REGIONAL AVIATION WEATHER DEVELOPMENT

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AvRDP 2nd Training Workshop 8-10 Oct 2018

REGIONAL WEATHER REQUIRED

- ATM requires regional weather for common situational awareness for coordination with regional airports, e.g. ASEAN multi-nodal networking coordination
- Airlines and pilots require hazardous weather information along the whole trajectory (TBO)
- Need harmonized weather information across FIR boundaries

AVIATION HAZARDOUS WEATHER

- Tropical cyclone
- Significant convection
- Turbulence
- Airframe icing
- High Ice Water Content (HIWC)
- Mountain wave
- Sand/duststorm
- Volcanic ash
- Radiative cloud
- Space weather

WEATHER SEES NO BOUNDARIES

Users demand better quality SIGMET



THE AIR TRAFFIC IN APAC IS GROWING VERY FAST



BACKGROUND ON THE OPERATIONAL SIGMET COORDINATION IN SE ASIA

- Based on "**Jakarta Recommendation**" adopted at WMO Regional Forum of Meteorological Services for Aviation Safety in SE Asia in 2015 in Jakarta, SIGMET coordination was proposed
 - aimed at improving SIGMET quality over the SE Asia airspace through coordinated meteorological watch and harmonised issuance of SIGMETs for weather phenomena straddling across FIR borders.
- Under the WMO's auspices
 - a Pilot Project on SIGMET coordination was conducted from 4 Oct 2016 3 Mar 2017
 - Indonesia (WIIF, WAAF), Malaysia (WBFC, WMFC) and Singapore (WSJC) were the pilot member countries

 Conclusion APANPIRG/26/62 — Cross-border MET Collaboration and Coordination (2015)

Recognizing the presence of SIGMET weather phenomena that straddles across boundaries, States/Administrations are encouraged to promote cross-border collaboration and coordination to harmonise the MET products of such phenomena between Meteorological Authorities to enhance MET support for ATM in the Asia/Pacific Region.

MET SG/21 (2017) approved

• Conclusion APANPIRG/28/30 - SIGMET coordination in the APAC Region (2017)

That, States and Administration are encouraged to:

- a) Participate in cross-FIR-boundary SIGMET coordination on a bilateral or multilateral basis for seamless hazardous weather information for the benefit of aviation users, as well as advancing the capabilities of participating MWOs in the issuance of SIGMETs for cross-border hazardous weather phenomena; and
- b) Continue to share outcomes from SIGMET coordination activities and consider a step-by-step integration of SIGMET coordination activities in the region when operationally ready.

FROM PILOT PROJECT TO OPERATIONAL SERVICE

- At the wrap-up meeting of the project on 27 29 March 2017 in Singapore, the group agreed to
 - continue the project on a semi-operational state
 - transition to 24x7 operations on 1 August 2017
- JMA and HKO supported the operations by offering their web tools which facilitated successful coordination
- Monthly review meetings led by Singapore (Coordinator) were conducted (via teleconference) for the group to discuss any issues, share experiences & learn from each other's best practices

WEB-BASED MONITORING AND COORDINATION TOOL (HKO)



Operational since 1 August 2017 Viet Nam joined in January 2018 for trial operation

MONITORING AND COORDINATION TOOL (JMA)



JAPAN COORDINATIVE SIGMET ISSUANCE (CSI) - OPERATION SINCE APR 2018



Collaborative SIGMET Issuance Demonstration Project —Since 2015

Multi-lateral collaborative efforts for better harmonized en-route hazardous weather information

Project members :

- Japan (JMA)
 Lao PDR (LDMH)
- Myanmar (MDMH)
- Philippines (PAGASA)
- Thailand (TMD)
- Vietnam (VATM)

Air navigation service providers (ANSPs) and airlines have been invited to participate in the project and evaluate the demonstrations



Project members

JAPAN EXPANDING COORDINATION WITH USA AND PHILIPPINES - UNDER TRIAL



WORLD-WIDE SIGMET COORDINATION EFFORTS

- SIGMET Coordination to address consistency issue
 - Op-SIGMET Coordination
 - Cooperative SIGMET Initiative (CSI)
 - METAlliance SIGMET Coordination Project
 - Russian Federation SIGMET Coordination Project (Russia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan)
 - Balcans (Bosnia-Herzegovina, Croatia, Serbia and Slovenia)
 - DACH (Germany Austria and Switzerland)
 - NAMCON (Denmark, Estonia, Finland, Iceland, Latvia and Norway

EUROPE - METALLIANCE



- Eight member states share national tools
- Harmonize forecaster's handbooks and SIGMET thresholds
- Real-time web portal for common situation awareness

WMO Pilot Project 15 Aug 2016



Pilot Project on SIGMET Coordination

Guiding Principles of Cooperation and SIGMET Coordination Procedures

> Version 1.0 25 August 2016



with the assistance of



Operational since 1 Aug 2017

Operational SIGMET Coordination

Guiding Principles of Cooperation and SIGMET Coordination Procedures

> Version 2.0 1 August 2017





with the assistance of





Operational SIGMET Coordination

Guiding Principles of Cooperation and SIGMET Coordination Procedures

> Version 2.1 25 January 2018



with the assistance of





GUIDING PRINCIPLES

- Each MWO is ultimately responsible for the SIGMETs issued for its FIR
- Each MWO own national operational needs takes priority over the coordination
- For more efficient and timely coordination, the coordination could be
 - Initiated by any one of the MWOs concerned
 - Undertaken in an efficient manner in order to avoid delays
- Ensuring quality of SIGMET issued in terms of accuracy



OP-SIG-COORD

Indonesia x2, Malaysia x2, Singapore, Vietnam (trial since 1 Jan 18) Focusing on WS SIGMET



- A role model of coordination among MWOs
- Improved weather services for airlines operating in APAC
- Regular meetings to review:
 - Performance
 issues
 - Cloud-top issues
 - Issuance criteria
 - Extension for WC, WV SIGMET
 - etc.

SIGNIFICANT IMPROVEMENT IN SIGMET



WS SIGMET for WSJC WSJC SIGMET 1 VALID 190100/190400 WSSS- WSJC SINGAPORE FIR EMBD TS OBS WI N07 E108 - N0738 E10907 - N0536 E11251 - N0349 E11032 - N07 E10648 - N07 E108 TOP FL520 STNR NC=

WS SIGMET for WBFC WBFC SIGMET A01 VALID 190100/190400 WBKK- WBFC KOTK KINABALU FIR EMBD TS 2005 WI M0448 E11418 - N0306 E11372 - N0354 E11036 - N0542 E17254 - N0448 E11418 TOP FL530 STNR NC=

COORDINATED SIGMET AND UN-COORDINATED SIGMET



SIGMET COORDINATION TRAINING WORKSHOP (4-6 DEC 2017, HONG KONG)

- 1st Expert Group meeting on regional hazardous weather advisory services cum SIGMET-Coordination Training Workshop held at HKO on 4-6 Dec 2017
- All ASEAN countries representatives attended and exchanges wills on regional collaborations











EXPERT/PANEL SUMMARY

- Close relationship with users is very important.
- Encourage MWOs to talk to users. Make them happy with your work. See how your work after the service of users.
- Build trust with users via regular meeting to listen and to report progress, i.e. engaging them in the development process.

SURVEY FEEDBACK

- Efficiency a "lite" web-platform (at least for starting up the web) is preferred to improve the response speed of the web platform. Flexibility should be given for the users to determine which layers to add/remove according to their internet bandwidth/machine performance etc considerations.
- Grouping should allow easy grouping to reduce the number of FIRs involved in the coordination and hence the complexity in the chat room.
- Nowcasting users want guidance on the movement/development of the sigconv polygons.
- Turbulence etc. a few users want the web platform to be extended for Turbulence, TC and Volcanic ash.
- Parameters "the convection polygon can add information about the movement and intensity of trend ..."
- Chat room design should make the chat room more eye-catching (color, size, etc.)
- Wind prefer to use wind barb (with choices of flight level) instead of streamline.
- sustainable support some wish HKO to continue develop features on the web platform.



Opening Ceremony of International Seminar on Aeronautical teorological Service, and Quasi-Operational Launch of Asia Aeronautical Meteorological Service Website



WMO RA II pilot project startup in 2007 For building capacity

- CAAC, CMA and HKO jointly develop AAMC
- Provide aviation weather products and guidance for MWOs' reference
- Capacity development support in aeronautical meteorological services



Started AAMC development in 2016 after appreciating global trend from *Conjoint* ICAO/WMO Meeting



AAMC operational in 2018

- HKO Aviation Forecaster conducts daily morning aviation weather briefing with CAAC
 Aviation Forecaster via internet
- Together issues coordinated weather guidance for CAAC and HKO's reference in issuing harmonized SIGMET
- Some ASEAN countries have also access to the websites

CAAC - Beijing





HKO/AMO - Hong Kong



Monitoring and coordination platform



Monitoring and forecast tools to support SIGMET issuance





Chinese Fengyun 4 Geostationary Satellite Satellite-based nowcast (convection, global lightning and cloud top height)



NWP-based Forecast (turbulence, icing, convection, mountain wave, sand/dust storm)

Convection identification & Nowcast



0-6 hr nowcast

Actual Himawari-8 deep convection



Purple : actual; Green : forecast Numerics : cloud top height hourly outputs (1, 2, ... 6hr) and accumulative outputs (0-4hr) High Ice Water Content (HIWC)



HIWC (ICING)





H8 observed data : (without VIS) Red (Band 09-

Band13): deep convection Blue (Band 12-Band13): high cloud tops (regions with ice crystals) True skill statistics (TSS): 0.42



WRF simulation :

20161006 0000Z base T+24H F/C Base image : simulated H8 IR1 Highlighted: Sig. convection (red) and potential HIWC (blue) using multichannel radiance simulation



WRF simulation (cal): 20161006 0000Z base T+24H F/C

Histogram matching of observed and simulated channels

Real-time weather monitoring platform Including WV SIGMET and WC SIGMET and WS SIGMET



AAMC weather monitoring – current regional weather including satellite, radar, wind, global lightning, Special Air Report, NWP forecasts, valid SIGMET and TC/VA Advisories

CHATROOM TO FACILITATE DISCUSSION BETWEEN FORECASTERS FROM PARTICIPATING MWOs





Significant convection, turbulence, icing, mountain waves, dust/sand storm guidance information Facilitating MWOs to prepare respective SIGMET (textual and graphical) and preparation for XML exchange

SOME USEFUL TOOLS TO HELP CAPACITY BUILDING

- SIGMET Coordination Web Tool: <u>https://sigmet.hko.gov.hk/sigcoord-newfeature/ops-sigcoord/</u>
 - Contact Dr Jeffery Lee of HKO jeffreylee@hko.gov.hk
- > AAMC web platform <u>http://www.aamets.com</u>
 - Contact Dr FY Wang of CAAC <u>wangfy@atmb.cn</u>
- > WMO RSMC on Nowcasting https://swirls.hko.gov.hk/rsmc/aviation.html
 - Contact Dr Jeffrey Lee of HKO jeffreylee@hko.gov.hk
- Community SWIRLS <u>https://swirls.hko.gov.hk/rsmc/aboutSWIRLS.html</u>
 - Contact Mr WC Woo of HKO wcwoo@hko.gov.hk
- XML and SWIM development
 - Contact Mr BL Choy blchoy@hko.gov.hk
- > AvRDP Website <u>https://avrdp.hko.gov.hk</u>
 - Contact Dr Peter PW Li pwli@hko.gov.hk

Request: Share ARS

THANK YOU