Australian Government
Bureau of Meteorology

airservices australia

Collaborative Network Management

Balancing demand and capacity for Australia's aviation network

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Role of airservices australia

AIRSPACE MANAGEMENT

NETWORK MANAGEMENT

AVIATION RESCUE AND FIRE FIGHTING SERVICES

11%World's airspace

"we provide safe, secure, efficient, and environmentally-responsible air navigation and aviation rescue fire fighting services to the aviation industry"

29 AIR TRAFFIC CONTROL TOWERS

AERONAUTICAL INFORMATION MANAGEMENT

4 AIR TRAFFIC SERVICES CENTRES

AVIATION COMMUNICATIONS

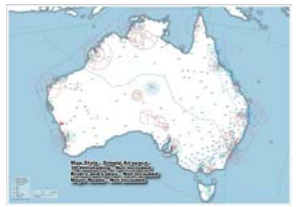
RADIO NAVIGATION AIDS

AIRCRAFT NOISE MANAGEMENT

27 AVIATION RESCUE AND FIRE FIGHTING STATIONS

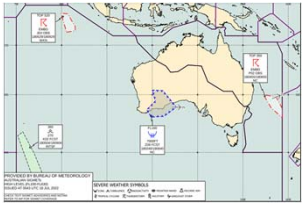
Role of Bureau of Meteorology

>200 Aerodrome Forecasts



> 250 METAR/SPECI

Enroute Met Products



11% World's airspace

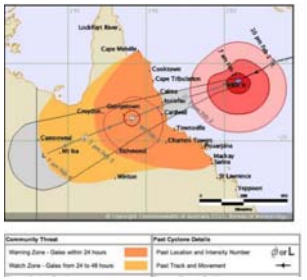
"We provide the aviation industry with weather information to support safety and efficiency. This includes specialised observations, forecasts, warnings and advisories. We provide these for the areas near aerodromes as well as for routes flown."

Advanced Radar – data every 5 minutes from 80 weather radars

> 700 Automatic Weather Stations

Around 50 Aviation Camera Network

Global Space Wx Advisory Centre



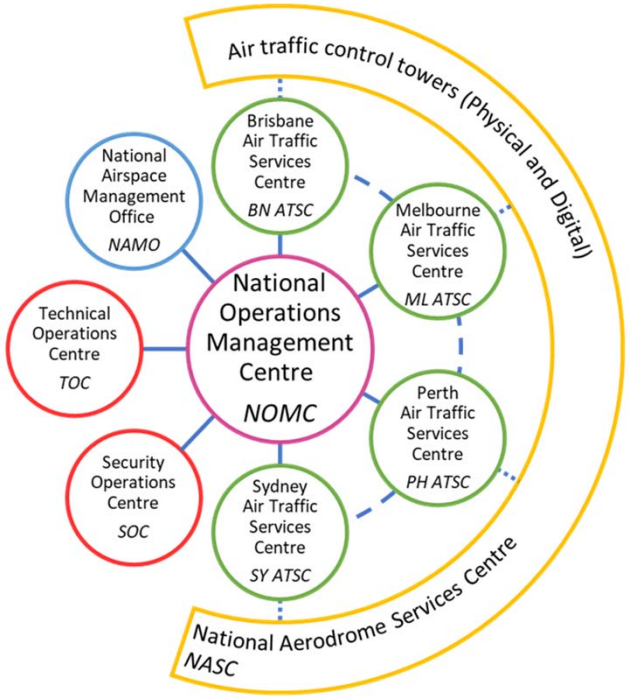
Tropical Cyclone Advisory Centre

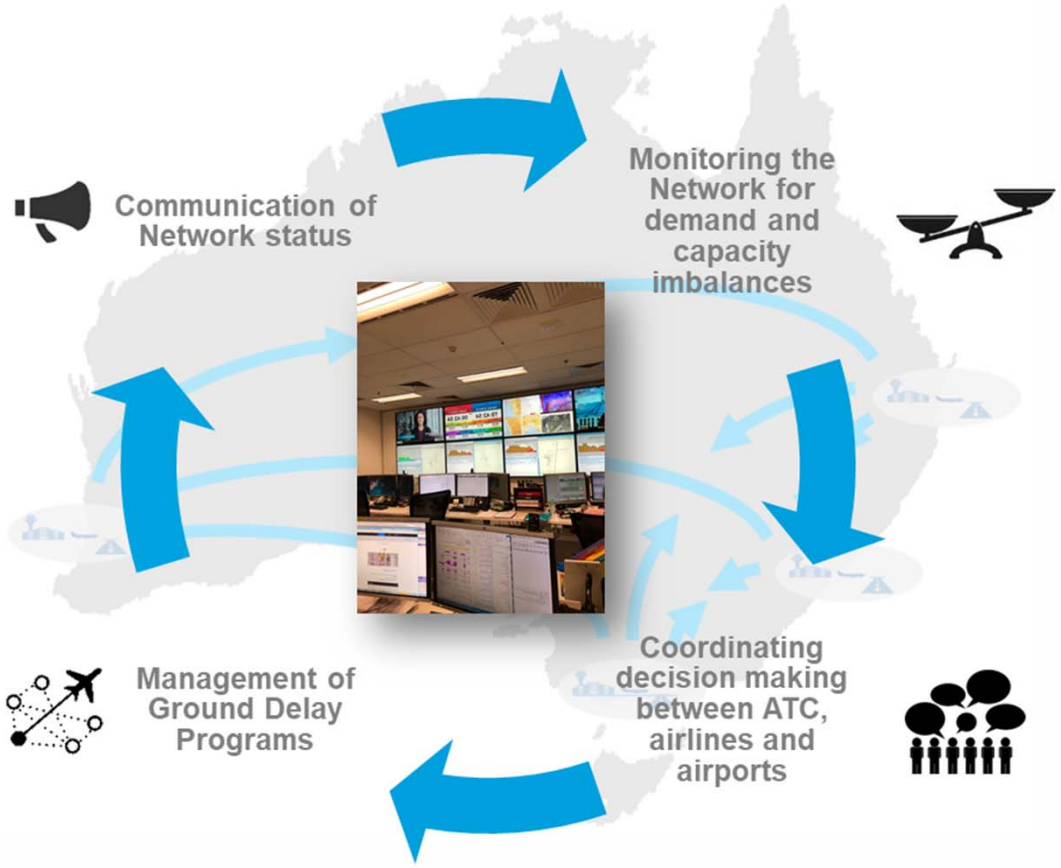
Volcanic Ash Advisory Centre

NETWORK MANAGEMENT

Balancing *demand* with *available capacity* across the Network (runway, airspace and gates)

The Airservices National Operation Management Centre (NOMC) in Melbourne is the centralised collaborative command and control point for the Australian ATM Network





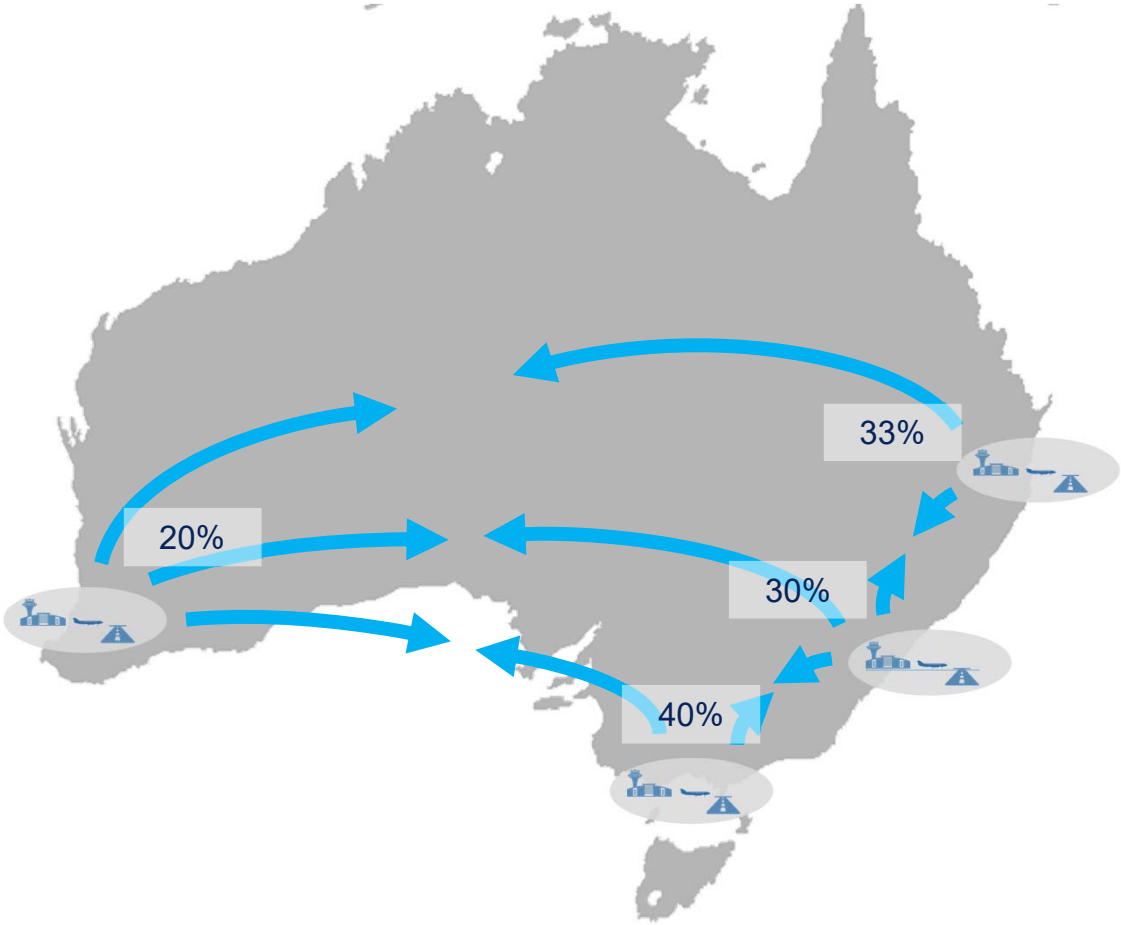
Our environment

Concentrated traffic patterns

3 of 15 world's busiest city pairs

Traffic concentrated between major capital city airports

- ~160 flights/day between Melbourne and Sydney
- ~100 flights/day between Sydney and Brisbane



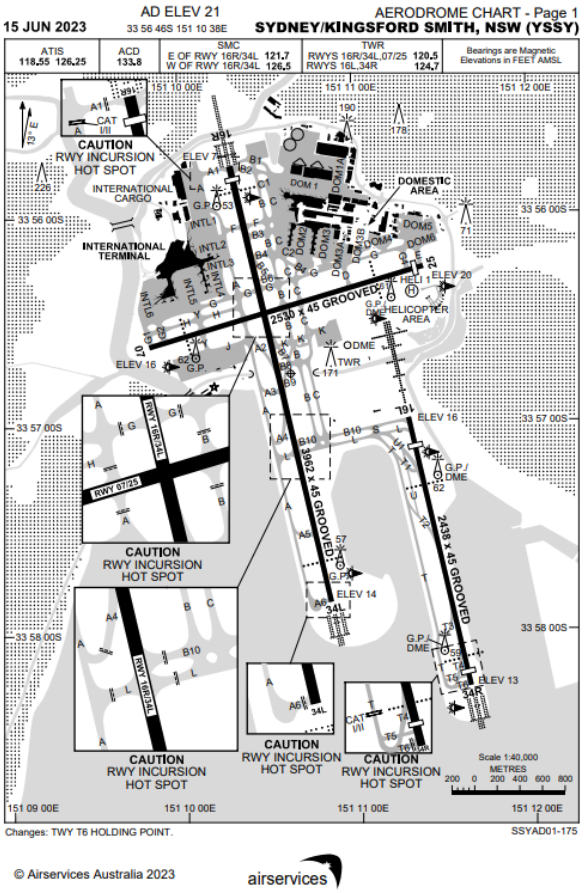
Day prior: The need for collaborative decision making

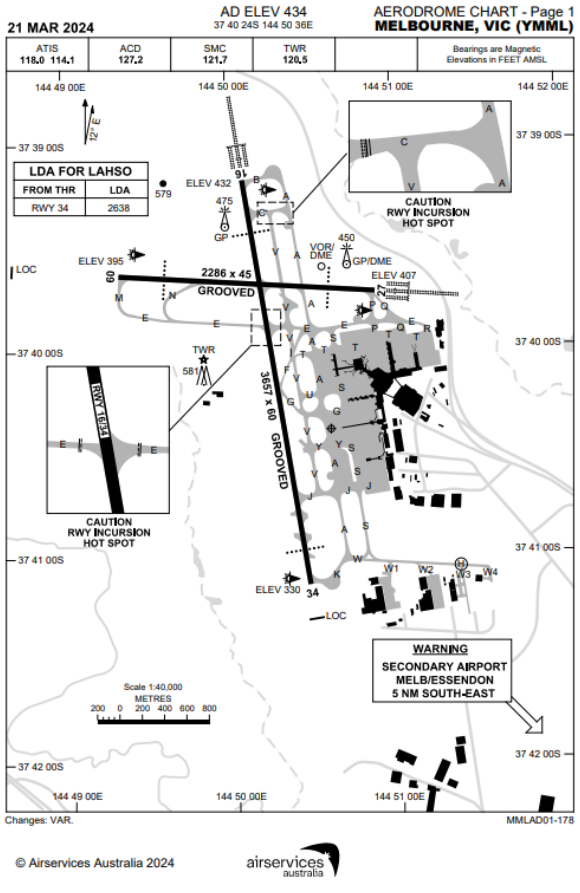
CDM is the process whereby all relevant stakeholders (e.g. NOMC, ATS units, Airlines, Airports and the Bureau of Meteorology) aim to achieve consensus by which available network capacity is used to best optimise runway capacity against individual objectives

Variations in capacity cause major disruptions and airlines like to plan and adjust schedules a day ahead to inform passengers of changed itineraries

Strong need for ATFM decision making to be driven by detailed and accurate weather forecasts that are collaboratively established by key stakeholders

Predictable network is responsibility of all stakeholders!



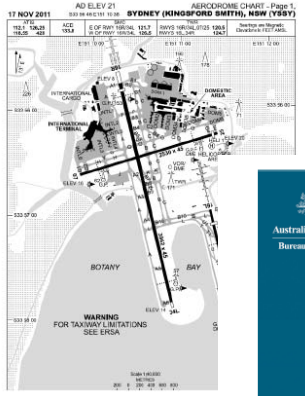


Day prior: Rates Cards

- Capacity planning for day of operations is different to strategic capacity declarations: purpose is to determine the *capacity the Air Traffic System car safely achieve given anticipated conditions on the day,* incl:
  - Forecast weather
  - Airport works
  - ATS availability
- The Air Traffic Flow Management Rates Cards provides the available arrival capacity for different weather conditions
- Rates are those that can be safely achieved at various conditions through analysis of historical data and ATC simulator exercises.
- Accounts for weather at the airport as well as for weather in the surrounding airspace (e.g. presence of thunderstorms in surrounding airspace impacts ATC ability to flow air traffic even if weather at the airport is clear)
- Rates card is periodically reviewed between Airservices, Bureau of Meteorology and industry. Airservices as the ATS provider is the final arbiter.
- Rates card published in Network Management User Manual (available on NCC Portal on Airservices website) as well on the BoM website (Knowledge Centre (bom.gov.au))

YSSY Air Traffic Operations

Sydney is the busiest international airport in Australia consisting of twin moderately spaced parallel runways in the direction 16/34 magnetic, and a single cross runway of 07/25 magnetic.

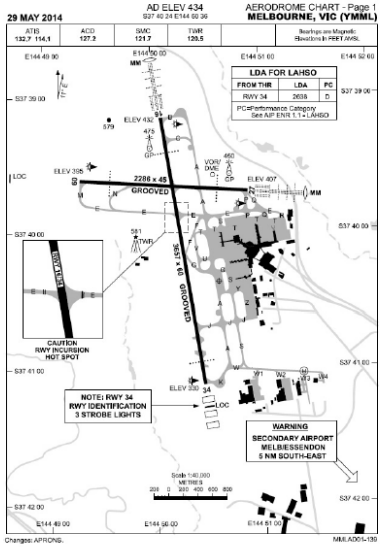


Curfew
Curfew regulates aircraft taking off or landing between the hours of 11pm and 6am. A limited number of scheduled and approved take-offs and landings are permitted respectively in the "shoulder periods" of 11pm to midnight and 5am to 6am, by Section 12 of the *Sydney Airport Curfew Act 1995.*

Aircraft Arrival Rates (AAR)
Sydney Airport has a legislated capacity of 80 aircraft movements per hour which cannot be exceeded. For arrivals only, Sydney Airport has the capacity to take a rate of 46 or 50 on the parallel runways and 24 on the cross runway.

YMML Air Traffic Operations

Melbourne is the second busiest international airport in Australia consisting of two intersecting runways in the direction 16/34 magnetic and 09/27 magnetic.



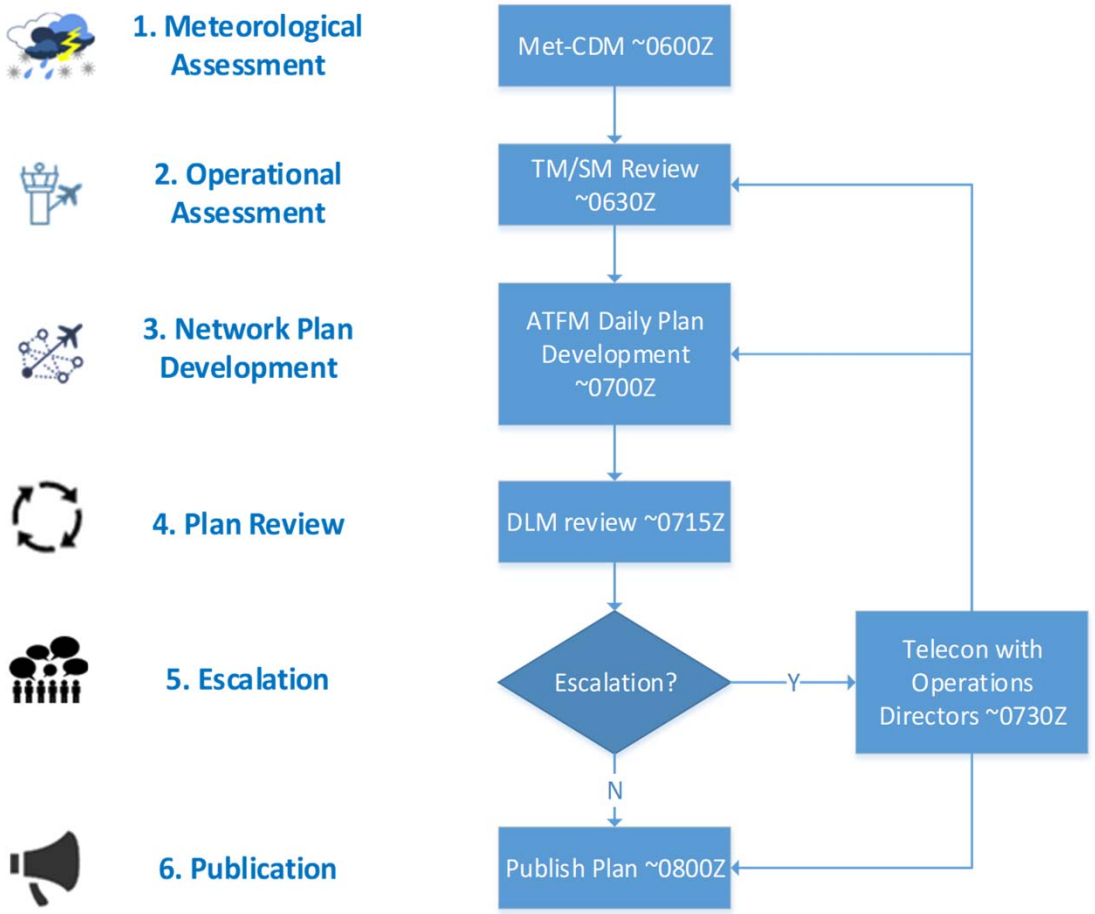
Noise Abatement
There is no curfew at Melbourne airport. However, noise abatement procedures apply. These procedures include a preference to use runway 16 for noise abatement, particularly in the overnight

Terminal Area (TMA)
This term is used to describe the designated area of controlled airspace surrounding a major airport where there is a high volume of traffic. The Terminal Area (TMA) is a 30nm radial area

7

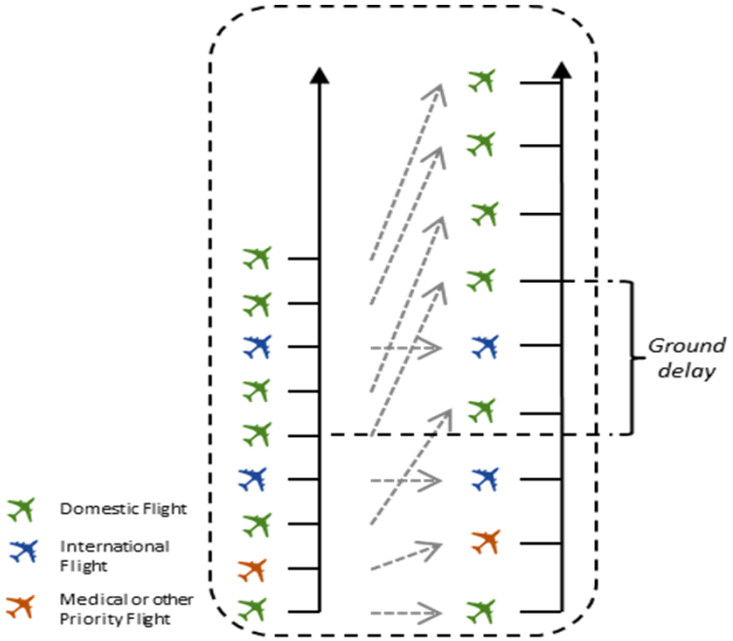
Day prior: Met-CDM

- MET-CDM → Meteorological Collaborative Decision Making
- Collaborative weather decisions made with Bureau Forecasters and Airline Meteorologist (1)
- Collaborative weather forecast is translated into Airport Arrival Rate (AAR) using set of pre-agreed Business Rules
- ATC reviews MET-CDM proposed AAR and may further adjust for operational restrictions (2)
- NCC subsequently develops Network Plan for next day including proposed ATFM measures, e.g. Ground Delay Programs (3)
- Plan is reviewed (4), discussed if required (5) and then published (6) with GDPs run for the next day
- Process repeated throughout the day of operations as required



Day prior: ground delay Programs

- Ground Delay Programs (GDPs) manage the flow of aircraft by spacing out demand at times of congestion
- GDPs only apply to domestic flights and assign ‘ground delays’ to meter aircraft getting airborne
- A comparison in daily life would be ramp lights to meter cars onto a busy freeway




(Source: Vicroads)

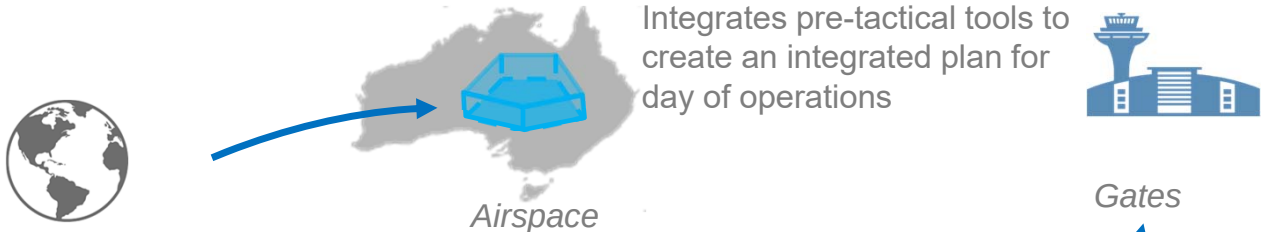
Network INITIATIVES

Levers to manage demand for network resources through *Collaborative Decision Making* with airline and airport stakeholders

Long Range Air Traffic Flow Management (LR-ATFM)**
integrates international flights into the Australian Network

Ground Delay Program (GDP)
reduces airspace congestion by assigning departure times for domestic flights

Digital Twin
Integrates pre-tactical tools to create an integrated plan for day of operations



Arrival Management
ensures the orderly flow of arriving traffic onto the runway

Airport Collaborative Decision Making (A-CDM)
reduces surface congestion by managing gate push-back sequence

**Long Range Air Traffic Flow Management (LR-ATFM) currently on hold and reserved as a future program

New tools – Digital Twin

Delivers a world class Enterprise Digital Twin on our Digital Service Platform, using data, AI and Digital to process large data sets and run millions of ‘what if’ scenarios to optimise our decision outcomes.

The core simulation models the Australian FIR and, for the first time, allows us to see whole of network effects caused by capacity and demand at individual airports. We are then able to predict Network behaviour by modelling the impact of Network decisions to manage disruptive events including:

- Changes to airport capacity
- Ground Delay Program (GDP) parameter changes

We are delivering tools that deliver an improved experience for our staff; augmenting their skill and experience to deliver improved network planning and management for our airline customers, improve the balance of capacity and demand in our ATSCs and underpin the OneSKY benefits case.

Applications include pre-tactical delay management, Day-of-Operations delay management, What-if scenario modelling and Taskload management.

The applications will assist in strategic planning for known network events (runway maintenance etc), resource modelling and planned events.

Airport Collaborative Decision Making (A-CDM)

A proven operating concept to improve airport operational efficiency, optimisation of resources and predictability based on accurate, real-time data & insights.

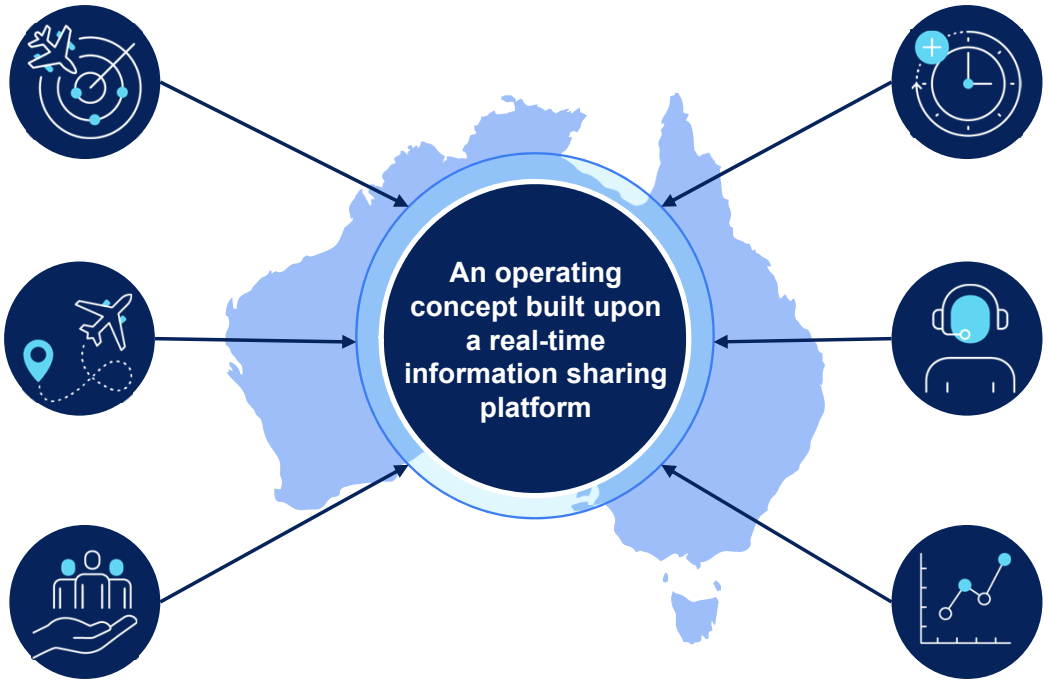
A-CDM will enhance airline, airport and passenger experience by making departure management more predictable, improving use of runway and gate capacity, and reducing the time aircraft are waiting on taxiways prior to take-off. A-CDM provides a common picture that optimises gate allocations, allows ground handling resources to be ready when needed, gives airlines more certainty about when a flight will take-off, reduces gate changes and improves the passenger experience.

A-CDM will share common information with the Digital Twin to allow for more accurate pre-tactical planning of the network and predictability for all stakeholders.

Common situational awareness for all stakeholders (air traffic control, airlines, airports, ground handlers)

Tracking of flight progress in real time according to standardized milestones

Pre-departure sequencing based on operational constraints and operator preferences



Calculation of key components (e.g. taxi time) per aircraft type / airport config, optimizing departure sequencing, fuel usage and taxi out timing.

More timely recovery from adverse conditions (predicted or unpredicted) considering both arrival and departure demand

Reporting dashboard helping air traffic control and partners identify ways to make fuel usage, asset management and gate allocation improvements

Future concept – Collaborative Convective Forecast-CDM

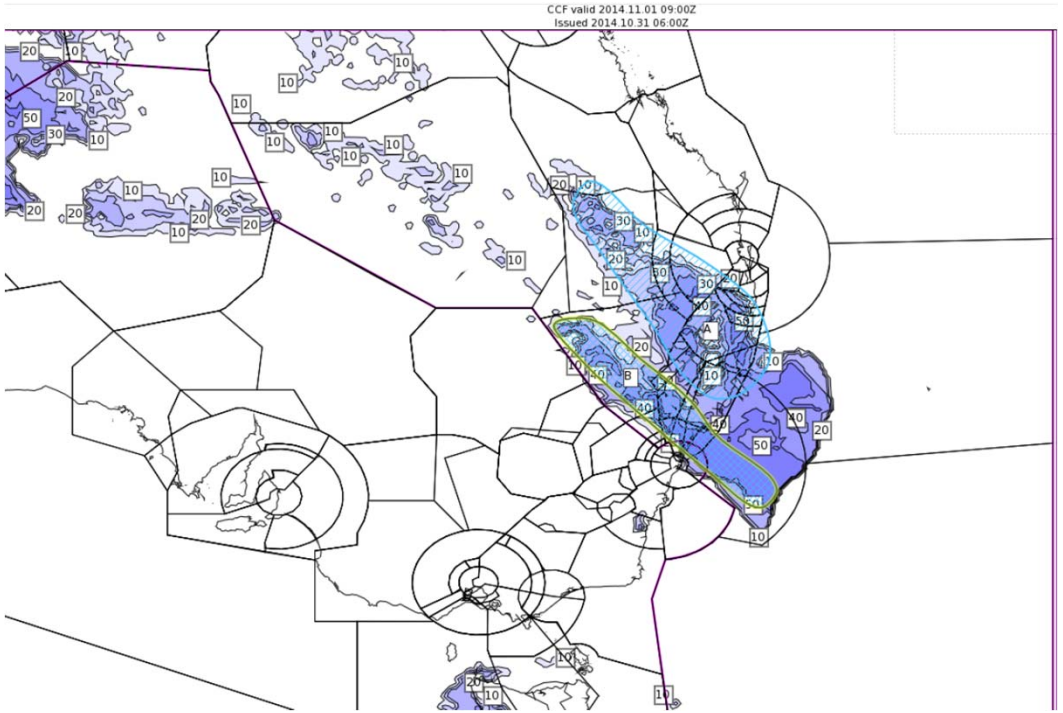
Impacts/disruptions to ATFM at a distance from the point of departure/arrival are mostly attributed to thunderstorms, severe thunderstorms and tropical cyclones in the Australian region.

Forecasting the location, timing and severity of thunderstorms is very difficult.

Disruption management is currently a reactive process because the effect of thunderstorms on network airspace is difficult to forecast.

CCF-CDM aims to improve readiness for disruptive events in a manner that meteorologists, ATC and operators understand

There are ATFM technology dependencies required to gain benefits and predictability from CCF-CDM.



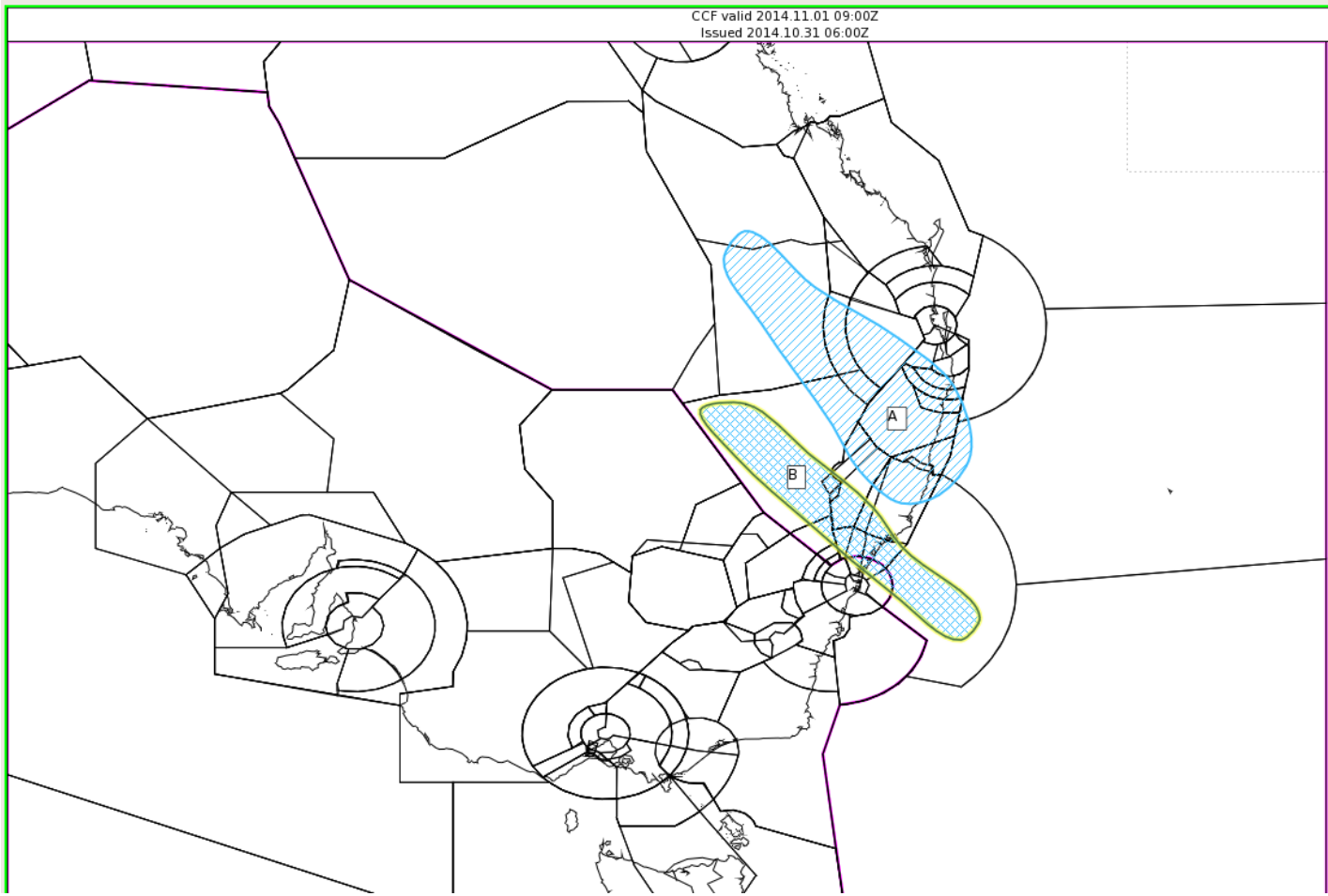
Future concept – Collaborative Convective Forecast-CDM

Four categories:

- Unconstrained Airspace
- Permeable airspace
- Semi-permeable airspace
- Severely constrained airspace

Whilst pilots can fly through all categories at their discretion there is a potential network perspective to these categories that should be considered.

As Digital Twin, A-CDM and other ATFM tools are developed and refined CCF-CDM and potential impacts can be integrated.



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Thank you

Ashwin Naidu: Aviation Customer Lead – Australian Bureau of Meteorology

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