



*International Civil Aviation Organization*

## **INFORMATION PAPER**

### **TWENTIETH MEETING OF THE METEOROLOGY SUB-GROUP (MET SG/20) OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (APANPIRG)**

*Bangkok, Thailand, 6 – 9 June 2016*

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**Agenda Item 6: Research, development and implementation issues in the MET field**  
**6.1) Observations, reports, forecasts, advisories and warnings (including MET/S WG Report)**

#### **DEMONSTRATION ON COLLABORATIVE SIGMET ISSUANCE**

(Presented by Philippines, Viet Nam and Japan)

#### **SUMMARY**

This paper presents information regarding a demonstration project on collaborative SIGMET issuance which has been conducted by the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), the Vietnam Air Traffic Management Corporation (VATM) and the Japan Meteorological Agency (JMA). The three organizations carried out the first demonstration for collaborative SIGMET issuance from 9 to 20 May 2016 with thunderstorm (TS) as the initially considered phenomenon.

## **1. INTRODUCTION**

1.1 The ICAO Meteorology Divisional Meeting (2014) noted that there had been long-standing SIGMET deficiencies in some States and expressed requirements from users for harmonized, phenomenon-based hazardous weather information. In this regard, there was an urgent need demonstrated by aviation users for the establishment of regional hazardous weather advisory centres (RHWACs) to assist meteorological watch offices (MWOs) with the provision of SIGMET information for select hazardous meteorological conditions that included, as a minimum, thunderstorms, icing, turbulence and mountain waves, but which excluded volcanic ash and tropical cyclones (given the existing volcanic ash and tropical cyclone advisory systems). Taking into account such users' requirements, the meeting fully concurred that a regional hazardous weather framework should be implemented expeditiously, while considering the development of a governance and cost recovery framework.

1.2 The ICAO APANPIRG/26 was invited to note the importance of cross-FIR-boundary coordination and alignment of the MET information provided by States for adjacent FIRs to support enhanced operational efficiency and safety of the air transport system – especially SIGMET information provided for a hazardous phenomenon that affects multiple FIRs. The meeting agreed that such initiatives to enhance the sharing of MET information between States would help to ensure the necessary alignment of MET information provided for adjacent FIRs. In view of the above, APANPIRG/26 adopted the following conclusion:

**Conclusion APANPIRG/26/62 — Cross-border MET Collaboration and Coordination**

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.

**2. THE FIRST DEMONSTRATION FOR COLLABORATIVE SIGMET ISSUANCE**

2.1 Noting the existence of SIGMET discontinuity between FIRs and the above requirements, the Philippine Atmospheric Geophysical and Astronomical Services Administration (PAGASA), the Meteorological Watch Office of the Vietnam Air Traffic Management Corporation (VATM/MWO) and the Japan Meteorological Agency (JMA) have conducted a demonstration project on collaborative SIGMET issuance and carried out the first demonstration to find an effective way to issue a harmonized information.

2.2 A dedicated website was developed by JMA for this purpose where the MWOs and the test advisory provider were collaborating on the formulation and issuance of the test SIGMETs text and graphics.

Outline of the first demonstration

2.3 The first demonstration for collaborative SIGMET issuance was carried out from 9 to 20 May 2016. During this demonstration, PAGASA and VATM, the MWOs of Philippines and Viet Nam, respectively, issued test WS SIGMETs to their FIRs with reference to JMA's phenomenon-based test advisory information the coverage of which includes the whole target area, i.e., Hanoi, Ho Chi Minh and Manila FIRs. Both past and real-time observation data were used to assure a sufficient number of cross-FIR-boundary coordination trials.

2.4 The target phenomenon was limited to thunderstorms (TS), one of the listed up phenomena at the ICAO Meteorology Divisional Meeting (2014) and which is frequently observed in the target area. The information issuance time was fixed at 03, 06 and 09 UTC. If no cumulonimbus clouds (CB) was forecasted for the day, a decision to use past data was made before 03 UTC. Since this was the first step, the above limitations were introduced to secure the regular operation which the three organizations continued in parallel with the demonstration. The issued test information was shared via the dedicated website.

Participation of aviation users

2.5 PAGASA, VATM and JMA invited the Air Navigation Service Providers (ANSPs) and Airlines who have regular operation in the target area to assess the first demonstration. 32 feedbacks in total were provided from such users including the Civil Aviation Authority of the Philippines (CAAP), two Area Control Centres (ACCs) of VATM (ACC Hanoi and ACC Ho Chi Minh), All Nippon Airways, Cebu Pacific Air, Japan Airlines, Philippine Airlines, Saudia Airlines, SEAIR International, Vietjet Air and Vietnam Airlines.

2.6 The issued test information, both the test WS SIGMET (text and graphical) and the test advisory information (graphical) were provided to the participating users via a dedicated webpage for information provision. Satellite imagery referred in the test information issuance was also available at the webpage as an option overlaying the issued information. Samples are shown in the **Appendix 1**.

#### Coordination before and during the first demonstration

2.7 Before the first demonstration, the three organizations had developed the test information issuance procedure considering the differences between the criteria on their regular SIGMET issuance. As a result, the test advisories were decided to be issued only for the TS areas of 200 km x 200 km or larger, while MWOs may issue for smaller areas around congested air-routes (see the Figure 3 of the **Appendix 1** for such example). Another possible difference accepted in advance was with regards to the height of the CB top. If a CB area extends from one FIR to another, the test advisory would be issued with the highest CB top of the whole system, while test SIGMETs would be issued with the highest value in each FIR.

2.8 The primary means of real-time communication during the demonstration was the BBS at the dedicated website. Forecasters' comments on their test information and reasons to issue test SIGMETs for unspecified area or with different height were posted. Some parts of the communication via the BBS are shown in the **Appendix 2**.

#### Highlights of the first demonstration

2.9 During the first demonstration, a total of 53 test SIGMETs, including 4 cases for cross-FIR-boundary phenomena extending over Ho Chi Min and Manila FIRs, were issued with reference to 52 phenomenon-based test advisory information. Listed below are the highlights of the demonstration.

- ✓ Some test SIGMETs were issued when CBs cover congested air-routes or areas even when the sizes of CBs were smaller than the criteria of test advisory issuance. On a congested airspace, there is a need for SIGMETs issuance even for CBs that is relatively smaller in area coverage (**Appendix 1**, Figure 3). The importance of attentive service to congested air-routes and sharing such information beforehand were once more recognised.
- ✓ The location of weather phenomena in some test SIGMETs appeared a bit different compared to advisory due to rapid development of concerned CB during the lag-time between the test advisory and SIGMET issuances (**Appendix 1**, Figure 4).
- ✓ The fact that the highest CB top or movement of a system could be different in the parts located in each concerned FIR was recognised.

#### Summary of feedbacks from the aviation users

2.10 The collection of the aviation users' feedbacks is attached as the **Appendix 3**. The summary of the feedbacks are listed below.

- ✓ The first demonstration was well-received among the participated aviation users. Significant weather information plays an important role in their operations and its improvement can enrich their services, which will further contribute to the efficiency and safety of the air transport system.

- ✓ SIGMET users have mentioned deficiency and discontinuity in recent operational SIGMET information, and thus share expectation and desire for getting more qualified, easier to use/understand SIGMET bulletins.
- ✓ There were further requests on target phenomena (turbulence, icing, etc.), issuance timing (information on developing CB and 3/6 hour forecast), element (affected altitude), and information detail (information on individual CB, not whole the system).
- ✓ The participated users desire that the information like those issued during the first demonstration will be available in regular operation.

#### Summary of the first demonstration

2.11 Listed below are the summary of the demonstration outcome:

- ✓ The demonstration highlights the role of a reliable sub-regional/regional significant weather advisory system not only in supporting one or more MWOs with defining weather phenomena (area of coverage, intensity, movement, etc.) that could affect flight operations within their spaces of responsibility, but also provide a broad view of significant weather information over a sub-region/region for cross-multi-FIR flights.
- ✓ From the side of flight operators/pilots/ATC, the demonstrated advisory system would be remarkably helpful over the regions with deficiency and/or discontinuity of SIGMET information such as far offshore, over the ocean or in regions with no radar data.
- ✓ Notwithstanding the advisory, the demonstration stresses the decisive role of each MWO in issuing SIGMET for its responsible space regarding local significant weather phenomena or other special user-oriented considerations. Indeed some test SIGMETs were issued when CB clouds covered congested air-routes or a sector of the FIR even when the size of CBs coverage was relatively small compared to the criteria of test advisory issuance.
- ✓ Because of the fact that SIGMETs discontinuity (e.g. CBs coverage/top/movement and SIGMET issuance time/period of validity) over boundary regions of FIRs gives difficulty to the operation of ATC/Pilots, collaboration of adjacent MWOs to participate on the SIGMET information harmonization is needed in order to improve the SIGMET quality, efficiency, and reliability. For SIGMET harmonization, “agreed standard procedure” on SIGMET issuance and advanced advisory information should be shared among concerned MWOs.
- ✓ The SATAID software, other application and the dedicated website used for the first demonstration performed well. These provide enough time for satellite and NWP analysis, discussion within a MWO or with the other MWO and the test advisory provider, decision making, SIGMET formulation and issuance. The dedicated website was remarkably user-friendly.

#### Future plan

2.12 To answer the users’ desire, sub-regional/regional significant weather advisory system should be established in the near future. Taking into consideration the feedbacks from the users, some modification should be made before launching the advisory system as a regular operation and additional limited-time demonstrations will be needed to verify its effectiveness.

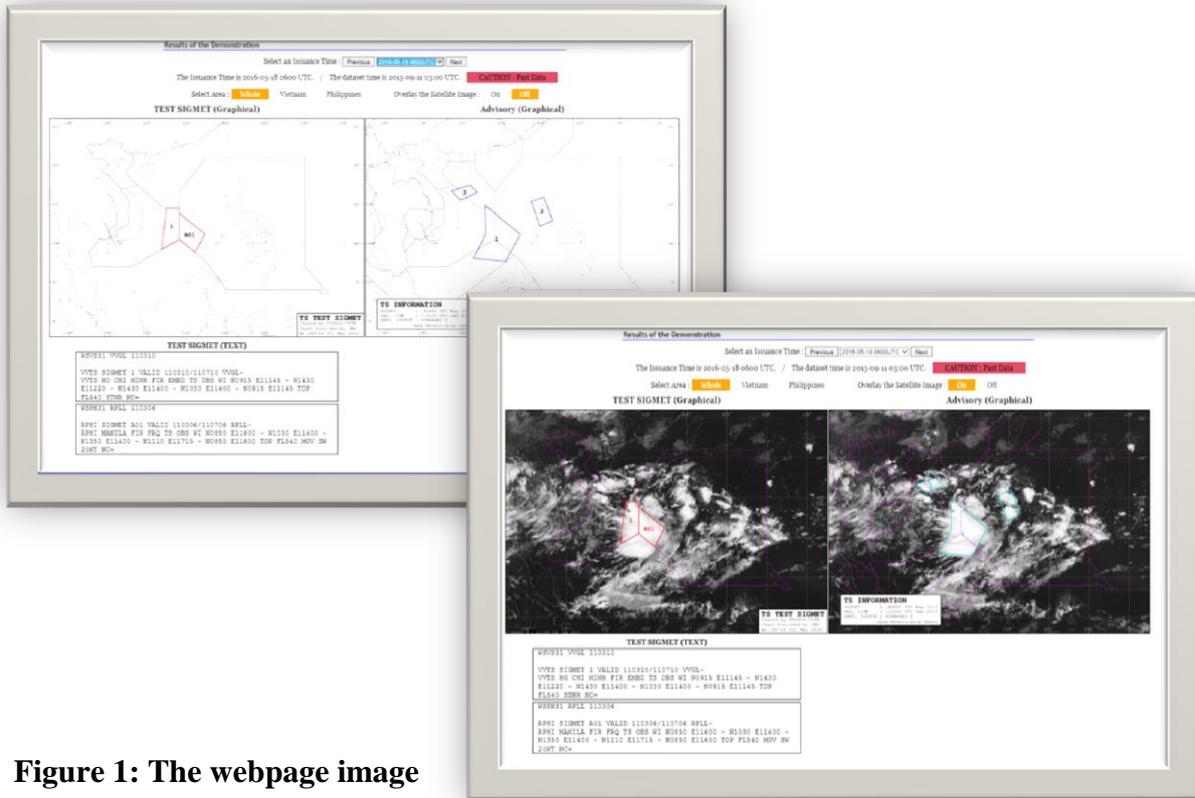
- 2.13 For the demonstration project, the three organizations will consider to work on:
- ✓ Continue developing an effective SIGMET harmonization procedure;
  - ✓ Continue to verify the necessity and effectiveness of a regional hazardous advisory system; and
  - ✓ Call for other MWOs in APAC regions to join the project team, to work together for the sake of further improvement of the regional meteorological service for aviation.

**3. ACTION BY THE MEETING**

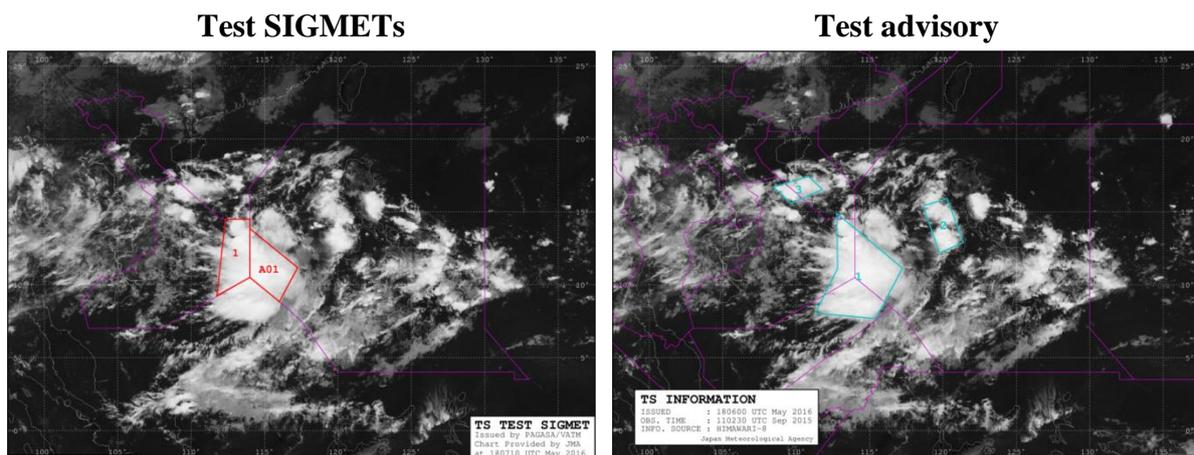
- 3.1 The meeting is invited to note the information contained in this paper.

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**Appendix 1 — Test WS SIGMET and test advisory information sample**

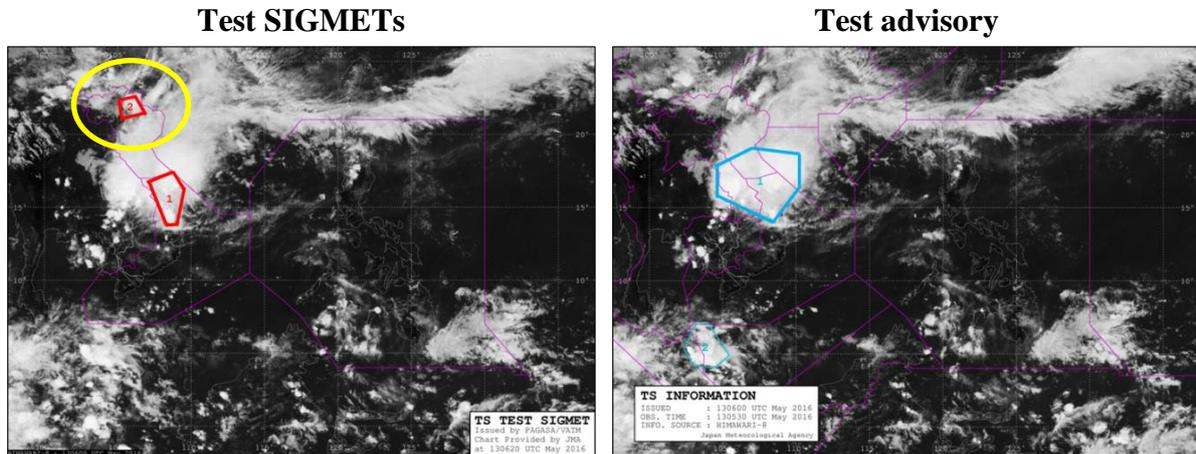


**Figure 1: The webpage image**



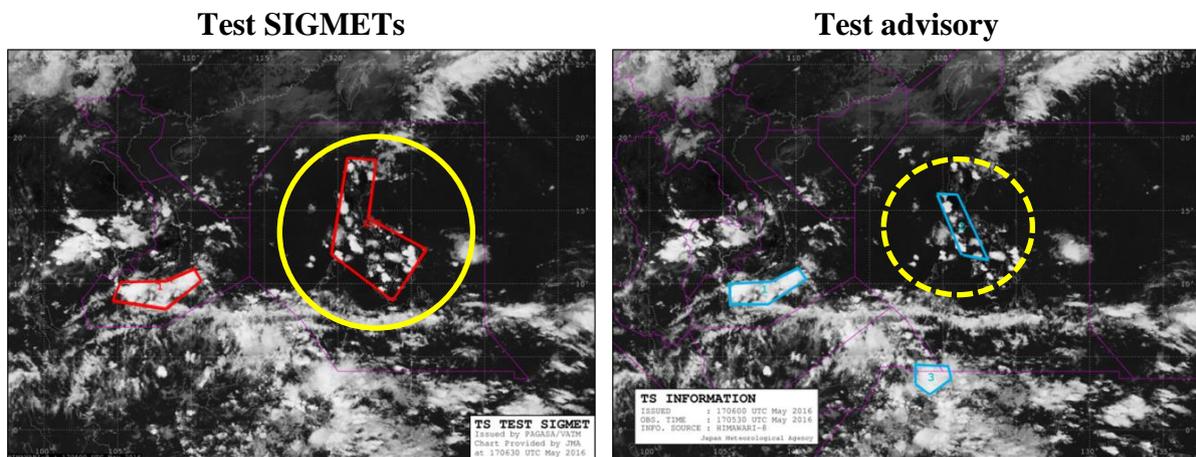
**Figure 2: Test information issued at 0600 UTC, 18 May 2016 (past data)**

- ✓ A test advisory information was issued for a cross-FIR-boundary CB system extended over Ho Chi Min and Manila FIRs.
- ✓ Two test “harmonized” SIGMETs were issued for the parts of the CB in each FIR referring to test advisory information.



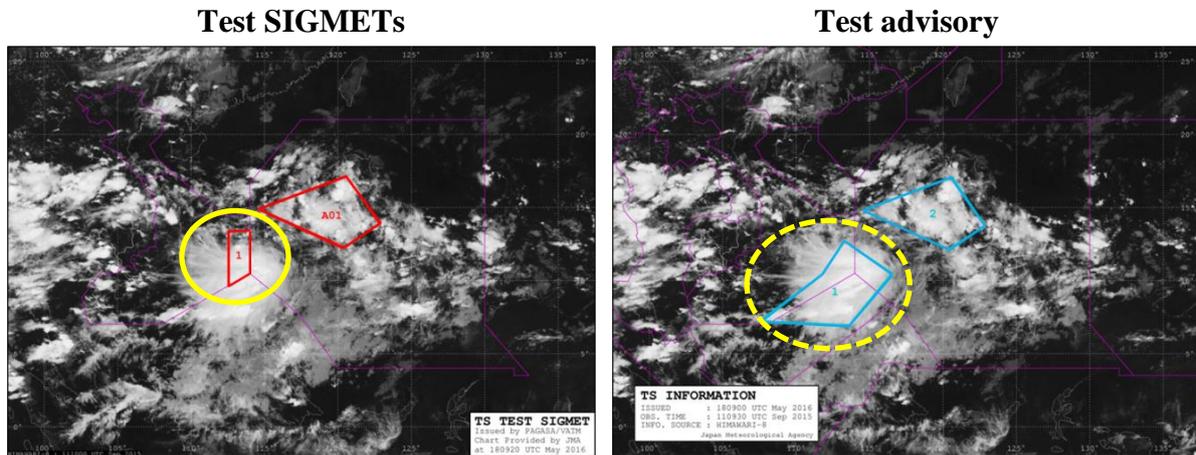
**Figure 3: Test information issued at 0600 UTC, 13 May 2016 (real-time data)**

- ✓ A SIGMET was issued for a relatively small CB area, without associated advisory.
- ✓ The small CB covered congested area where even small CB may affect air traffic.



**Figure 4: Test information issued at 0600 UTC, 17 May 2016 (real-time data)**

- ✓ A test advisory information was issued for a CB area within the Manila FIR.
- ✓ Associated SIGMET was issued for a larger area because of the rapid development of the CB after the test advisory issuance.



**Figure 5: Test information issued at 0900 UTC, 18 May 2016 (past data)**

- ✓ A test advisory information was issued for a cross-FIR-boundary CB system extended over Ho Chi Min, Manila and Singapore FIRs.
- ✓ Associated SIGMET for Manila FIR was not issued because the concerned MWO forecasted that the part of the CB within the Manila FIR would weaken.

**Appendix 2 — BBS communication sample**



**Time:** May 09, 2016, 09:46 UTC  
**From:** JMA  
**Message:** Dear VATM friends, thank you for your message. We understand the reason why VATM issued SIGMET for Ho Chi Minh FIR. If necessary, we can discuss on this matter on the web meeting on Friday.

**Time:** May 09, 2016, 09:28 UTC  
**From:** VATM/MWO  
**Message:** Dear all, there are convective clouds in the north of Ho Chi Minh FIR. This TS area is small but located along with the routes. So, we decided to issue SIGMET 1

**Time:** May 10, 2016, 02:39 UTC  
**From:** JMA  
**Message:** Dear all, we will conduct today's demonstration as scheduled and use real-time data. CBs can be seen in the north of Hanoi FIR and convective clouds are expected in this area through 06UTC. Also, CBs are expected in the inland area of Vietnam around 09UTC (same as yesterday's situation). However, convective activity is not as strong as yesterday at the east of Mindanao Island. We will keep monitoring.

**Time:** May 10, 2016, 02:56 UTC  
**From:** VATM/MWO  
**Message:** Dear all, at the moment VATM/MWO have the same opinion with JMA on TS forecasts over Vietnam Territory for today, only TS over land in H0\_CHI\_MINH FIR may be weaker than yesterday due to less heat. Thank you.

**Time:** May 11, 2016, 09:01 UTC  
**From:** JMA  
**Message:** JMA has issued 3 advisories. CBs can be seen at the south of Ho Chi Minh FIR, but they were still small for advisory info at 0830 UTC. However, they are expected to continue developing... Also, there are CBs near Manila, but it was also small for advisory info.

**Time:** May 17, 2016, 06:32 UTC  
**From:** PAGASA  
**Message:** Greetings. PAGASA issued WS SIGMET A01. Warning Area is enlarged due to developing isolated CBs all over Luzon and Visayas and the trough affecting Northern Luzon.

**Time:** May 20, 2016, 06:18 UTC  
**From:** VATM/MWO  
**Message:** Dear all, in the advisory 1, TSs area is small which is not enough 200x200 km. Beside, we predict that, this TSs area is weaken and do not exist over 3 hours. So we decided not to issue SIGMET. We keep monitoring.

**Time:** May 18, 2016, 09:09 UTC  
**From:** PAGASA  
**Message:** 111006\_TESTSIGMET\_A01 UPLOADED. No SIGMET issuance for Advisory 1 because it is weakening and moving away from Manila FIR.

## Questions and Assessment from aviation users

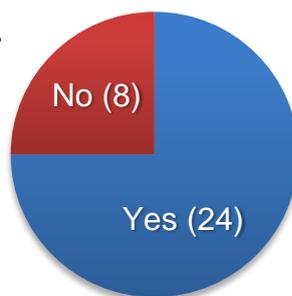
Q1. Do you often use SIGMET information in your operation? (Yes/No)

Q2. Have you ever experienced inaccuracy (in terms of area coverage or intensity) in SIGMET (Thunderstorm, Turbulence, Icing) information? (Yes/No)

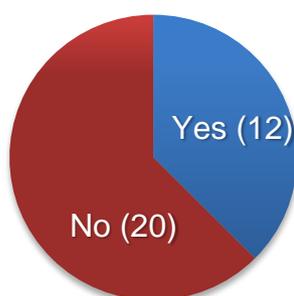
Q1.



Q2.



Q3. Have you ever experienced receiving dissimilar SIGMET information from the two concerned MWOs for one significant weather phenomenon over the FIR boundary between them? (Yes/No, with comment optional)

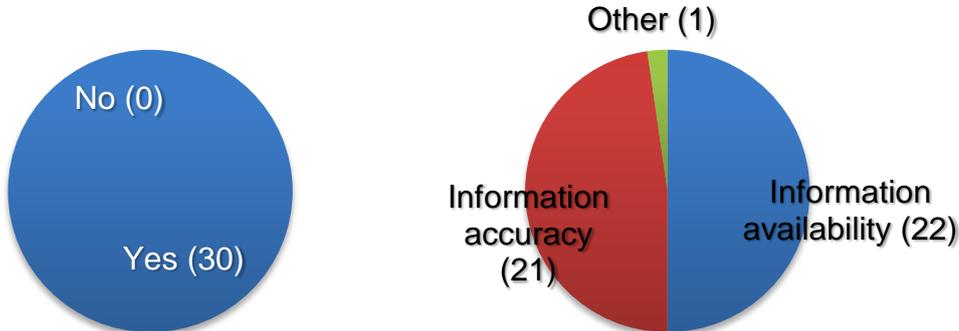


### Comments:

- Eventhough some information in SIGMETs are not very accurate, SIGMET information still play an important role in supporting pilots and ATC to guide aircraft deviating from the flight route due to bad weather. (ATC Officer)
- Current SIGMETs seem not reliable enough and they are used only for awareness. (Dispatcher)
- Sometimes information about weather phenomenon's direction of movement may not be accurate (as we refer to weather deviation requests from aircraft the same time). (ATC Officer)
- Sometimes there was a difference between actual height and the one reported in the concerned SIGMET, regarding severe turbulence. (Dispatcher)

Q4. Do you think that this collaborative WS SIGMET issuance is useful to your operation? (Yes/No)

If Yes, please select from the following criteria that describe its usefulness and were improvement from your current operation. (Information availability/Information accuracy/Other, with comment optional)

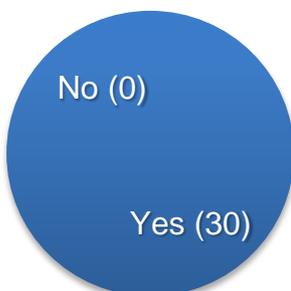


No answer (2)

Comments:

- It will be beneficial that significant weather information will become available in the area where currently no SIGMET has been issued. (Dispatcher)
- With information availability improvement, ATC would have useful information for planning flight operations over his/her space of responsibility. (ATC Officer)
- With such information, ATC can inform and give good advice for pilots en-route and in turn improve air traffic service. (ATC Officer)
- Implementing the 'test SIGMET issuance' in this Demonstration into a real operation would be very useful to ATC. (ATC Officer)

Q5. Do you think this Demonstration worked well for improved quality/effectiveness of SIGMET information (minimize inaccuracy, relieve discontinuity)? (Yes/No, with comment optional)



No answer (2)

Comments:

- Consistent information between FIRs will be welcomed. Please target the higher level among those States concerned. (Dispatcher)
- The ATC coordination over FIRs boundary becomes more complicated especially if the enroute aircraft has to deviate from its track and enter the adjacent FIR to avoid the adverse weather ahead and back to its original track. Good (accurate) SIGMET information provided to pilots and/or ATC ahead of time would help much with flight route planning and at the same time would reduce the work load of ATC. (ATC Officer)
- The collaboration among agencies/organizations in collection/preparation and provision of MET information will help provide correct information to support airlines' trust/reliance in making decisions for flight operations regarding adverse weather conditions. (Dispatcher)

Q6. Thunderstorm (TS) was the only target phenomenon of the first Demonstration. Do you have any request for future demonstration/operation? (comment optional)

- I hope information on developing CB based on Himawari-8 data will be provided. (Dispatcher)
- I think TS is the major significant weather phenomenon in the target region and there is no need to add the other target phenomena. (Dispatcher)
- In addition to TS, also TURB is an important phenomenon for dispatchers and pilots. Information regarding turbulence and icing will be also required. (Dispatcher)
- I think information regarding turbulence is more important than that of thunderstorm. Whether TS information is available or not, pilots avoid individual CB based on airborne radar or visual observation. Although most of the turbulence in South East Asia is associated with TS, information focused on TURB will also be useful. (Pilot)
- TS is the major significant weather phenomena in the target region which may affect the flight planning. Not only CB top height, but also information of altitude where aircraft operation can be affected will be useful. (Pilot)
- Turbulence, Lightning (Dispatcher)
- If could, please provide information for Clear Air Turbulence (CAT) areas. (ATC Officer)
- If practicable, please provide information about thunderstorm rain, turbulence, tropical depressions/cyclone, volcanic activity as well as other unusual weather that affect safety for flight operations. (Dispatcher)

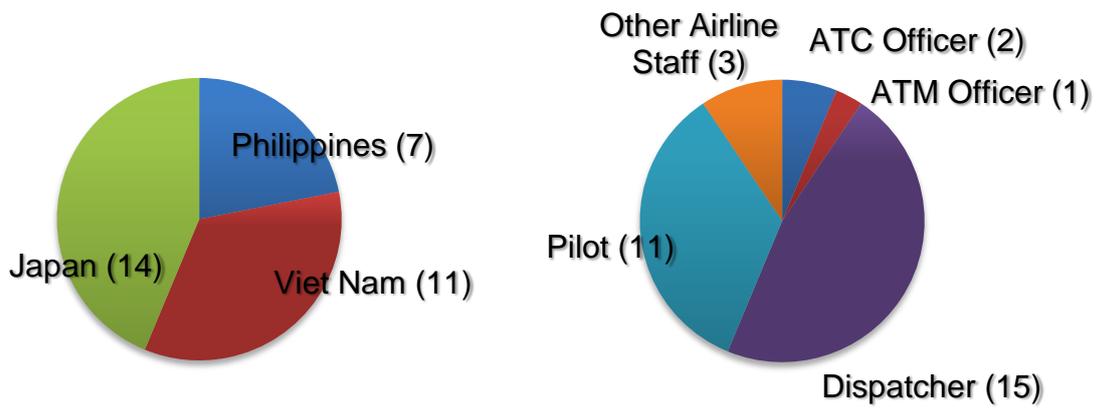
Q7. Please provide your comments, if there is any. (comment optional)

- It will be appreciated if you would further consider more detailed, individual CB state, and real-time information provision in future. (Dispatcher)
- It would further help the airlines if a 3, 6 hour TS positional forecast can also be provided. (Dispatcher)
- I think current SIGMETs are not accurate enough and often the extents are too large. It will be helpful if significant weather information showing more exact area become available. (Pilot)
- I hope timely information provision to cockpit (through data-link, ATC Officer...etc) will be implemented. (Dispatcher)
- I hope this kind of efforts will contribute to SIGMET improvement. (Dispatcher)
- Looking forward to smooth transition into actual application of this important meteorological application! (Airline Flight/Station operator)
- Looking forward for the actual operational implementation of this demonstration and a continuous access to the website. (Senior Manager, Airline Operations Control Center)
- Would be even better if other agencies will help collaborate their data to expand this project for longer international routes. (Dispatcher)

**Q8. Your (assessor's) position (optional)**

(State: Philippines/Viet Nam/Japan/Other)

(Role: ATC Officer/ATM Officer/Other Civil Aviation Officer/  
Dispatcher/Pilot/Other airline staff/Other)



Note: feedbacks from Viet Nam ACCs are not from individual Officers but from user bodies.