

## EXECUTIVE SUMMARY

The need for additional airport and airspace capacity is a worldwide issue within aviation. In an expanding industry, there are significant requirements for growth and improvements across all areas of both Airport and ATC operations. Hong Kong International Airport is strategically located within the rapidly growing South East Asian area and has a significant need to address the projected growth in both traffic and passengers. Whilst the airfield operation is the obvious starting point for capacity assessment, the surrounding airspace and procedures must complement the increase in traffic. There are many examples around the world where airport capacity has been compromised by airspace constraints.

This report conducted by NATS is, therefore, wide ranging and should be considered as a series of integrated issues which require careful planning. The recommendations, ideas and proposals should not be viewed in anyway as a criticism of the current operations and procedures in current use. The current operation is very effective and is able to react to unusual circumstances e.g. adverse weather conditions. The proposals contained in this report reflect the views and thoughts of the NATS' team based on their experience and knowledge in busy En-route, TMA and airport environments and supported by analytical analysis conducted with the TAAM Fast-Time Simulator. It is the view of the consultants that the existing airspace system, as currently configured, is close to capacity. This report should therefore be viewed as an opportunity to identify the issues that will need to be addressed in order to move the airport and surrounding airspace forward with a step change to a new, high intensity, operation. Some of the recommendations are also seen as building blocks that will provide a firm foundation for further developments including reorganisation of the Pearl River Delta airspace and the possibility of a third runway at Hong Kong International Airport.

The Hong Kong airspace is complex and the ATC and airfield operations complicated. The limitations identified in this report mean that, without change, the current system will not be able to cope with the predicted traffic growth at the airfield or in the Pearl River Delta area. A fundamental change is therefore required. However, as traffic levels increase further the system needs to be able to cope with unusual situations without compromising, as far as possible, traffic throughput. The recommendations contained in this report reflect the next stage in the development of Hong Kong International Airport – in terms of both the airport and the ATC - and include environmental and economic factors which are shaping the industry worldwide. Headline recommendations on the key issues to be addressed are given below. These are expanded with specific recommendations in each section of this report. A high level draft implementation plan is provided.

This study identifies operational and ATC system changes to facilitate increases in airfield and airspace capacity. Subject to independent operations being established and the recommended operational and airspace changes being implemented, increases in HKIA movements will be possible up to a level of 68 movements per hour. It is recommended that hourly capacity declarations should be considered based on the operational requirement. NATS considers that, through further enhancements to the wider airspace and operational procedures, runway utilisation in excess of 68 movements per hour may be possible; however, this needs to be considered within the scope of a wider review of the PRD airspace as is currently planned. It must be noted that many of the recommendations given herein will require further work and must be subject to a full safety assessment.

This report has been compiled by NATS' Operational Experts and their local TAAM expert in Hong Kong. The team wish to acknowledge the excellent assistance and full support in all aspects of their work by the Civil Aviation Department of Hong Kong and the Airport Authority management, the CAD Evaluation Unit and the ATC watch members who have contributed to the understanding of the day-to-day operations. They have provided all information requested and contributed fully in the explanation and subsequent debate in the many complicated and interrelated issues that need to be discussed and understood when studying capacity issues.

## HEADLINE RECOMMENDATIONS

- In order to raise the capacity of Hong Kong airspace a fundamental change in the operating philosophy is recommended. The move towards a more systemised mode of operation will have significant capacity benefits to Hong Kong International Airport and the surrounding airspace whilst permitting a more segregated operation for transit traffic to adjacent Pearl River Delta airfields.
- Similarly, the impact on the airline operators should also be part of the discussion process. The proposed operating philosophy requires full co-operation from all parties, especially pilots and ATC controllers via their respective management processes.
- It is strongly recommended that the changes to operating methodology, sectorisation and airfield procedures proposed in this document are supported, where appropriate, by Real-Time Simulations, safety analysis and an assessment of future equipment requirements.
- Sufficient support staff should be made available to conduct the required training and implement the recommended changes into operational use. Experience in the UK has shown that the lack of resources to implement change can result in poorly written instructions, inadequate training and implementation problems.
- This report recommends a staffing review to assess the staffing requirements for: additional operating positions; proposed new sectors and functions; longer opening times for some of the current positions. This needs to be supported by a robust sickness cover regime to guarantee sustainability of service.
- It is proposed that a phased introduction of changes would complement all the above issues, including discussions with adjacent authorities, assimilation of new principles, training and utilisation of support staff. A proposed staged implementation plan is outlined.
- The geographical position of the Hong Kong FIR in South East Asia means that it is a critical area for the increasing number of international flights, especially in the growth of low cost operators. It is therefore recommended that a South East Asian Traffic Management Unit, similar to the European centre in Brussels, is established to assist day to day tactical and longer term strategic operations. The adverse weather conditions in the area at certain times of the year results in disruption to services over a large area and it would seem logical to use Hong Kong as the focal point for such a unit given its strategic position. This should be complemented by a Hong Kong ATM Management position which oversees operations at the airport and for management of traffic overflying the FIR.
- In the long term consideration should be given to steps to support further development in the Pearl River Delta area. The proposed change in operating philosophy should be complemented by detailed discussions with Macau and Chinese mainland authorities as well as the other adjacent ATC authorities which surround Hong Kong airspace. This should also include possible airspace sharing arrangements, combined Approach control facilities and a review of the route structure to and from the Hong Kong FIR.

## RECOMMENDATIONS

- R1:** Introduce a more systemised operating environment within the HKFIR.
- 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 FIR.
- R4:** Establish a high level sector to control overflying traffic of the HKFIR.
- R5:** Review internal HKFIR route structure associated with new holding stacks, SIDs and STARs.
- R6:** Establish a robust set of triggers for the combining and splitting of sectors.
- R7:** That the current standing agreement principles between sectors should be further developed.
- R8:** Establish an air traffic flow and capacity management position in Hong Kong.
- R9:** Coordinate with adjacent ACCs the proposed establishment of a South East Asian air traffic flow management unit.
- R10:** Establish a separate TMA stream of controllers.
- R11:** Establish TMA inner holds for Hong Kong traffic.
- R12:** Establish and educate staff in a standardised approach environment.
- 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 APP and 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.
- R18:** Establish a new hold for Macau.
- R19:** Urgently develop procedures to remove inbound traffic from the departure position.
- R20:** Implement a standard outbound speed regime.
- R21:** Review the design of airspace to segregate arrival and departure streams.
- 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.
- R23:** Review of the modes of operation, based on the application of independent segregated mode and the types of operation (ICAO or NATS style spacing) felt to be most appropriate to Hong Kong.
- R24:** Review possible enhancements to the airfield and airspace operation recommended in this report and that AAHK, CAD and operators jointly agree a 5-7 year program of implementation, together with staged increases in capacity as the enhancements become available.
- 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 GMN and GMS hours of operation, in particular in the evening.
- 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 airport authority 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.
- R29:** Regularly review GMC capacity, including towing to ensure that GMC workload is within acceptable limits and suitably balanced.
- R30:** Consider the use of taxiways for departures to minimise GMC workload while maximising flexibility for AMC to achieve the optimum departure sequence.
- R31:** Consider the introduction of a Heathrow style Runway Holding Areas (RHAs) to minimise GMC workload and improve flexibility for AMC.
- R32:** Consider the requirement for a third GMC as part of any mid field development.
- R33:** Consider providing a full time Situation Data Display (SDD) screen on GMC.
- R34:** Continue the desk redesign process to improve the visibility from the control positions. Extend the scope of the work to:
- Examine the positions of the desks in order to maximise the visibility of important locations on the airfield;
  - Review the benefits of bridging over the walkway;
  - Consider the inclusion an assistants position alongside GMC;
  - Ensure that data transfer is acceptable, possibly by the use of "shoots" between positions.
- R35:** Continue the efforts to reduce ROTs using appropriate techniques including:
- Regular ROT surveys and review meetings;
  - Pilot briefing and active attention to the problem with specific airlines;
  - 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.
- R36:** Review short term stand availability including:
- Possible additional use of multiple use stands;
  - Consider the possible use of remote holding.
- 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 AAHK 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.
- 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.
- R41:** Ensure that sufficient sickness cover and staffing contingency is provided to enable service delivery to be maintained as far as reasonably possible.
- R42:** Develop an implementation plan for the proposed changes, including evaluation and training requirements – to include the staff required for implementation.
- R43:** Develop a systemised ATC operating environment and foster a uniform "Hong Kong" method of operating.
- R44:** Expand current competence assurance program.
- R45:** Hold regular stakeholder meetings covering all areas of common interest.
- R46:** Develop a plan of future work to support the implementation of these changes and establish the basis for further developments beyond the scope of this study.

## **CONCLUSIONS**

In conclusion, the overall outcome of the study is that there are a number of opportunities to improve the capacity of the airfield and the surrounding airspace. In order to achieve this a more systemised operation is felt to be required and the detailed recommendations in this report cover the specific aspects that need to be addressed.

In some ways it would be ideal if the new operation could be developed and introduced as a whole, but the extensive simulation, development and training requirements mean that this would not be practical. A chronologically staged approach has been outlined below. It is suggested that this plan is used as the basis for a development program covering in the order of five to seven years and designed to coincide with the changes to the airfield infrastructure, capacity and airspace demands.

It is important that all relevant stakeholders are consulted during the development of this implementation plan, a process in which NATS would be happy to assist as an independent consultant