Air Traffic Management Office
MOLIT, Republic of Korea

Operational Capacity Guidelines linked to Weather Forecasts

MET/ATM Seminar and ATFM/SG/15

Contents

- Need for ATFM and Proactive Decision-Making
- Development of Operational Capacity Guidelines
- MET-CDM Process and Real-World Example
- Implications

Need for ATFM during Snowfall

During runway snow removal

→ Runway closure reduces capacity

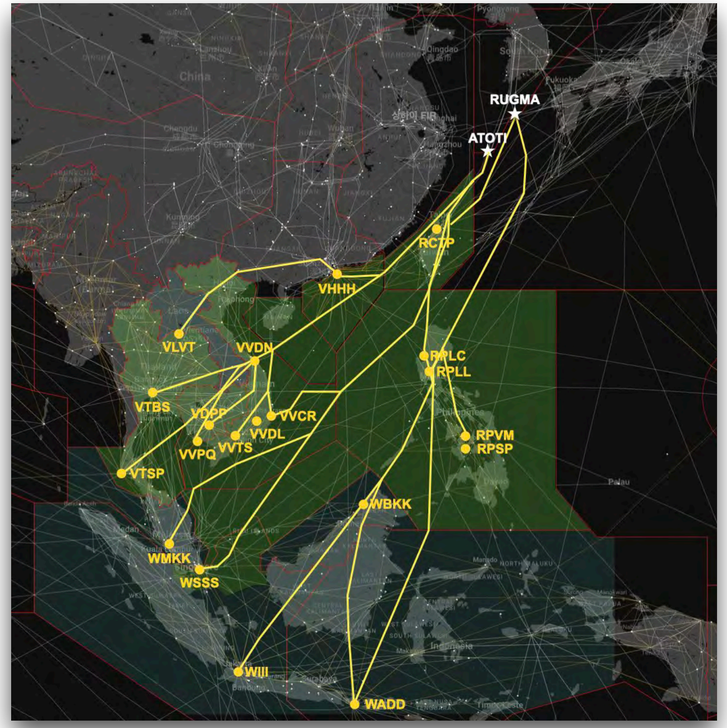
Waiting for de-icing/anti-icing pads

→ Ground congestion → Apron capacity reduction

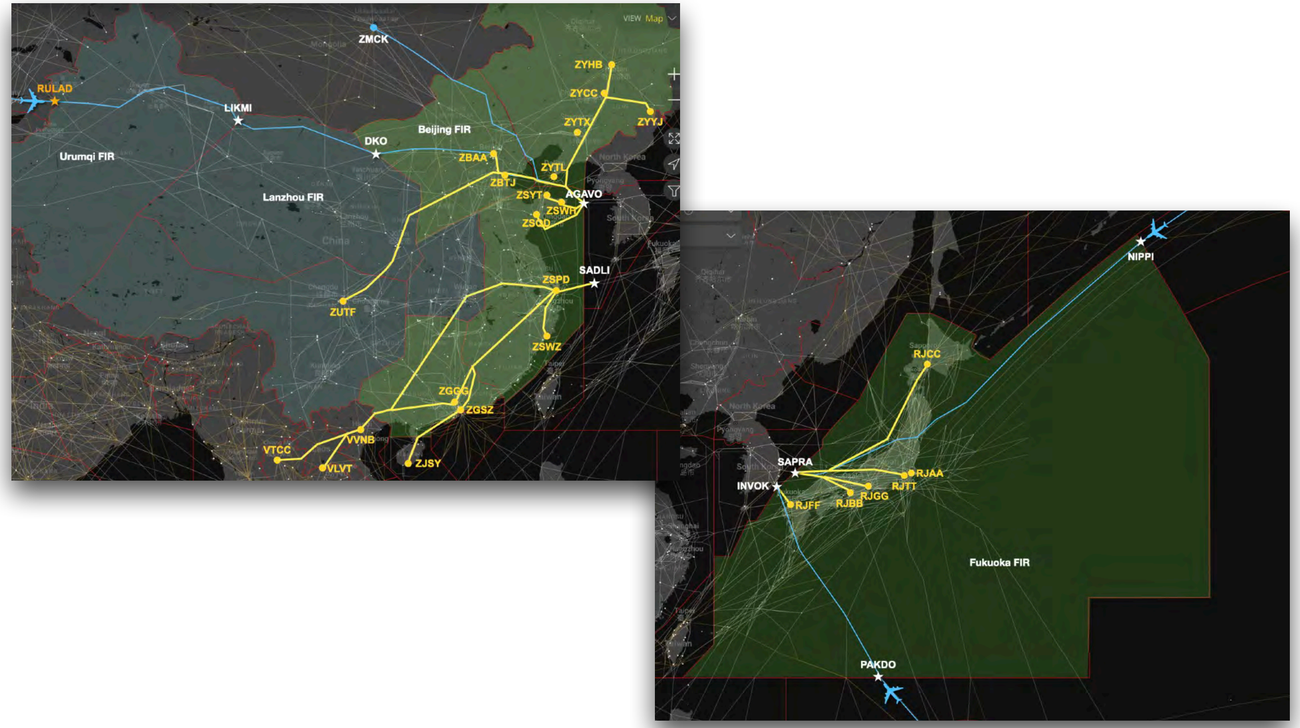
Need for Proactive Decision-Making

To issue ATFM measures 2 hours before subject flight's EOBT

Flights from Southeast Asia (about 5 hours of duration)
→ Morning arrival peak

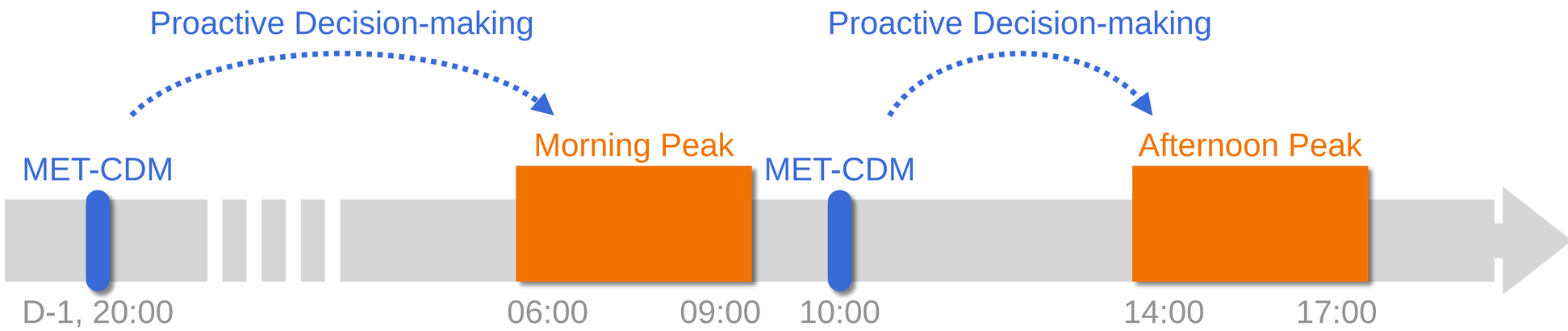


Flights from Northeast Asia (about 2 hours of duration)
→ Afternoon arrival peak



MET-CDM meeting cycles

Setting MET-CDM meeting cycles based on flight durations by traffic flow



< RKSI Arrival Traffic patterns >

- Morning peak : depart from Southeast Asia (about 5 hours of duration)
- Afternoon peak : depart from Northeast Asia (about 2 hours of duration)

Need for Operational Capacity Guidelines linked to MET

Establishing a Data-Driven Decision-Making Procedure

MET-CDM Online Meeting

Decision-Making Limitation

- Meteorologists lack ATM expertise
  Controllers/Flow managers lack meteorological knowledge
- Even with MET-CDM online meetings,
  prompt and accurate capacity decisions based on weather forecasts are difficult

Solution

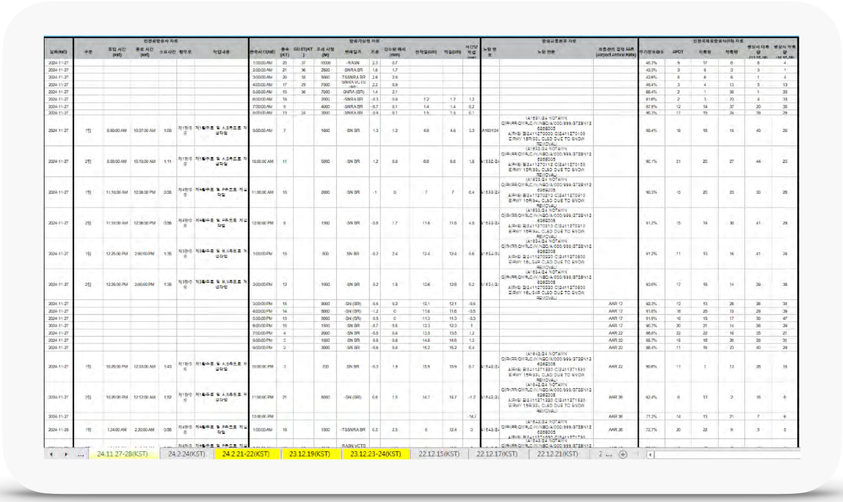
- Collaborative development of Operational Capacity Guidelines linked to Meteorological Data

Development Process

Data Integration and Collaborative Research by Agencies

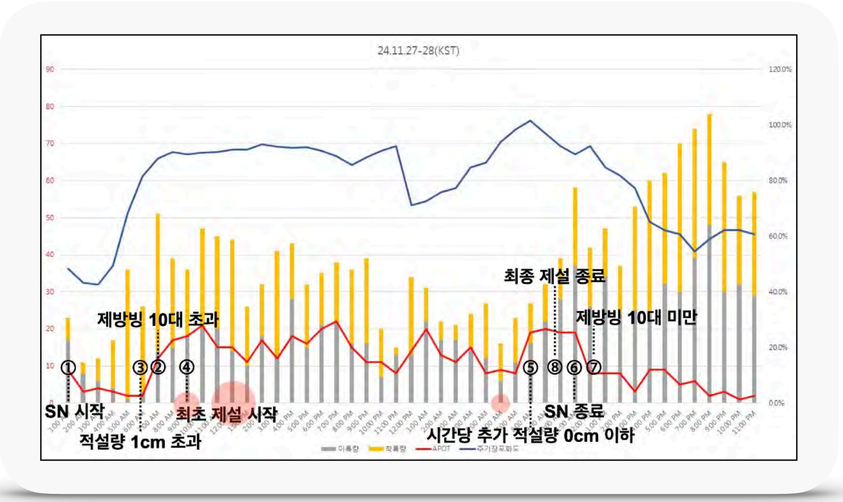
Consolidated data from relevant agencies

- MET(AMO) : Weather data
- Airport Operator(IIAC) : Snow removal logs, A-CDM data
- ATFM(ATMO) : ATFM logs, Runway snow removal NOTAMs



Inductive Approach

- Inductive analysis of snowfall events over past 3 years
- Analyzed snow removal start/end times with concurrent weather data to identify patterns
- Applied observed patterns to predict future outcomes



Key Findings

Key relationships between snow removal and weather data from real-case observations

- No snowfall when surface temperature > 0°C
- Snow removal rare when hourly snowfall < 1 cm
- Snow removal consistent when hourly snowfall > 1 cm

Operational Capacity Guidelines

Incheon Airport Operational Capacity Guidelines for Snow ATFM (version 1.1)

Stage	Surface temp	Hourly snowfall	Runway snow removal	Ground congestion due to de-icing	Hourly arrival capacity
1	Above 0°C	Any	Very low prob (Regardless of snowfall)	Very low prob (Regardless of snowfall)	44 aircraft
2	Below 0°C	0 cm	Very low prob	Smooth	40 ~ 44 aircraft
3	Below 0°C	0.1 ~ 0.9 cm	Low prob	Moderate	30 ~ 35 aircraft
4	Below 0°C	1 cm or more	High prob	Moderate	26 aircraft
5	Below 0°C	1 cm or more	High prob	Severe	20 or fewer aircraft

Operational Capacity Guidelines

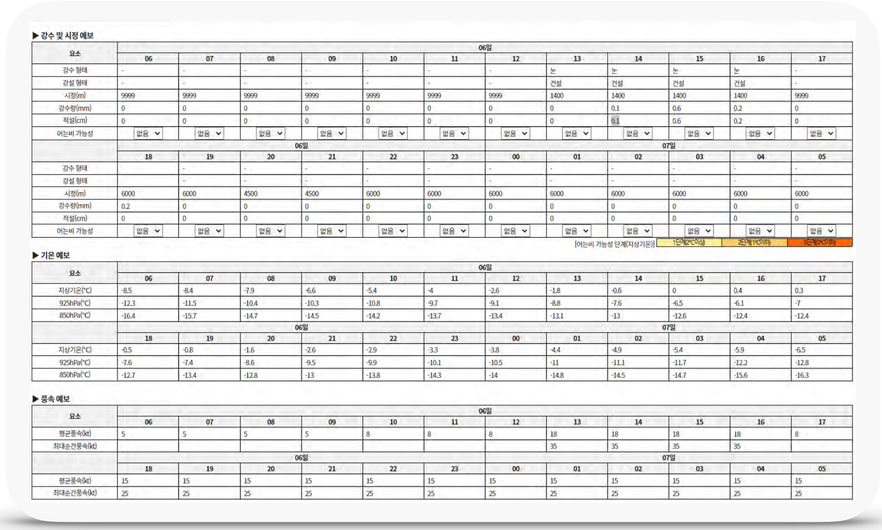
Detailed Guide for Intuitive Understanding and Easy Application by All Stakeholders

- **Stage 1** : when surface temperature is above 0°C, regardless of hourly snowfall, the probability of snow removal and de-icing is very low, allowing normal capacity.
- **Stage 2** : when surface temperature is below 0°C and hourly snowfall is 0 cm, snow removal probability is very low, and the scale of de-icing requests is at a manageable level, enabling smooth processing with a capacity of 40 ~ 44 aircraft.
- **Stage 3** : when surface temperature is below 0°C and hourly snowfall is 0.1 ~ 0.9 cm, snow removal probability is low, but increased de-icing requests require routine management, setting capacity at 30 ~ 35 aircraft.
- **Stage 4** : when surface temperature is below 0°C and hourly snowfall is 1 cm or more, snow removal probability is high, requiring a capacity of 26 aircraft based on single-runway arrival operations (if snow removal begins, this capacity must be maintained until the final snow removal is completed, regardless of subsequent forecasts).
- **Stage 5** : with intensified snowfall, ground handler de-icing capacity decreases, de-icing wait times increase, and apron/taxiway congestion rises, necessitating a capacity of 20 aircraft or fewer based on ground congestion levels.

MET-CDM Process

MET-CDM Online meeting Process

- Receive weather forecast data from meteorologists
- Use guidelines to decide capacity
- Incorporate real-time site conditions and stakeholder input
- All stakeholders participate in capacity decisions



▶ 강수 및 시정 예보

요소	06일											
	06	07	08	09	10	11	12	13	14	15	16	17
강수 형태	-	-	-	-	-	-	-	눈	눈	눈	눈	-
강설 형태	-	-	-	-	-	-	-	건설	건설	건설	건설	-
시정(m)	9999	9999	9999	9999	9999	9999	9999	1400	1400	1400	1400	9999
강수량(mm)	0	0	0	0	0	0	0	0	0.1	0.6	0.2	0
적설(cm)	0	0	0	0	0	0	0	0	0.1	0.6	0.2	0
어는비 가능성	없음	없음	없음	없음	없음	없음	없음	없음	없음	없음	없음	없음
	06일								07일			
	18	19	20	21	22	23	00	01	02	03	04	05
강수 형태		-	-	-	-	-	-	-	-	-	-	-
강설 형태		-	-	-	-	-	-	-	-	-	-	-
시정(m)	6000	6000	4500	4500	6000	6000	6000	6000	6000	6000	6000	6000
강수량(mm)	0.2	0	0	0	0	0	0	0	0	0	0	0
적설(cm)	0	0	0	0	0	0	0	0	0	0	0	0
어는비 가능성	없음	없음	없음	없음	없음	없음	없음	없음	없음	없음	없음	없음

[어는비 가능성 단계(자상기준)] 1단계(주의) 2단계(경계) 3단계(심각)

▶ 기온 예보

요소	06일											
	06	07	08	09	10	11	12	13	14	15	16	17
지상기온(℃)	-8.5	-8.4	-7.9	-6.6	-5.4	-4	-2.6	-1.8	-0.6	0	0.4	0.3
925hPa(℃)	-12.3	-11.5	-10.4	-10.3	-10.8	-9.7	-9.1	-8.8	-7.6	-6.5	-6.1	-7
850hPa(℃)	-16.4	-15.7	-14.7	-14.5	-14.2	-13.7	-13.4	-13.1	-13	-12.6	-12.4	-12.4
	06일								07일			
	18	19	20	21	22	23	00	01	02	03	04	05
지상기온(℃)	-0.5	-0.8	-1.6	-2.6	-2.9	-3.3	-3.8	-4.4	-4.9	-5.4	-5.9	-6.5
925hPa(℃)	-7.6	-7.4	-8.6	-9.5	-9.9	-10.1	-10.5	-11	-11.1	-11.7	-12.2	-12.8
850hPa(℃)	-12.7	-13.4	-12.8	-13	-13.8	-14.3	-14	-14.8	-14.5	-14.7	-15.6	-16.3

▶ 풍속 예보

요소	06일											
	06	07	08	09	10	11	12	13	14	15	16	17
평균풍속(kt)	5	5	5	5	8	8	8	18	18	18	18	8
최대순간풍속(kt)								35	35	35	35	
	06일								07일			
	18	19	20	21	22	23	00	01	02	03	04	05
평균풍속(kt)	15	15	15	15	15	15	15	15	15	15	15	15
최대순간풍속(kt)	25	25	25	25	25	25	25	25	25	25	25	25

Weather forecast data provided by MET team

Stage	Surface temp	Hourly snowfall	Runway snow removal	Ground congestion due to de-icing	Hourly arrival capacity
1	Above 0°C	Any	Very low prob (Regardless of snowfall)	Very low prob (Regardless of snowfall)	44 aircraft
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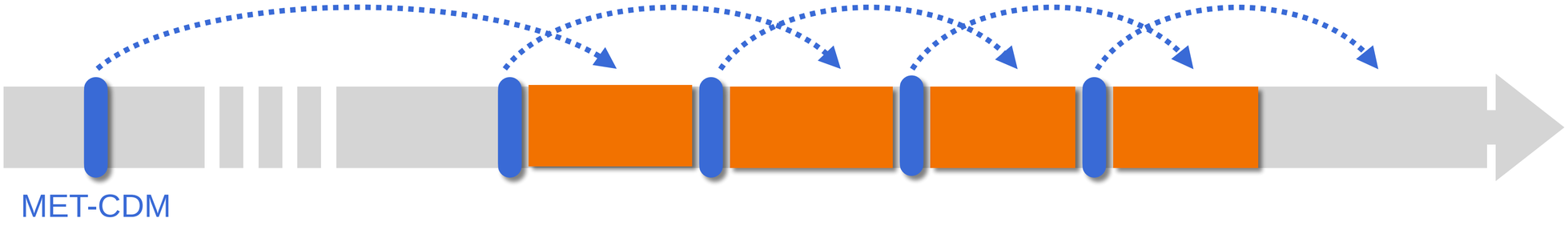
Operational Capacity Guidelines

Example of actual MET-CDM meeting schedule

Results of the January 31, 2025 MET-CDM

CDM Meeting Time (Local Time)	Operational Capacity Determination	ATFM Application Period (Local Time)
Jan 30, 20:00	26	Jan 31, 06:00–10:00
Jan 31, 06:00	30	Jan 31, 10:00–14:00
Jan 31, 09:00	40	Jan 31, 14:00–16:00
Jan 31, 11:00	40	Jan 31, 16:00–18:00
Jan 31, 15:00	ATFM lifted	ATFM lifted



Implications

- Swift, accurate CDM decisions enhance predictability and trust
- Proactive ATFM reduces delays and regional disruptions
- Shared guidelines foster Asia/Pacific ANSP cooperation
- Ongoing research improves congestion models and forecast accuracy

Thank you!

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