Instrument Flight Procedure Development in CAAS with ATM Considerations

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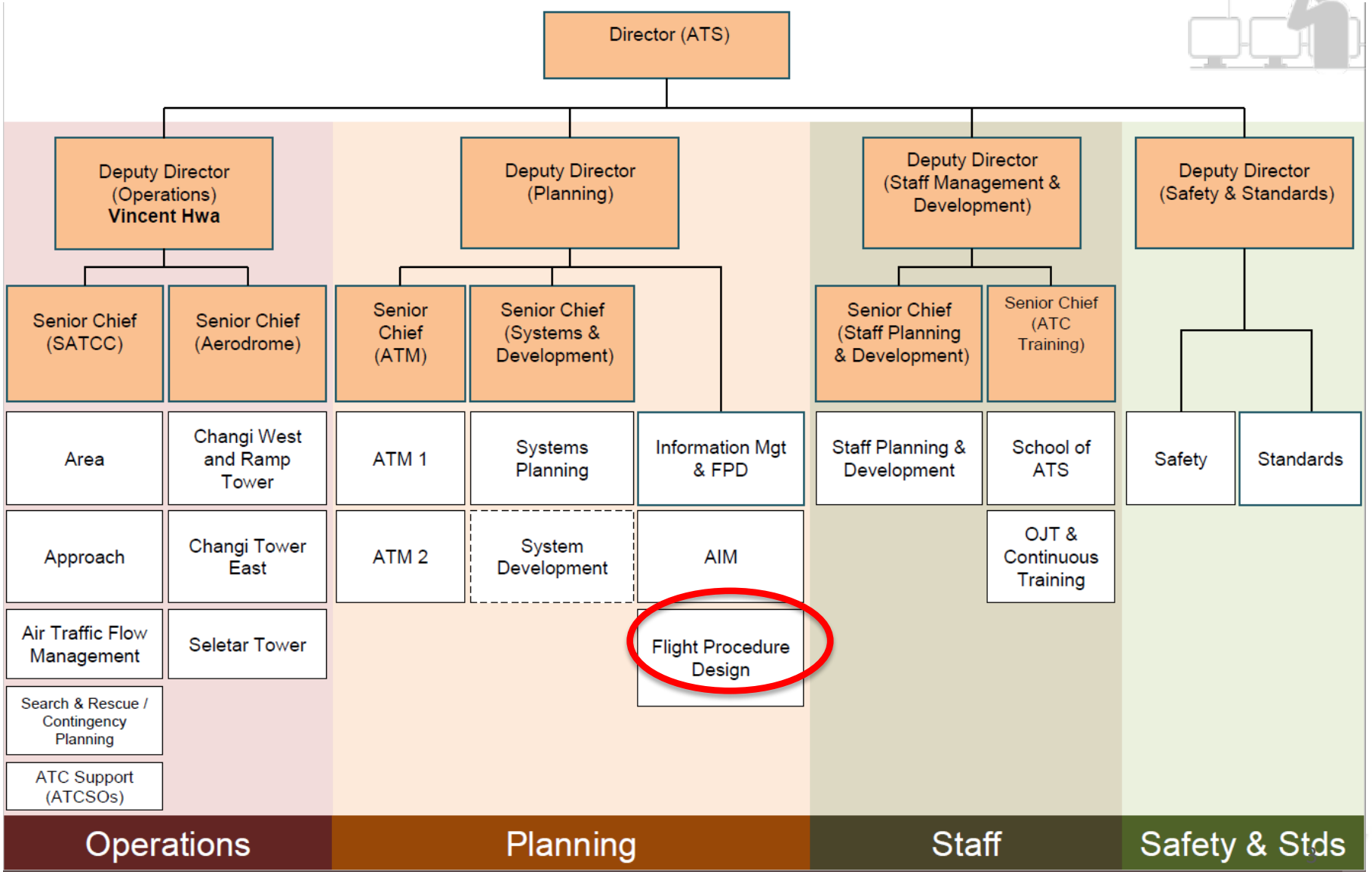
17 September 2019

CAAS
Civil Aviation Authority of Singapore

Flight Procedure Design Office (FPDO) in CAAS

Civil Aviation Authority of Singapore

Air Traffic Service (ATS) Division Organisation



Instrument Flight Procedure (IFP) Design

- Carried out by the ATS Division Flight Procedure Design Office (FPDO)
  - Staffed by 4 flight procedure designers
  - Supported by suite of software tools
  - Established processes for initiation and review of IFPs

Flight Procedure Design Office (FPDO)

- Design, validate, implement, review and document instrument flight procedures and ensure assurance in safety, integrity and accuracy of flight procedures

- Ensure compliance to ICAO Document 8168 Volume II, Construction of Visual and Instrument Flight Procedures; to achieve safe and regular instrument flight operations

- Produce instrument flight charts that results in uniform practices at all aerodromes where IFPs are carried out

- Maintain open channels of communication with Changi Airport Airline Operators/Pilots to gather feedback on service standards and expectations, with a view to improving service and meeting customers' demands

Training of Flight Procedures Designers

- Recruitment considerations based on recommendations in Doc 9906 (ATC, AIS, engineer, technician and pilots)
- Established Training Programme for Designers
  - Initial Training (e.g. attend ICAO PANS-OP Course)
  - Advance Training (e.g. RNP-AR)
  - On-the-Job Training (OJT)
  - Refresher training (table-top exercise or classroom)
- OJT focus on achieving competency elements
  - Collect, validate and incorporate electronic/paper data
  - Conceptual Design
  - Application of criteria
  - Documentation and storage of procedures
  - Ground verification and validation
  - Draft Publication

Airspace Enhancement, Review & Optimisation System (AEROS)

- Suite of tools for airspace planners
  - Geographical Information Systems (ESRI)
  - Terminal Area Route Generation, Evaluation, and Traffic Simulation (TARGETS)
  - AirTOp (Air Traffic Optimization) – Fast Time Simulation
  - LORADS III Data Warehouse
  - Electronic Terrain & Obstacle Data (ETOD)
  - Other advance/complimentary Procedure Design Software
    - FPDAM

Instrument Flight Procedure Design Processes in FPDO

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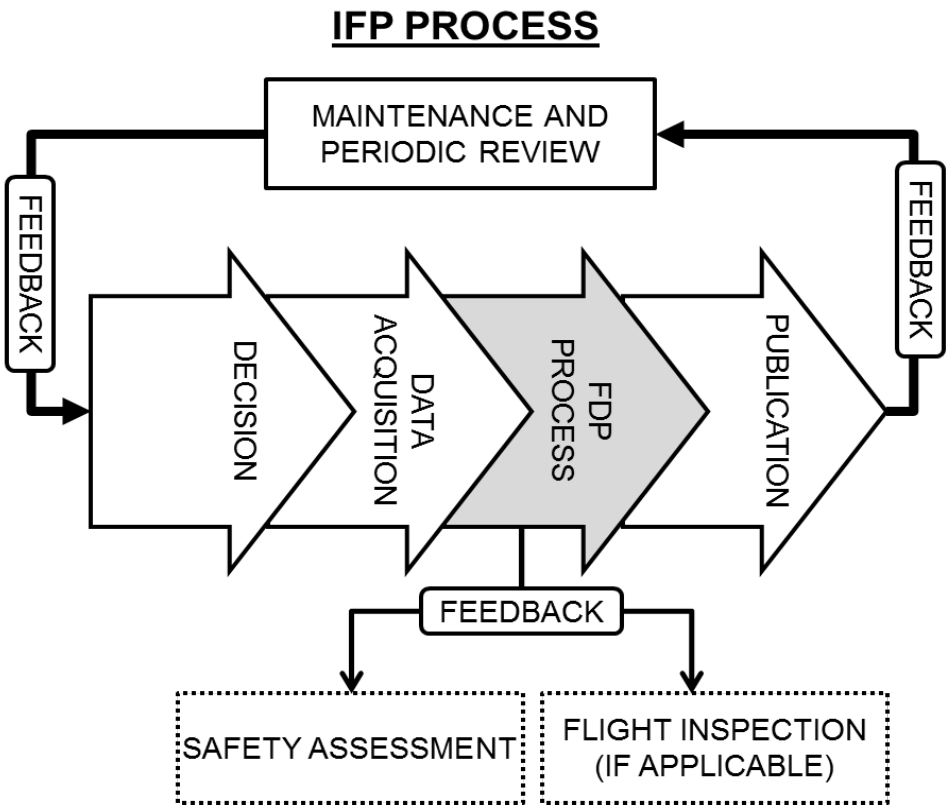
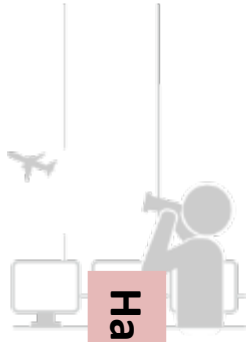
Instrument Flight Procedure Lifecycle

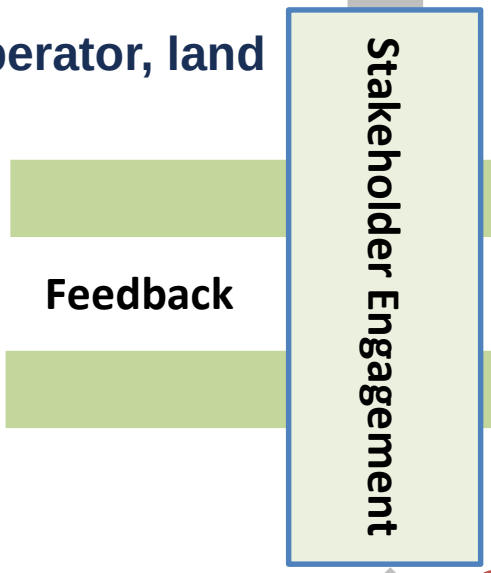
- IFP lifecycle focus on achieving quality assurance based on ICAO Doc 9906 (Quality Assurance Manual for Flight Procedure Design)
- Process regulated by national standards and requirements in Manual of Standards – Instrument Flight Procedure Design

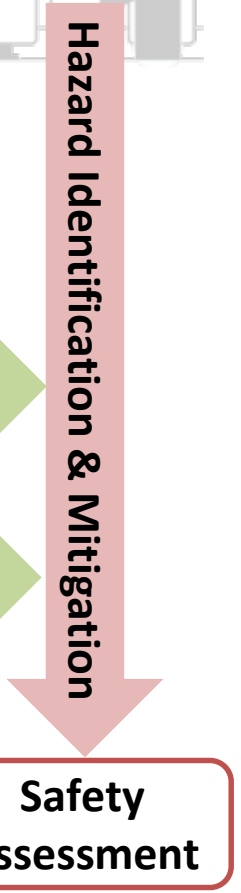


Instrument Flight Procedure Design Process

- **Initiation / Decision**
  - **Understand requirements**
- **Data Acquisition**
  - **From sources such as airport operator, land planning agency, etc.**
- **Design**
  - **Conceptual design**
  - **Application of criteria**
- **Validation**
  - **Ground and/or flight validation**
- **Publication**
  - **AIP Supplement (AIRAC)**
- **Post implementation assessment and feedback**







Stakeholders Engagement

- Who?
  - Airspace Users (Airlines, Military, etc), Airport Operator, adjacent State(s), Regulator, AIS, ATC, ATM
- When?
  - Conceptual & Formal Design, Pre-publication
  - Post implementation - Regular engagements
- How?
  - Stakeholders meetings
  - Feedbacks through Emails and meetings (Post Implementation)
- Why?
  - Understand their requirements and considerations
  - Share with stakeholders procedure limitations if any
  - IFPs are being redesigned to optimize ATM if required

Overview of Air Traffic Management in Singapore

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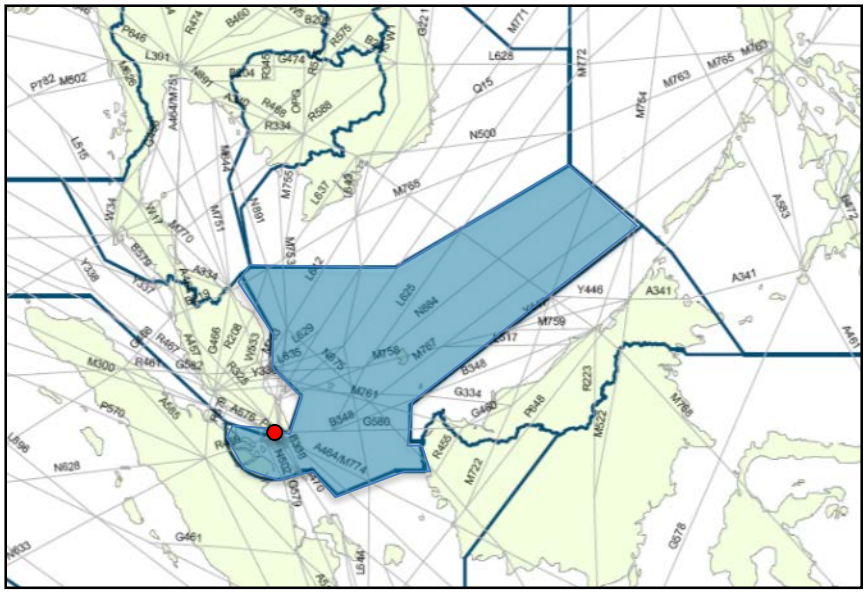
Air Traffic Management in Singapore

- Develop plans and solutions for sustainable airspace capacity to meet the traffic growth demands;
- Carry out regular study and review airspace capacity and collaborate with the ATC operational units
- Plan, coordinate and implement ATM initiatives within Singapore FIR;
- Evaluate and coordinate for regular and ad-hoc airspace reservation requests from external organisations and government agencies such as air defence exercises, maritime exercises, aerial displays etc.
- Plan, implement, review and document instrument flight procedures (FPDO)

Air Traffic Management in Singapore



245,000 NM²

(840,000 KM²)

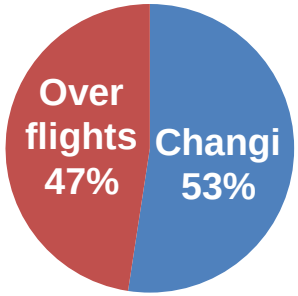
6 Contiguous boundaries with Area Control Centres

- Bangkok
- Ho Chi Minh
- Jakarta
- Kuala Lumpur
- Kota Kinabalu
- Manila

741,000

Total Movements

Changi - **391,000**



1 Area Control Centre

8 En-route Sector

1 Approach Control Centre

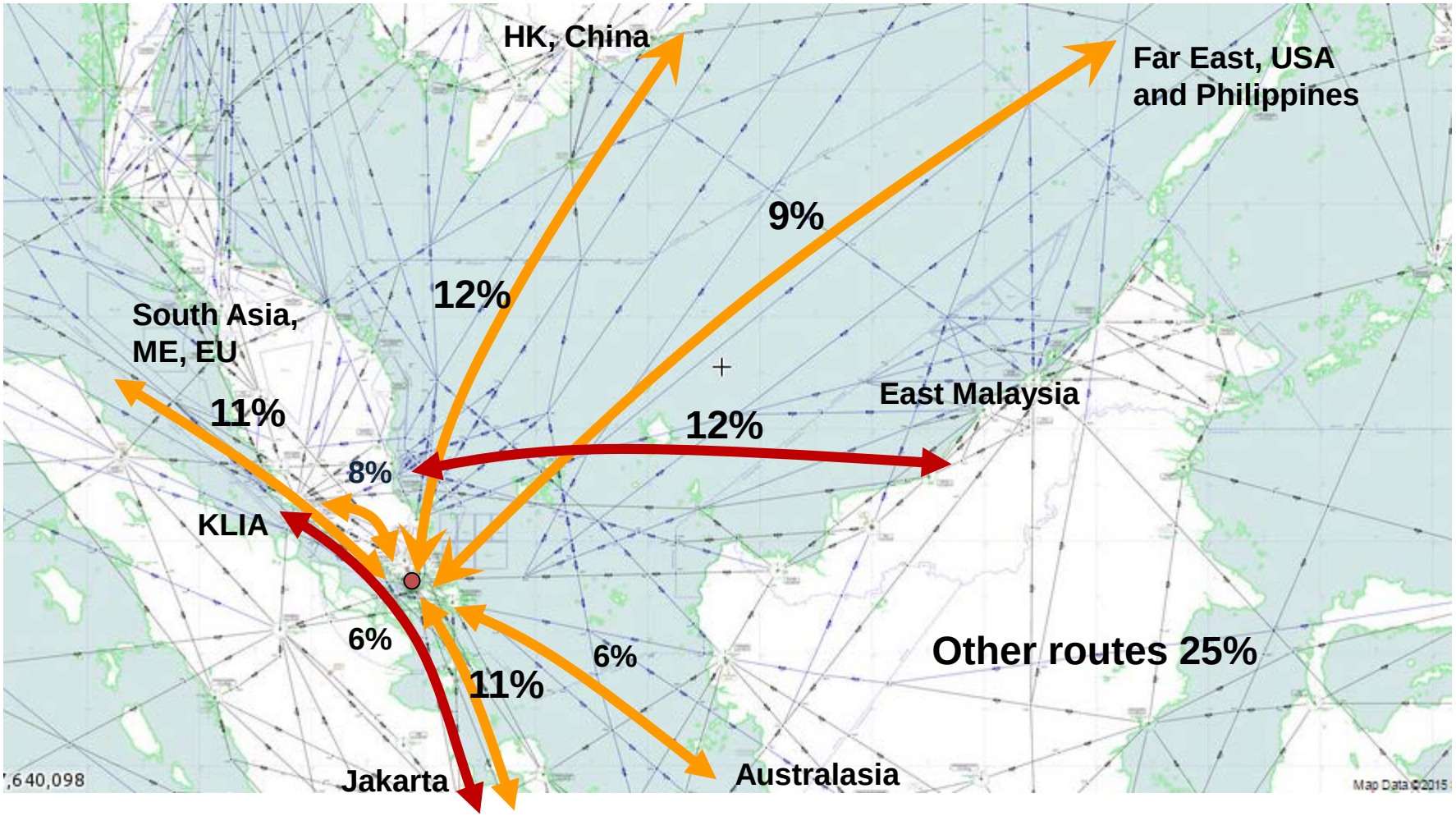
2 Air traffic control towers

- Changi
- Seletar

470

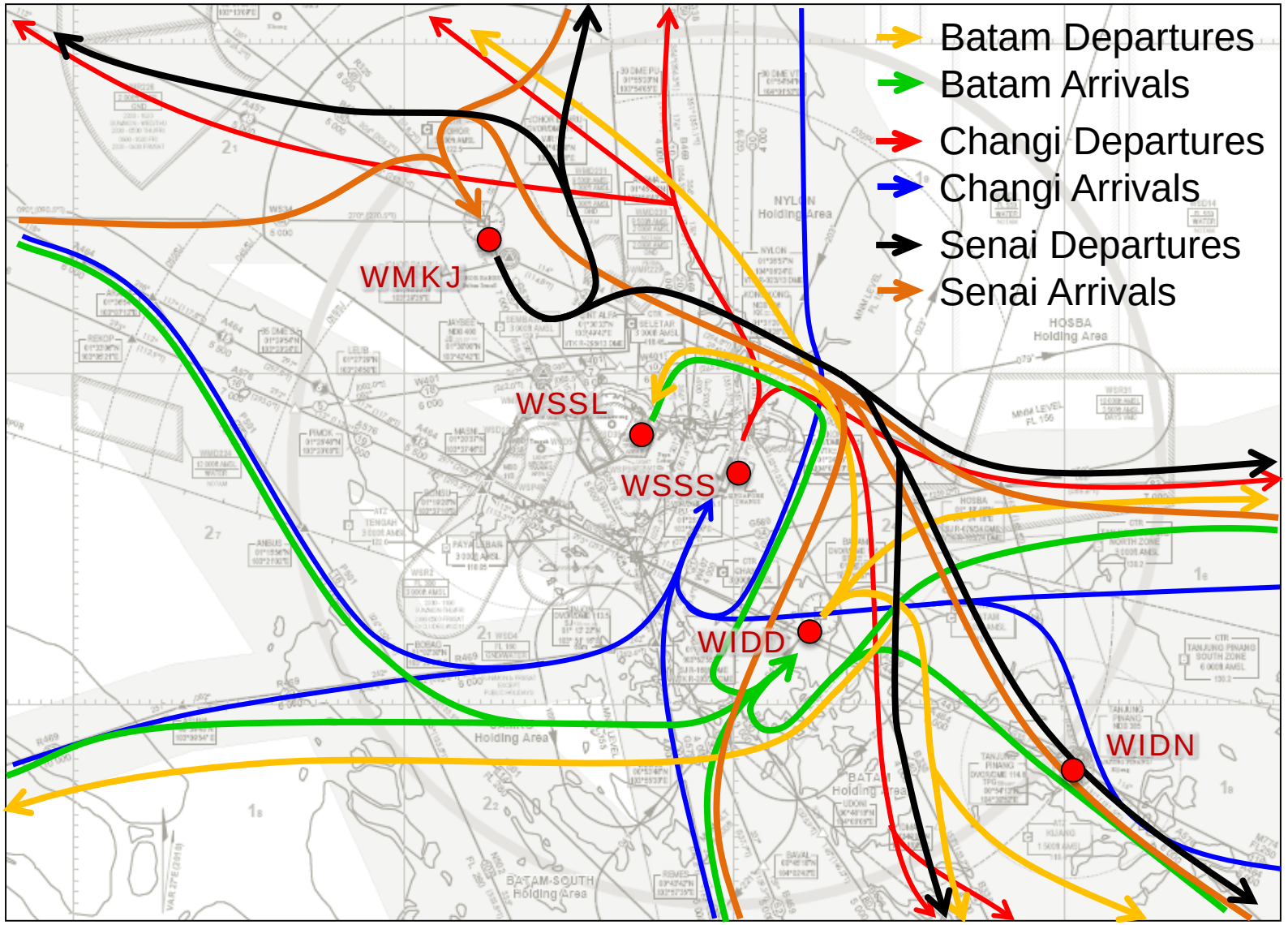
Air Traffic Controllers

Air Traffic Movements in Singapore FIR



- Based on OAG's report, the busiest international route in the world is SIN-KLIA and SIN-Jakarta

Air Traffic Movements in Approach Airspace



IFP Designed for ATM

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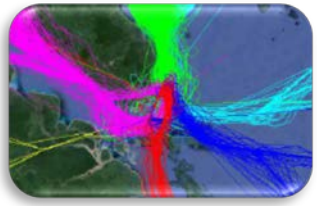
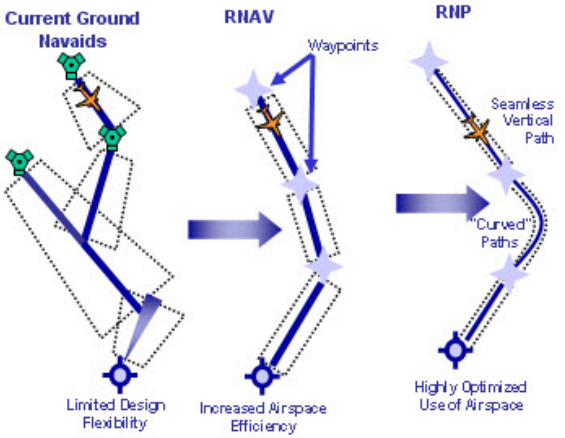
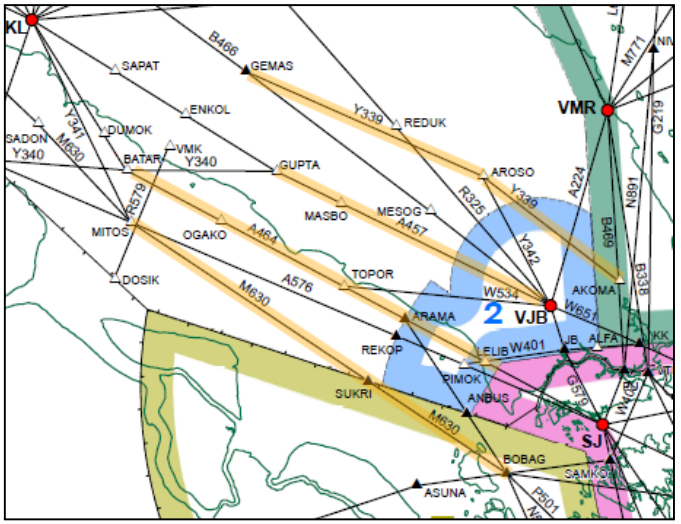


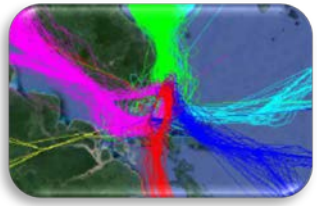
Optimising Airspace Capacity

En-route Enhancement

- Utilising Performance Based Navigation (PBN)
- Focus on high-density city pairs
- Reduce route spacing and harmonising longitudinal spacing



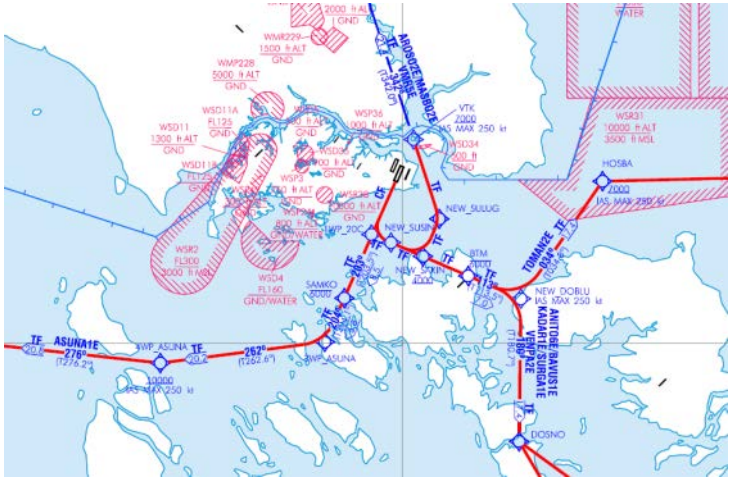


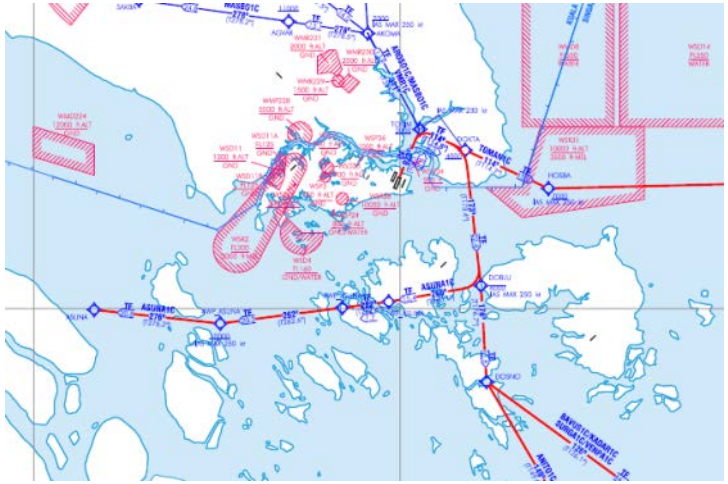


Optimising Airspace Capacity

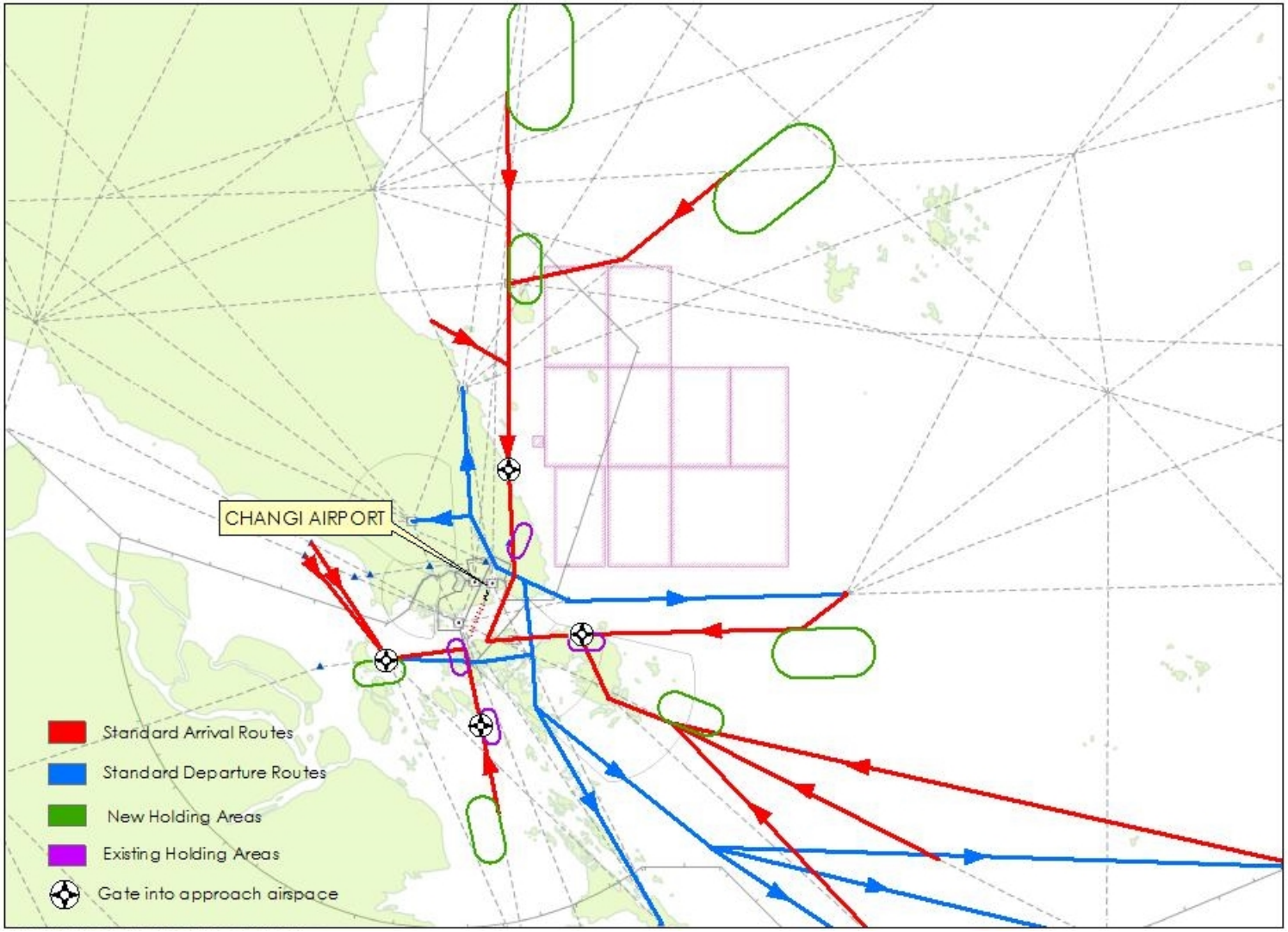
Review of SIDs & STARs

- Keeping aircraft on rails
- Speed Restrictions
  - Departures
    - 230 KIAS below 4,000 feet
    - 250 KIAS below 10,000 feet
  - Arrivals – hard speeds
  - Improve predictability
- Recent reviews
  - Facilitate runway high intensity operations
  - Simplified Naming Convention





RNAV SIDs and STARs for Changi



Thank you

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