International Civil Aviation Organization

Fourteenth Meeting of the Asia/Pacific Air Traffic Flow Management Steering Group (ATFM/SG/14)

Bangkok, Thailand, 22 – 26 April 2024

Agenda Item 7: Any Other Business

MET/ATM SEMINAR REPORT

(Presented by the Secretariat)

SUMMARY

This paper presents the summary of MET/ATM Seminar conducted with joint effort from MET domain and ATM domain.

1. INTRODUCTION

1.1 A seminar in conjunction with the Meteorological Requirements Working Group (MET/R SG) was held on 22 April 21, 2024 at ICAO Asia/Pacific Regional Office in Bangkok, Thailand.

1.2 The seminar was conducted in hybrid mode and was attended by 189 in-person participants from 23 States/ Administrations and four International organizations including Australia, Bhutan, Brunei Darussalam, Cambodia, China, Hong Kong China, Fiji, Indonesia, Japan, Kiribati, Lao PDR, Malaysia, Maldives, Mongolia, Nepal, Pakistan, Papua New Guinea, Philippines, Republic of Korea, Singapore, Thailand, United States, Viet Nam, CANSO, IATA, ICCAIA, IFATCA and ICAO. In addition, 43 participants from 13 States/ Administrations and International organization attended online through MS Teams portal.

2. DISCUSSION

2.1 Eleven (11) presentations under 3 topics were conducted in four sessions.

Session 1: ICAO Provisions

2.2 This session consisted of two presentations and was moderated by Mr. Piyawut Tantimekabut, the Chairperson of the ATFM/SG.

2.3 Mr. Peter Dunda, Regional Officer MET/ENV from ICAO APAC Regional Office, presented on the topic of “Updates to ICAO Provisions”.

2.4 The presentation began with a recap of today’s Annex 3 – MET provision using traditional means of dissemination for traditional users in traditional forms. Followed by introducing the future trends under ICAO’s Global Air Navigation Plan (GANP) under fully harmonized global air navigation system using System-Wide Information Management (SWIM) where MET is a key enabler.

2.5 The presentation concluded by reinstating the envisaged applicability schedule of PfAs to Annex 3 and the transition to digital MET to support SWIM.

2.6 Mr. Rick Taylor, Air Traffic Controller representing IFATCA, presented on the topic of "Terrain and Obstacle Clearance and Cold Temperature Correction".

2.7 Due to the working principle of barometric altimeters, vertical position of the aircraft is derived but not measured by comparing with the position and datum atmospheric pressure. Under cold temperature conditions, the actual height of the aircraft would be lower than the reading from the altimeter and might not achieve sufficient terrain and obstacle clearance.

2.8 Despite the existing SARPs and PANS already had the issue covered, the presentation brought upon the future directions which focus areas could further work upon to ensure all the stakeholders were better prepared to handle such scenarios.

Session 2: National Initiatives

2.9 This session consisted of 3 presentations and was moderated by Ms. Christy Leung, Scientific Officer from Hong Kong Observatory

2.10 Mr. Junpeng Wen, Weather Forecaster from Central and Southern ATMB of CAAC presented on the topic of "CAAC MET Service to Support ATM Operations".

2.11 The presentation introduced the 3 levels MET services organization and their corresponding adaptation in China which provided ATM-tailored MET Information and Services according to different stage Air Traffic Flow Management necessities.

2.12 To allow dissemination of MET information with ease, service websites, Multi-data Fusion System and mobile apps are available for users. Regular services quality assessment and joint MET-ATM Weather Review are conducted to ensure adequate level of MET information and service are met.

2.13 Mr. Ashwin Naidu, Aviation Customer Lead from Australian Bureau of Meteorology presented on the topic of "Coordination Challenges between MET and ATM in Pacific Island" on behalf of Kiribati.

2.14 The presentation shared challenges that are faced by Kiribati such as limited MET observation stations and lack of resources for proper communication channels for coordination. It was reflected that similar issues are also valid for other Pacific Island States.

2.15 Kiribati presented their way forward to tackle the shortcomings such as Certification based on Part 174 and ISO 9001, support in Cost Recovery for MET infrastructure and equipment and also communication channel to enhance dissemination of Meteorological Information to ATS.

2.16 Mr. Simon Godsmark, Network Operation Manager from Airservices Australia, and Mr. Ashwin Naidu presented on the topic of "Collaborative Network Management".

2.17 Australia shared how Airservices together with the Bureau of Meteorology collaborate to balance the demand with available capacity across the network and how the CDM process aided the National Operation Management Centre (NOMC) to come up with Network Plan for different airspace users.

2.18 The presentation introduced the new tools called "Digital Twin" of which its application will assist in strategic planning for known network events, resource modelling and planned events. And

eventually the Collaborative Convective Forecast -CDM (CCF-CDM) could be refined, and potential impacts be integrated under the development of Digital Twin, A-CDM and other ATFM tools.

Session 3: National Initiatives

2.19 This session consisted of 4 presentations and was moderated by Mr. Ashwin Naidu.

2.20 Mr. Ben Annells, Meteorologist from Australian Bureau of Meteorology presented on the topic of "Meteorological Challenges in Support of Air Traffic Control (ATC) Decision-making".

2.21 The presentation introduced Meteorological Collaborative Decision Making (MET CDM) had been adopted in the four busiest airports in Australia which provide pre-tactical forecast using weather information relevant to ATFM. Tactical advice was also provided at 60–90-minute time frame with TAF3 being available to 10 airports issued 3 hourly outside if amendments with frequent review.

2.22 Discussion was brought upon to consider the potential gap in the information provided by the MET service to support tactical decision making by ATC and the operationally significant criteria by ATC. How the pre-existing product/ service bridges the gap and supplement for better decision-making processes.

2.23 Mr. Yamakawa Kenichi, Air Traffic Management Officer from Japan Civil Aviation Bureau, and Mr. Kenji Uchida, Senior Forecaster from Japan Meteorological Agency presented on the topic of "Case Study: MET Information and Services to Support ATM – Adverse Weather over the Aerodromes" and "Verification and Enhancement of Impact-based MET Information to Support ATM Operations".

2.24 Japan kicked off the presentation by elaborating the importance of cooperation between ATM and MET which is the reason why the ATM booth and Weather booth are co-located in the ATMC Operations Room to maximize the efficiency.

2.25 Followed by two case studies in Chitose and Haneda, Japan stressed the concerted effort between MET and ATM was the key to effective air traffic control especially in adverse weather conditions.

2.26 Japan shared their experience in the verification of impact-based ATM-tailored MET information product and how to identify appropriate indicators to evaluate the impact on ATM of which there were non-meteorological factors that ATC capacities must consider.

2.27 Mr. Chan Yan Chun, Ira, Scientific Officer from Hong Kong Observatory, presented on the topic of "Development of Probabilistic Forecast Products Supporting ATM".

2.28 The presentation expressed that the probabilistic forecast product was developed not only for ATFM users but also other airport stakeholders such as airlines and airport operators. Hence, the table was colour-coded in 5 categories to align with the recommendations of World Meteorological Organization (WMO).

2.29 Mr. Chan presented how the probabilistic forecast product helped to provide early awareness for the risk of weather condition change that could cause significant capacity reduction. On-going development in forecasting other operation impacting phenomena such as low visibility, wind-shear and diurnal wind variation will excel the product to aid stakeholders to plan for any necessary ATFM and operational measures.

Session 4: International Initiatives

2.30 This session consisted of 2 presentations and was moderated by Mr. Manjunath Krishna Nelli, Regional Officer ATM from ICAO APAC Regional Sub-Office.

2.31 Ms. Midori Tanino, Global ATM Program Manager from FAA presented on the topic of "Regional Operation Support - CADENA".

2.32 The presentation introduced the footpath of CADENA. Alternative communication channels such as Webex and WhatsApp were used to enhance the notification efficiency. Through the CADENA OIS, how participating States/ Administrations could benefit from the templates and guiding material for easier and more effective coordination.

2.33 With the positive experience of CADENA, the CANSO Aviation Data Exchange Network for Cooperative Excellence (CADENCE) was promoted for development, enhancement for operational coordination and information sharing among ANSPs in the world under the CANSO Global OIS umbrella to achieve higher level of operational safety and efficiency.

2.34 Mr. Ashwin Naidu presented on the topic of "Space Weather Services".

2.35 The presentation introduced how the space weather, typically solar flares, affects the safe conduct of flights in terms of negative effect on navigation, communication or even high-energy particle exposure to live beings.

2.36 With such impact in mind, the timely dissemination of space weather advisory is paramount. SARPs for Space Weather were detailed in Manual on Space Weather Information in Support of Internation Air Navigation (Doc 10100) and ICAO Annex 3. Participants were encouraged to take note on the advisory as solar activity is expected to reach the cycle maximum in 2024.

Conclusion

2.37 The seminar was conducted with active participation from the audience. More than 50 questions were raised during the seminar. However, due to time limitations, not all the questions were answered or responded during the seminar. The list of questions is enclosed as **Attachment A** to this paper.

2.38 The participants were reminded of the close relationship between MET services and Air Traffic Flow Management. Participants were advised to strengthen the relationship between MET Services provider and the national ATFN unite in providing quality services for safe and efficient conduct of civil aviation.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matters as appropriate.

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Questions & Answers for MET/ATM Seminar on 22 April 2024

SP/01 - Updates to ICAO Provisions (ICAO Secretariat)

	Originator	Question	Answered?
1	Anonymous	Can we have a summary on which portions of Annex 3 PfA are expected to applicable in Nov 2024, Nov 2025 and Nov 2026, from State/Administration perspective?	Y
2	Arjan Mukherjee (INDIA)	Met Data exchange through SWIM is expected to begin from Nov 2024 but IWXXM format for met Data exchange will be beginning from 2030. So, what will be the data exchange format in interim time?	Y
3	Anonymous	Where can we obtain a copy of the Regional Air Navigation Agreement as mentioned in Annex 3, para 2.1.3 (pg 2-1)? Are these agreements specific to a particular region or to individual states?	Y
4	Neeti Singh (INDIA)	Like TAF Trend forecast verification for probability forecast is there any ICAO verification criteria?	N

SP/02 - Terrain and Obstacle Clearance and Cold Temperature Correction (IFATCA)

	Originator	Question	Answered?
1	Anonymous	What will be the minimum temperature for application of the correction. In addition, is there any formula for correction of altitude?	Y
2	BL Choy (HONG KONG CHINA)	It would be nice if the requirement (when and where) for provision of minimum temperature could be made available for the development of new IWXXM format as well as information services.	Y

SP/03 - CAAC MET Service to support ATM Operations (China)

	Originator	Question	Answered?
1	Arjan Mukherjee (INDIA)	The probabilistic forecasts of significant weather events are used for application of ATFM measures?	Y
2	Anonymous	Could you share the process of how your stakeholders translate your information (e.g. the Forecast System) to their operations? How were the tailored products designed with their requirements?	Y
3	Arjan Mukherjee (INDIA)	Any analysis is conducted for measuring accuracy of the probabilistic forecasts with reference to the actual day of operation	Y
4	Anonymous	Thank your presentation, CDM meeting of CAAC have all stakeholders (ATC, ATFM, Airport, MET) join meeting?	Y

	Originator	Question	Answered?
5	Kenrick Talyor (IFATCA)	Are there any long-term/seasonal forecasts made, to assist the ATS authority to estimate capacity over the next 6-12 months?	Y
6	Anonymous	How CAAC ensure the compliance of the MET services for the provision of ANS and also ATFM services is according to the standards outlined by ICAO.	Y

SP/04 - Coordination challenges between MET and ATM in Pacific Island (Australia on behalf of Kiribati)

	Originator	Question	Answered?
1	Anonymous	Does Kiribati impose or plan to impose MET charges to end users for the use of its aviation MET products to support the cost recovery for MET infrastructures?	N

SP/05 - Collaborative Network Management (Australia)

	Originator	Question	Answered?
1	Arjan Mukherjee (INDIA)	As flight plans are received on day of operations so what is the source of air traffic data used in the digital twin scenario for ensuring accuracy with actual day of operation	Y

SP/06 - MET challenges in support of ATC Decision-Making (Australia

	Originator	Question	Answered?
1	Arjan Mukherjee (INDIA)	The MET CDM is conducted on daily basis or only during any significant weather events? **Answer:** *Hi there, thank you for the question. The MET CDM is provided on a daily basis and subject to continuous monitoring/review as conditions may change. It informs the available airport capacity as related to the forecast weather on a given day.*	Y
2	Anonymous	What are other meteorological service providers doing in this space? A pre-existing product/service or a new one tailored specifically using operationally significant criteria for ATC?	Y
3	Anonymous	Which party is responsible for filling up the planned AAR table in the pre-tactical phase? And how was the table developed, and by who? Thanks. **Answer:** *Hi there, thank you for the question. The embedded meteorologist in the National Operations Management*	Y

	Originator	Question	Answered?
		Centre (Airservices Australia) completes the table, we provide an hourly MET or advisory rate via the ATFM business rules that relate various weather parameters to the airport acceptance rate. This MET CDM rate is decided by a collaborative process with the forecasting office and embedded airline meteorologists. The final AAR is a result of the combined process with ATC (taking into account operational considerations).	
4	Anonymous	Does Australia find the quality of TAF info sufficient to implement a Ground Delay Program (GDP) on? Would special MET product be suggested, considering the MET-CDM procedure in Australia? **Answer:** *Hi there, thank you for the question. The TAF does provide useful information as a basis for our MET CDM process however we supplement this information by having specific discussions with the forecasting office as the criteria for Air Traffic Flow Management (ATFM) are different. We are able to enquire about more detailed criteria and other forecast possibilities so that these can be accounted for in the pre-tactical forecast.*	Y
5	Anonymous	In adverse weather conditions, multiple runway changes (due to instability of wind conditions) within a short span of time is one major challenge for ATC. Any MET products to overcome this?	Y

SP/07 - Case Study: MET information and services to support ATM - adverse weather over the aerodromes (Japan)

	Originator	Question	Answered?
1	Kenrick Taylor (IFATCA)	When the MetC coordinates with the ATC unit, who represents the ATC unit? A local flow controller? Or another person in the ATC unit? **Answer (Toshihiro Yone (JCAB)):** *METC provides weather products to ATMs, ATM officers are the point of contact for weather products. We call the ATM officer at the airport TMU.*	Y
2	Christy Leung (HONG KONG CHINA)	How often do you conduct the joint review past critical SIGWX events? Is it a near real-time review or a consolidated review with a couple of cases? **Answer (JMA):**	Y

	Originator	Question	Answered?
		JMA conducts such joint review five or six times a year. We had more reviews in early days when the MET impact on ATM was not well known.	
3	Anonymous	Does JCAB consider TAF forecasting thunderstorms of sufficient fidelity to implement ATFM measures? Are special MET products required apart from ones in Annex 3 today? **Answer (JMA):** *As Peter explained this morning, current Annex 3 does not provide ATM-tailored MET products. So the products that Japan presented today are not on the ICAO provision.*	Y
4	Ashwin Naidu (AUSTRALIA)	excellent presentation. Regarding your case studies, in particular TS, how do you manage ATFM process during the instances when forecast TS commences earlier than the expected time?	Y
5	Arjan Mukherjee (INDIA)	In case of sudden weather events when ATFM measures are applied within short timeframe What is the usual compliance percentage by the airlines with the slots issued through ATFM measures	Y
6	Anonymous	For JMA, how many hours ahead of the snowstorms hitting airports like Chitose (RJCC)? Short lead-time notification may force use of more reactive ATFM measure e.g. Ground Stops, MIT, MDI **Answer (JMA):** *We recognize necessary lead-time is at least 2 hours and understand short lead time force reactive ATFM. JMA usually holds special weather briefings for significant weather events such as heavy snow a day prior to the event.*	Y

SP/08 - Verification and enhancement of Impact-Based MET information to support ATM Operations (Japan)

	Originator	Question	Answered?
1	Anonymous	Do you have any mechanism to cater for low level wind shear particularly in approach path in the impact-based products? **Answer (JMA):** *While it is not integrated into the impact-based forecast, we have technics to detect low-level windshear on the approach path using lidar and Doppler radar for airport weather.*	Y

	Originator	Question	Answered?
		Answer (Kenji ATMETC): *JCAB and JMA issue Wind-shear-alert using detected data by Airport Doppler Radar and LIDAR.*	
2	Anonymous	As the aviation community gradually implements Free Route Airspace (FRA), how would impact-based MET product described in SP/08, tailoring to ATS routes be affected? **Answer (Kenji ATMETC):** *Thank you for asking. As mentioned in last year's seminar, if free routing is implemented, there is a possibility that current methods will not be able to cover the issue. We are constantly improving our products based on ATM/MET cooperation. Of course, we also have input Free-routing. As for the plan, we haven't made any plans yet, but we will improve the product as necessary to meet the needs of the time.* **Answer (Michiko IKEDA (JMA)):** *As mentioned in last year's seminar, if free routing is implemented, there is a possibility that current methods will not be able to cover the issue. We are constantly improving our products based on ATM/MET cooperation. Of course, we also have input Free-routing. As for the plan, we haven't made any plans yet, but we will improve the product as necessary to meet the ATFM operation needs of the time.*	Y
3	Ashwin Naidu (AUSTRALIA)	it seems like only radar and satellite outputs are used for verification. Did you consider using lightning network to verify TS occurrence? Follow up question: is it possible to also verify using PIREP? **Answer (JMA):** *So far, we do not utilize lightning detection for the forecast of convective clouds impact. It is utilized just real-time assessment and for the forecast for next 2-3 hours.* **Answer (Kenji ATMETC):** *Thanks for Good question Ashwin. We still don't use a number of lightning detection in specific area like 20km mesh around airport to verification. But When I brief about Thunderstorm to Air Traffic Manager. sometimes I mention*	Y

	Originator	Question	Answered?
		the probability of a number of TS detection. I mean how big scale TS or not. **Answer (Kenji ATMETC):** *> Follow up this question, is it possible to also verify using PIREP? Thanks for asking. Answer is as for the verification using PIREPs, I think it would not be sufficient for convective clouds impact as the distribution of reports is sparse, but effective for turbulence forecast verification.*	
4	Anonymous	In your studies so far, has the aircraft avoided penetrating into SIG CLOUD (non-convective)? **Answer (Kenji ATRMETC):** *Thank you for asking. Not all the aircraft avoided the non-convective clouds. But affected to ACC and ATMC operation by some of deviates.*	Y
5	Anonymous	As MET information gradually migrates to SWIM-based IWXXM delivery, have there been any development of IWXXM / XML-equivalent impact-based weather product in SP/08 @ ICAO METP? **Answer (ICAO-Peter Dunda):** *This is a work in progress. The ICAO METP is responsible for developing ICAO provisions for MET services consistent with operational improvements envisioned by the Global Air Navigation Plan (GANP). E.g., the MET Panel is developing MET information in the SWIM-enabled environment, and provisions for a phenomena-based, globally-consistent, hazardous weather information service. It has developed a Concept of Operations for Hazardous Weather Information Services in Support of International Air Navigation. In addition, the MET Panel white paper on Future Aeronautical Meteorological Information Service Delivery presents an agreed high-level understanding of how meteorological service provision will most likely evolve. The white paper discusses collaborative processes that take account of the impacts MET conditions have – both positive and negative – and the requirement for an increased focus on fully understanding the impacts of MET.*	Y

SP/09 - Development of Probabilistic Forecast Products supporting ATM (Hong Kong, China)

	Originator	Question	Answered?
1	Anonymous	Interesting what HKO intend to do about Wind Shear prediction. Can you share some preview on how HKO is going to forecast windshear? **Answer (Ira, Chan Yan Chun (Hong Kong Observatory):** *In our case, we have different kinds of low-level wind shear near the airport. For example, there could be terrain induced wind shear when the low level winds under southerlies or southwesterlies. Those are more likely to be predictable. There was also sea breeze induced low level windshear. We are still under investigation about this kind of the probability. We will be very welcome to share when there is good progress.*	Y
2	Arjan Mukherjee (INDIA)	How the probability table probabilistic forecasts are shared with stakeholders and ATFM measures are applied on basis of this forecasts? **Answer (Ira, Chan Yan Chun (Hong Kong Observatory):** *The probability table will be disseminated through the web portable for aviation communities. We will have regular and ad-hoc briefing with ATFM and airport operators, and face-to-face consultation with the stakeholders in the Integrated Airport Centre. The probabilistic forecast sometimes will be emphasized during the briefing and consultation.*	Y
3	Anonymous	For the HKO presentation, what do the different probabilistic forecast colours shown in 25 Mar 2023 + 19 Aug 2023 mean? **Answer (Ira, Chan Yan Chun (Hong Kong Observatory):** *The different colour of the probabilistic forecast could represent the tendency of the chance of thunderstorms, and maybe also the most probable timing of the occurrence. Those two cases are only example to be illustrated.* *The different colour of the probability represents the chance of occurrence Low (0-29%), Medium-low (30-44%), Medium (45-54%), Medium-high (55-69%), and High (70-100%).*	Y
4	Anonymous	Is the METP working on any guidance material for probabilistic MET forecasts similar to those presented by Australia, Hong Kong China and Japan? It appears to be beyond TAF requirement?	Y

	Originator	Question	Answered?
		Answer (ICAO-Peter Dunda): *The ICAO METP will determine requirements for tailored meteorological information and services under a SWIM environment, which will fulfil the operational needs of a wide variety of user domains as identified and prioritised in the GANP and ASBU. It will also develop necessary provisions for implementing the required meteorological information and services. The expected applicability of the new provisions and their associated guidance material is November 2026.*	

SP/10 - Regional Operation Support: CADENA (United States)

	Originator	Question	Answered?
1	Anonymous	Why is the twice-weekly Ops web conference being held on Webex instead of CADENA OIS? Isn't it better to have all the capabilities within a single platform (information + conference etc)?	Y
2	Anonymous	CADENA contingency events handling mentioned of 15 contingency event types. Can they be further consolidated so that they can be more frequently rehearsed in the quarterly rehearsals?	Y
3	Anonymous	How to calculate, assessment or evaluate the economic benefits quantitatively?	N
4	Anonymous	How does CADENA ATFM Daily Plan table facilitate linkage between Airport/Airspace Constraints / Significant Weather and planned ATFM measure?	N
5	Anonymous	Will it be possible to explain the difference between CADENA OIS and CADENCE OIS please?	N
6	Anonymous	Will CADENCE OIS be evolved towards supporting Flow Exchange Model (FLXM) as the ATFM Daily Plan (ADP) exchange model matures over time?	N
7	Anonymous	How does CADENA manage data exchange in a way that aligns with Personal Data Protection laws that States are increasingly implementing?	N
8	Ashwin Naidu (AUSTRALIA)	should consider 'Space Weather events' as one of the severe weather events. There could be some major impacts from this event. Refer to SP/11 for more info.	N

SP/11 - Space Weather Services (Australia)

	Originator	Question	Answered?
1	Anonymous	If a Space Weather Advisory indicate GNSS outage, how should NOTAMs be released to indicated associated GNSS-related outages e.g. GBAS outage?	Y

	Originator	Question	Answered?
2	Anonymous	How severe can the loss of satellite tracking affect airspace users and ATC? Were there any real-life examples?	Y
3	Anonymous	What are MWO expected to do when they do receive a Space Weather Advisory? Do they issue a corresponding warning to Air Traffic Services or they simply forward the Advisory to ATS?	N
4	Anonymous	How do the space weather advisory centers verify that the interference impact is caused by space weather and not by human jamming?	N
5	Anonymous	Would it be necessary to issue a NOTAM to advise Airlines of possible Space weather phenomenon? As of now, there is no clear way to ensure SWXC advisories do reach ATS and Airlines.	N
6	Anonymous	What are the common mitigations for airspace users and/or ATC when space weather has been forecasted? Like the example of the LPV failure, Thank you	N
7	Anonymous	Should States or ANSP issue NOTAM after receiving space weather advisories? or these advisories itself suffice the requirement?	N
8	Neeti Singh (INDIA)	space weather cost recovery is implicated for countries who are taking these services.	N
9	Anonymous	Will Space Weather Advisories related to ionospheric scintillation help assess usability of GBAS implementations?	N