode Arrivals and Departures (**MM**).

For a 3-runway airport each runway is, in theory, capable of operating in one of these three modes, resulting in 27 potential operating modes. These 27 modes have been placed in a table and each mode evaluated for operability and capacity. At the end of this process a number of core operating modes are identified as suitable for further investigation.

11.2 Detail Review of Modes of Operation for each Runway Option

The three runway options (including variants) have been assessed based on the modes of operation selected from the initial review. The issues have been identified and a number of mitigation measures have been proposed. The capacity of each mode of operation, after implementation of these mitigations has then been assessed.

The review has been undertaken by developing a table for each runway option, for each mode of operation and in both the Runway 25 and the Runway 07 directions. The SOIR compliance issues in respect of parallel approaches, departures, missed approaches and wake vortex are identified in each case. Possible mitigations are then proposed where appropriate and considered to be viable.

Each table contains an assessment of the potential capacity of the airport operating in the chosen mode of operation on the assumption that the issues have been resolved. A final table for each option describes the primary mode of operation and the actual capacity that is likely to be achieved. Due to the significant and complex nature of the issues, particularly the interaction between the various issues, these capacity figures may be significantly lower than the theoretical maximum capacity.

The detailed review and the tables developed are contained in Appendix B.

The result of this is a review of the development of a recommended mode of operation for each runway option. This includes a recommended primary mode of operations where arrival and departure capacities are generally balanced. Modes of operation to deal with arrival and departure peaks are also recommended.

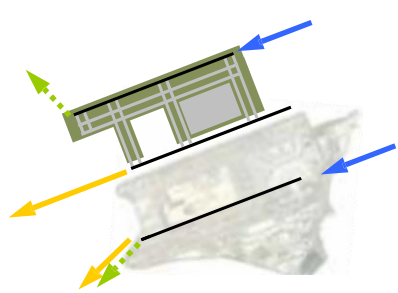
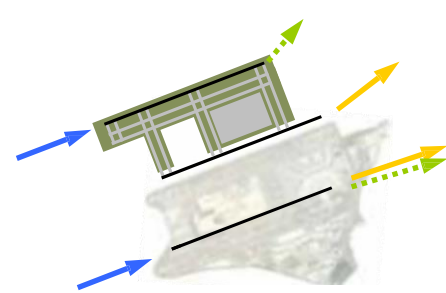
A summary of the review and these recommended modes are described below together with the mitigations that are required to operate these modes, and the capacity achieved with the mitigations in place.

11.3 Summary of the Review of Options P and R

Options P and R have the lowest number of SOIR compliant and operational issues. The outer runways are far enough apart to support Independent Parallel Operations using the proposed breakout manoeuvre. The arrival capacity of the dedicated arrival runway (07L/25R) has been assessed as 33 arrivals per hour for compatibility with the rest of the report. In practice, the improved consistency and reduced contingency margins proposed for two runways in segregated mode could also be applied to this runway which might result in the achievable arrival rate being slightly higher (up to around 36 arrivals per hour).

Significant issues that remain are the ability to apply 15 degrees separation between the missed approach and the SID tracks and the fact that the SIDs and missed approaches, while providing the required track separation, both turn in the same direction. A specific safety case is required to support these operations.

The analysis of Options P and R indicate that Mode 9 (MM/D/A) is the highest capacity mode. However, it requires a SID from Runway 07L that turns left by 30 degrees, and this creates a significant conflict with the Shenzhen circuit. As a result, Mode 9 is not recommended in the Runway 07 direction. This problem does not exist in the Runway 25 direction, as the Runway 25C SID can climb straight ahead, or turn only 15 degrees right, depending on the separation required from Runway 25L. Operating Mode 9 in one direction only does not provide any increase in the declared capacity, as only the lowest capacity can be declared. Operating different modes in each direction creates operational difficulties when changing runway direction and further complicated the process of terminal and runway allocations. As a result, Mode 23 is recommended as the primary mode of operations in both runway directions.

Options P & R		Mode 23 A/D/MM		Runway Separation 2240/1525m
RECOMMENDED PRIMARY MODE OF OPERATION				
Runway 25 Direction		Runway 07 Direction		
				
Runway	Use	Capacity	Arrivals	Departures
25R/07L	Arrivals	33/36*	33/36*	-
25C/07C	Departures	35	-	35
25L/07R	Mixed	34	17	17
Total		102/105*	50/53*	52

*Note: up to 36 arrivals and total capacity up to 105 movements per hour with the reduction in contingency in the arrival spacing.

Note:

Option P – Wide Spaced Parallel Runway (2240m) Offset to the West

Option R – Parallel Runway at 1525m Offset to the West

Projected Flight Tracks for 3RS in NATS Report

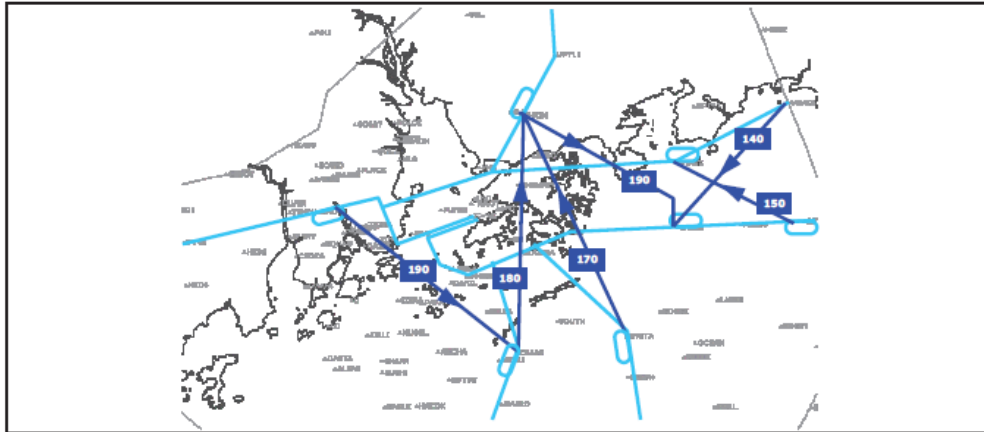


Figure 3.2 Suggested Airborne Crossover Tracks – Easterly Arrivals

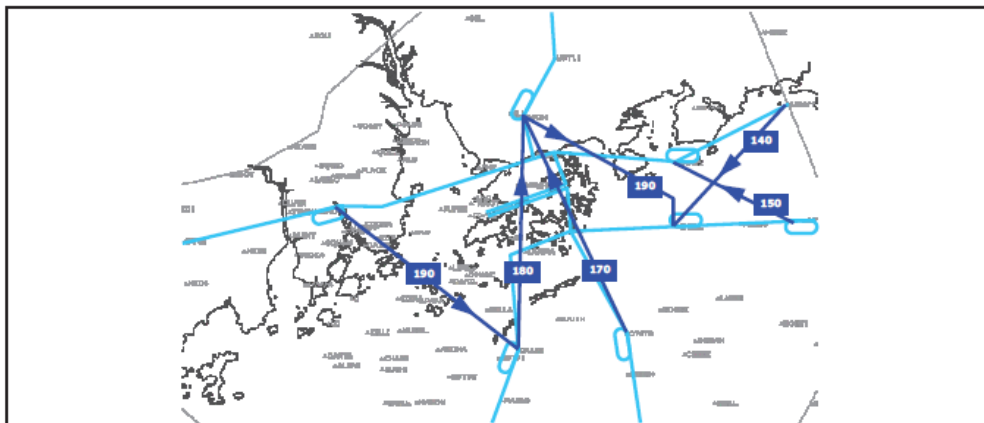


Figure 3.3 Suggested Airborne Crossover Tracks – Westerly Arrivals

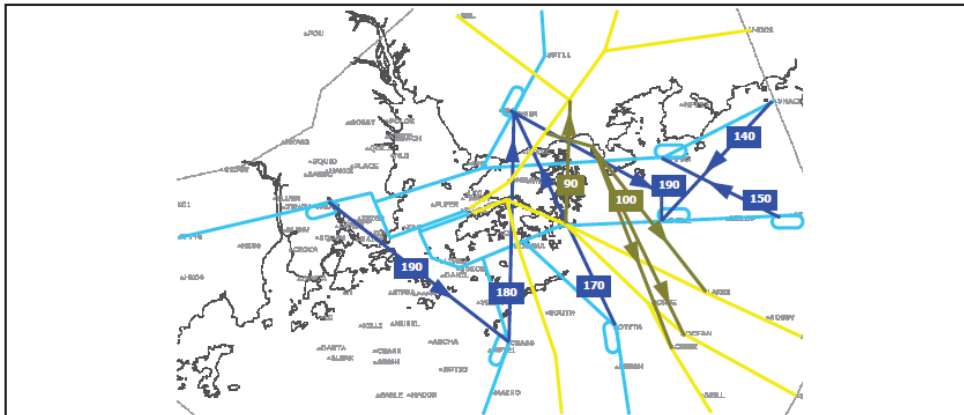


Figure 3.4 Airborne Crossover Tracks - Easterly Departures

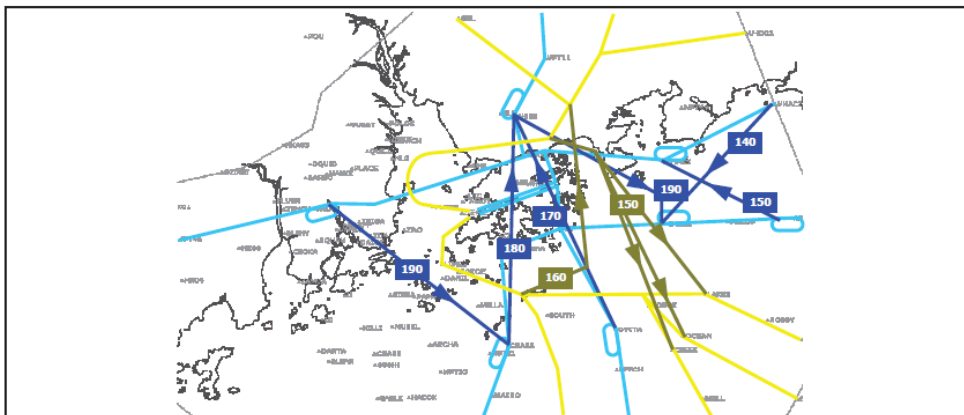


Figure 3.5 Airborne Crossover Tracks - Westerly Departures