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Meteorological challenges in support of Air Traffic Control (ATC) decision-making

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MET/ATM Seminar – 22 April 2024

Outline

- Background
- Pre-tactical and tactical advice
- Operationally significant criteria for Air Traffic Control (ATC)
  - Considerations for tactical decision-making
  - Challenges in providing relevant and timely advice
- Discussion

Background (from an Australian perspective)

- What we currently provide
  - Our Aviation Forecasting Centres provide various forecasts to the aviation industry
  - Aerodrome Forecasts (TAF) – forecast elements and amendments based on specific criteria

- Example: YSSY
  - HAM cloud/visibility: 1479ft, 7000m
  - SAM cloud/visibility: 700ft, 2500m

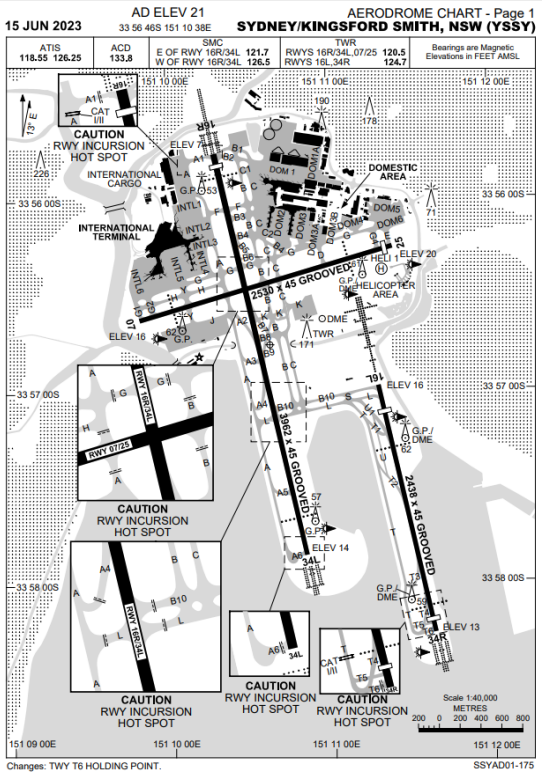
- ASH criteria for TAF (wind, visibility, cloud)

Table 7.3 Amendment Criteria/Change Group Criteria for TAF

Element	Amendment Criteria
Wind mean direction **Wind mean speed** **Wind Gust**	Change of 30° or more, mean wind speed 15 KT or more before or after the change. Change of 10 KT or more, mean wind speed 15 KT or more before or after the change Onset or cessation of wind gust exceeding the mean wind speed by 10 KT or more, mean wind speed 15 KT or more, or; Change to gust of 10 KT or more, mean wind speed 15 KT or more before or after the change
Visibility[3]	When visibility is forecast to deteriorate and pass through one or more of the following values; or is forecast to improve and change to or pass through one or more of the following values: • 150 m • 350 m • 600 m • 800 m • 1500 m • 3000 m • 5000 m • Highest Alternate Minimum (aerodrome specific)
Cloud Amount	When the amount of a cloud layer below 1 500 ft is forecast to change: • from FEW or SCT to BKN or OVC; or • from BKN or OVC to FEW or SCT.
Height of Base	When the height of the base of the lowest cloud layer of BKN or OVC extent is forecast to lower and pass through one of the following values; or is forecast to lift and change to or pass through one of the following values: • 100 ft • 200 ft • 500 ft • 1000 ft • 1500 ft • Highest Alternate Minimum (aerodrome specific)

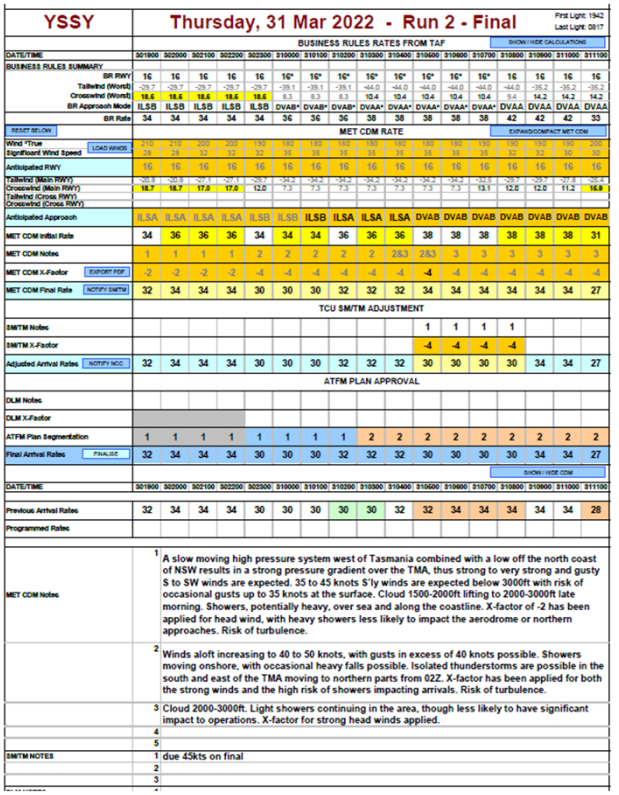
- For our four busiest airports, Meteorological Collaborative Decision Making (Met CDM) provides a pre-tactical forecast based on weather criteria relevant to Air Traffic Flow Management (ATFM)
  - Informs the planned Airport Acceptance Rate (AAR) for Ground Delay Programs (GDPs), managed by Airservices Australia NOMC

- Example: YSSY
  - AAR typically varies between 32 and 50 depending on multiple cloud and visibility criteria at/below 4000ft and 8000m respectively
  - Lower AAR for thunderstorms, low visibility operations, single runway



Pre-tactical information and advice

- Informs an hourly AAR for a specific airport
  - Previously based on TAF
- Met CDM product was created to address various limitations of using the TAF directly and to optimise meteorological intelligence from various sources via a collaborative process
- Met CDM process is now well embedded in Airservices Australia ATFM planning and has provided significant benefits to the aviation industry, with further development ongoing



YSSY	Thursday, 31 Mar 2022 - Run 2 - Final	First Light: 1942 Last Light: 0817

BUSINESS RULES RATES FROM TAF

DATE/TIME	301900	302000	302100	302200	302300	310000	310100	310200	310300	310400	310500	310600	310700	310800	310900	311000	311100
BUSINESS RULES SUMMARY																	
BR RWY	16	16	16	16	16	16*	16*	16*	16*	16*	16*	16*	16*	16	16	16	16
Tailwind (Worst)	-29.7	-29.7	-29.7	-29.7	-29.7	-39.1	-39.1	-39.1	-44.0	-44.0	-44.0	-44.0	-44.0	-44.0	-35.2	-35.2	-35.2
Crosswind (Worst)	10.6	10.6	10.6	10.6	10.6	8.3	8.3	8.3	10.4	10.4	10.4	10.4	10.4	9.4	14.2	14.2	14.2
BR Approach Mode	ILS	ILS	ILS	ILS	ILS	DVAB*	DVAB*	DVAB*	DVAA*	DVAA*	DVAA*	DVAA*	DVAA*	DVAA	DVAA	DVAA	DVAA
BR Rate	34	34	34	34	34	36	36	36	38	38	38	38	38	42	42	42	33
RESET BELOW	MET CDM RATE													EXPAND/COMPACT MET CDM			
Wind YTrue	210	210	200	200	190	180	180	180	180	180	180	180	180	180	180	180	200
Significant Wind Speed LOAD WINDS	28	28	32	32	32	36	36	36	36	36	36	36	36	32	32	30	30
Anticipated RWY	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Tailwind (Main RWY)	-30.8	-30.8	-37.1	-37.1	-29.7	-34.2	-34.2	-34.2	-34.2	-34.2	-34.2	-34.2	-34.2	-32.9	-29.7	-37.8	-30.4
Crosswind (Main RWY)	16.7	16.7	17.0	17.0	12.0	7.3	7.3	7.3	7.3	7.3	7.3	7.3	13.1	12.0	12.0	11.2	16.9
Tailwind (Cross RWY)																	
Crosswind (Cross RWY)																	
Anticipated Approach	ILSA	ILSA	ILSA	ILSA	ILSB	ILSB	ILSB	ILSA	ILSA	ILSA	DVAB	DVAB	DVAB	DVAB	DVAB	DVAB	DVAB
MET CDM Initial Rate	34	36	36	36	34	34	34	36	36	36	38	38	38	38	38	38	31
MET CDM Notes	1	1	1	1	2	2	2	2	2	2&3	2&3	3	3	3	3	3	3
MET CDM X-Factor EXPORT FCF	-2	-2	-2	-2	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4	-4
MET CDM Final Rate NOTIFY SMTM	32	34	34	34	30	30	30	32	32	32	34	34	34	34	34	34	27
	TCU SM/TM ADJUSTMENT																
SM/TM Notes											1	1	1	1			
SM/TM X-Factor											-4	-4	-4	-4			
Adjusted Arrival Rates NOTIFY NCC	32	34	34	34	30	30	30	32	32	32	30	30	30	30	34	34	27
	ATFM PLAN APPROVAL																
DLM Notes																	
DLM X-Factor																	
ATFM Plan Segmentation	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
Final Arrival Rates FINALISE	32	34	34	34	30	30	30	32	32	32	30	30	30	30	34	34	27
	SHOW / HIDE CDM																
DATE/TIME	301900	302000	302100	302200	302300	310000	310100	310200	310300	310400	310500	310600	310700	310800	310900	311000	311100
Previous Arrival Rates	32	34	34	34	30	30	30	30	30	32	32	34	34	34	34	34	28
Programmed Rates																	

MET CDM Notes	1	A slow moving high pressure system west of Tasmania combined with a low off the north coast of NSW results in a strong pressure gradient over the TMA, thus strong to very strong and gusty S to SW winds are expected. 35 to 45 knots S'ly winds are expected below 3000ft with risk of occasional gusts up to 35 knots at the surface. Cloud 1500-2000ft lifting to 2000-3000ft late morning. Showers, potentially heavy, over sea and along the coastline. X-factor of -2 has been applied for head wind, with heavy showers less likely to impact the aerodrome or northern approaches. Risk of turbulence.
	2	Winds aloft increasing to 40 to 50 knots, with gusts in excess of 40 knots possible. Showers moving onshore, with occasional heavy falls possible. Isolated thunderstorms are possible in the south and east of the TMA moving to northern parts from 022. X-factor has been applied for both the strong winds and the high risk of showers impacting arrivals. Risk of turbulence.
	3	Cloud 2000-3000ft. Light showers continuing in the area, though less likely to have significant impact to operations. X-factor for strong head winds applied.
	4	
	5	
SM/TM NOTES	1	due 45kts on final
	2	
	3	

Tactical advice

- 60 - 90 minute time frame, typically when majority of aircraft are airborne
- TAF3, expanded to 10 Airports and issued 3 hourly outside of amendments with frequent review
- Forecasters provide briefings to ATC

- Is there a potential gap in the information provided via the TAF and what is required for tactical decision-making by ATC?
  - ATC feedback
  - ASH criteria for TAF weather parameters
  - What are these criteria?
    - To ensure timely and sufficient level of information to support ATC.

Operationally significant criteria for ATC – Considerations

- Runway nomination criteria
  - Wind
- Runway configuration
  - Difference in airport movement capacity
- Runway changes
- Changes to weather parameters (TS, cloud and visibility)
- Other rapidly fluctuating conditions

Operationally significant criteria for ATC – Challenges

- Airports are getting busier
- Criteria very specific to the airport
- TAF using operationally significant criteria
- NOMC meteorologists have a level of understanding but also very much involved in Met CDM outside the tactical time frame

Challenges

- Example: YPPH
  - Often highly constrained Tuesday, Wednesday and Thursday for multiple hours across peak periods
  - Nearly always has a GDP on these days
  - Typical AAR varies 22 to 26, small changes in tactical AAR can have a significant impact

Discussion

- What are other meteorological service providers doing in this space?
- A pre-existing product/or service or a new one to supplement existing forecasts, tailored specifically using operationally significant criteria for ATC to support their decision-making?
- What and who is best to provide this, resources required?

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