

Second Meeting

of the Working Group of the Meteorology Panel

Meteorological Operations Group (METP WG-MOG/2) –

Work Stream 3: International Airways Volcano Watch (IAVW)

*Buenos Aires, Argentina, 27 to 28 April 2016*

**INTERNATIONAL CIVIL AVIATION ORGANIZATION**

**LIST OF METP WG-MOG/2– IAVW ACTIONS**

(Actions for the meeting)

**Action agreed 2/1: Terms of Reference**

**Action agreed 2/2: Key Performance Indicators (KPIs)**

**Action agreed 2/4: Trial on the inclusion of confidence in VA Advisory/VAG**

**Action agreed 2/5**: **Sharing of operational information between VAACs**

**Action agreed 2/6: Extension of the area of responsibility of VAAC Tokyo**

**Action agreed 2/7: Update of Model VAG and Model SVA (Appendix 1 to Annex 3)**

**Action agreed 2/8: Guidance material regarding the display of VA advisory and VA SIGMET information**

**Action agreed 2/9: Provision of T+24 supplementary guidance by VAACs**

**Action agreed 2/10: Reporting of NO ASH via special Air-report**

**Action agreed 2/11: Improvement of VA aircraft encounter information**

**Action agreed 2/12: Work on re-suspended ash**

**LIST OF WG-MOG/1 – WAFS DECISIONS**

**Decision 2/3 —Review the need of colour code in the VAA**

**Agenda Item 1: Opening of the meeting**

1.1 The Second meeting of the MET Operations Group (MOG/2) Work stream 2: International Airways Volcano Watch (IAVW) took place in Buenos Aires, Argentina, at the premises of the Servicio Meteorológico Nacional from 27 to 28 April 2016.

1.2 Mr. Nigel Gait, Regulated Aviation Services Manager, United Kingdom Met Office, on behalf of the Rapporteur of the Working Group, Mr. Colin Hord, presided over the meeting, assisted by Mr. Raul Romero, Technical Officer, Airspace Management and Optimization Section,

ICAO Headquarters.

1.3 The meeting was opened at 13.30 Hrs. by Mr. Peter Lechner, the METP Chairman.

**Agenda Item 2: Introduction**

2.1 Adoption of the Agenda.

2.1.1 The agenda proposed was adopted.

2.2 Working arrangements.

2.2.1 The meeting adopted appropriate working arrangements.

2.3 Attendance.

2.3.1 The list of participants is provided in Appendix A.

**Agenda Item 3: Review of Terms of Reference**

3.1 WG-MOG Terms of Reference

3.1.1 The meeting reviewed the proposed Terms of Reference (ToRs) for the WG-MOG WAFS, SADIS and IAVW work streams. (SN/01 refers). In this regard the group agreed that the ToRs set out the role of the MOG now that it encompasses a range of ICAO systems. However it was felt by the group that the ToRs required further review. Therefore the group agreed to task an ad-hoc group to carry out further work on them.

**Action agreed 2/1**: **Terms of Reference**

That an ad-hoc group formed by Steve (Rapporteur), Andrew, Dimitar, Nigel, Patrick and Yohko be tasked to review the ToRs and report back to the next MOG-VA meeting.

3.2 Key Performance Indicators

3.2.1 In this regard the meeting reviewed SN/03 which provided background information on how Key Performance Indicators (KPIs) are used as reporting tools for the UK CAA and as part of the WAFC and SADIS Management Reports. The meeting reviewed a proposal to initiate discussion on this topic with a view to initiating the publication of KPIs within each VAAC’s management report. In this regard the group agreed to establish an ad-hoc group to work on the development of appropriate KPIs for VAACs and report back to the next MOG/VA for consideration. Therefore the group agreed on the following action:

**Action agreed 2/2**: **Key Performance Indicators (KPIs)**

That an ad-hoc group formed by all the VAACs with Anton as Rapporteur be tasked to develop appropriate KPIs for VAACs and report to the next MOG/VA for its consideration.

3.3 Job Card 4 (Inclusion of Aeronautical Meteorological Information in the SWIM-enabled environment and further development of the SWIM concept relating to meteorology) and links to WG-MISD

3.3.1 The group agreed that it would provide input to the WG-MIE work stream with regard to IWXXM application to VAAC products. (Job card 4 allocated to WG-MIE). Patrick informed the group that information relating to IWXXM could be found on the WMO website at the following URL.

<http://www.wmo.int/pages/prog/www/WIS/wiswiki/tiki-index.php?page=IWXXM-2>

**Agenda Item 4: MOG Work Plan and Activities**

4.1. Progress Reports from each activity.

4.1.1 **Activity 3.1**: Increased use of the VONA template by volcano observatories and list of volcanoes that threaten aviation.

4.1.1.1 The Meeting noted a study note (SN/07) on the use of the ICAO aviation colour code. In this regard it was recalled that the aviation colour code was used in both VONA and in volcanic ash (VA) Advisories (VAA). The Meeting agreed to keep colour code as an optional element in Annex 3- *Meteorological service for International Air Navigation*, Appendix 2, Table A2-1. Template for advisory message for volcanic ash. Noting the history of the addition of the colour code to the VAA and the relatively recent establishment of VONA, it was felt that it was timely to review the need for the colour code in the VAA. Thus, the group decided that this matter should be addressed by the MISD workstream in view of the potential service development impacts.

**Decision 2/3: Review the need of colour code in the VAA**

That a review of the utility of colour codes in volcanic ash products be handed over to be addressed by the WG-MISD.

4.1.2 **Activity 3.2**: Situational awareness for aviation operators.

4.1.2.1 The group noted SN/20 regarding a web interface to a database of volcanic activity information known as the Graphical Daily Volcanic Activity Summary (GDAS) and supplementary products issued by other VAACs such as the annotated satellite image by VAAC London.

In this regard, it was agreed to monitor further developments within the best-practices group and to report back progress to the MOG.

4.1.3 **Activity 3.3**: Expressing confidence at the time of observation of an ash cloud (T+0 hours) in the volcanic ash advisory/volcanic ash advisory in graphical format (VA Advisory/VAG).

4.1.3.1 The group reviewed proposal (SN/05 refers) regarding the development and inclusion of Operational Risk Severity Indicators (ORSI) into the Volcanic Ash Advisory (VAA) by the Volcanic Ash Advisory Centre (VAAC). In view of the potentially wider implications contained within the paper it was decided to pass this matter to the WG-MISD for further review.

4.1.3.2 With regard to the inclusion of a confidence statement within the remarks section of the VAA, as presented in SN/19 and fully discussed in the preceding VAAC-BP meeting, the group supported the following action.

**Action agreed 2/4**: **Trial on the inclusion of confidence in VA Advisory/VAG**

That all the VAACs, with VAAC Darwin as rapporteur, be invited to:

a) Prepare guidance material on the assessment and interpretation of T+0 confidence levels, with a view to its inclusion in ICAO Doc 9766;

b) Reference T+0 confidence guidance material on each VAAC operational webpage;

c) Subsequently commence the routine inclusion, on a trial basis, of a confidence statement at the beginning of the remarks section, using one of the statements: T+0 CONFIDENCE HIGH or T+0 CONFIDENCE LOW, as appropriate; and

d) Collect feedback from users of the VAA on the utility of the T+0 confidence assessment/guidance material and report back to the next meeting of the MOG.

4.1.4 **Activity 3.4**: Evaluation of forecast confidence to meet the needs of volcanic ash related safety risk assessments.

4.1.4.1 This activity was combined with activity 3.3 above.

4.1.5 **Activity 3.5**: Common web page for VAACs.

4.1.5.1 The group recalled that the former IAVWOPSG (Conclusion 7/22) tasked an ad-hoc group to address the topic of a common web page for viewing the output from more than one dispersion model; the conclusion was revisited and formally declared valid at the IAVWOPSG 8th Meeting.

In this regard, the meeting reviewed SN/06 which provided an update on the development of a common web page and a discussion regarding the best way to progress on this topic. The VAACs explored the possibility of using a common website for exchanging model output and other relevant information used in operational responses.  A prototype developed by ARL was examined aswell.  While the idea of a platform for sharing information was found to be useful and the work done on this prototype appreciated, none of the VAACs are in a position to take on the responsibility for the maintenance and development of this site.  As a result, it was proposed to explore other options for sharing of information.  This includes, but is not limited to, social media platforms such as Facebook, WhatsApp and others.  The VAACs will look into the possibility of using such platforms and report back to the next best practices meeting.  Barring the adoption of such a platform, the fallback option would be email and phone, despite some limitations associated with each of these (linguistic barriers, volume of messages, etc.).

**Action agreed 2/5**: Sharing of operational information between VAACs

That all the VAACs , with VAAC Montreal as rapporteur, look into the possibility of using platforms such as social media for sharing of operational information and report back to the next VAAC-BP meeting.

4.1.6 **Activity 3.6**: Aerosol observations exchange.

4.1.6.1 The group noted a very interesting presentation from Alexander on behalf of WMO regarding the significant progress made since this task was assigned to the WMO-VASAG. The VASAG offered to keep the group informed of further developments at the next meeting.

4.1.7 **Activity 3.7**: Health risks to aircraft occupants posed by sulphur dioxide and other hazardous gases in the atmosphere.

4.1.7.1 This task was referred to the MISD

4.1.8 **Activity 3.8**: Use of infrasound data in support of the IAVW.

4.1.8.1 The meeting was pleased to hear that, after many years of active discussion, there has been solid progress on infrasound monitoring. In this regard, France and the CTBTO have continued to discuss practical arrangements for the exchange of infrasound data operationally, beginning with a pilot project and then looking to expand globally. Active collaboration has continued on a regional basis in several areas, including operationally focused work by the University of Alaska Fairbanks with the Alaska Volcano Observatory, work by the University of Hawaii, and the Earth Observatory of Singapore. Scientifically, the technology has considerably matured and effectively the only issue remaining for MOG is for ICAO to conclude discussions with the CTBTO. On that basis, the group expressed satisfaction and agreed that progress would continue to be monitored and reported back to future meetings.

4.1.9 **Activity 3.9**: Agreed in-situ and/or remote sensing techniques for discernible ash.

4.1.9.1 With regard to this activity originated by IAVWOPSG Conclusion 8/3 the group agreed to progress the work through the Best Practices mechanism and it was agreed that guidance material will be developed and presented at the next MOG meeting.

4.1.10 **Activity 3.10**: Expansion of the collaborative decision analysis and forecasting process to allow its application to all significant volcanic events.

4.1.10.1 The meeting noted that this task had been assigned by the IAVWOPSG (Conclusion 8/7) to an ad-hoc group lead by Dirk. No study note was presented in this regard.

4.1.11 **Activity 3.11**: Model chart for SIGMET for volcanic ash in graphical format

This activity was combined with activity 3.14.

4.1.12 **Activity 3.12**: Coverage of the unmonitored area north of the area of responsibility of VAAC Tokyo.

4.1.12.1 The group recalled Conclusions 7/12 - VAACs areas of responsibility and Conclusion 8/11 – Extension of VAAC London area of responsibility concerning the efforts to obtain global VAAC coverage. In this regard the meeting noted SN/009 presented by the Member from Japan where it is reported that VAAC Tokyo has developed successful efforts including software to run a dispersion model and the creation of VAA/VAGs for the area using imagery of polar-orbiting satellites provided by NOAA/NESDIS to cover the unmonitored area north of N60 between E090 and E150. The Meeting was also pleased to know the readiness of VAAC Tokyo to increase its area of responsibility to cover the above described unmonitored area. Therefore the group agreed to formulate the following action:

**Action agreed 2/6:** **Extension of the area of responsibility of VAAC Tokyo**

That the Rapporteur prepare a draft Conclusion, to be considered by the METP, inviting VAAC Tokyo to extend its area of responsibility to the area north of N6000 between E09000 and E15000.

4.1.13 **Activity 3.13**: Assessment of the feasibility of the establishment of a volcanology desk.

4.13.1 Previous discussion, particularly prior to VASAG/4, had highlighted a gap in State Volcano Observatory coverage under UN treaty frameworks. Liaison with the GEO Secretariat in Geneva during VASAG/4, taking advantage of the presence of Dr Chris Newhall, representing the World Organisation of Volcano Observatories, had identified potential placement opportunities for suitably funded volcanologists to work with the GEO Secretariat to begin to strengthen ties in this regard while a future direction is discerned, but progress since has been slow. Noting the critical role of State Volcano Observatories in the International Airways Volcano Watch, and the recent upgrade of ICAO provisions, including Annex 3 requirements and the provisions of the Handbook of the International Airways Volcano Watch, and the slow progress in implementing those provisions, VASAG reiterated the need to keep exploring this area. The WMO Secretariat, with Mr Lisk, have agreed to make contact with the GEO Secretariat in Geneva in June to further explore possible options for future engagement.

4.1.14 **Activity 3.14**: Update of Model VAG and Model SVA of Appendix 1 to Annex 3 – *Meteorological Service for International Air Navigation.*

4.1.14 In this regard the group recalled that IAVWOPSG Conclusion 8/16 tasked an ad-hoc group to further progress work on updating the Model VAG and Model SVA contained in Appendix 1 to Annex 3 –taking into account the need for consistency with the requirement that the volcanic ash advisory and SIGMET for volcanic ash are based upon accepted map projections. In this regard the meeting reviewed SN/016 containing a proposal for updates to the Model VAG and Model SVA in Appendix 1 to Annex 3. The meeting, notwithstanding the transition to IWXXM, for as long as VAA and VAG continue in their current form, recommended that the Model VAG and Model SVA contained in Appendix 1 to Annex 3 be updated to be consistent with current requirements regarding projections. Therefore the meeting agreed on the following actions:

**Action agreed 2/7**: **Update of Model VAG and Model SVA (Appendix 1 to Annex 3)**

That the VAACs in coordination with WMO be invited to review the examples for MODEL VAG and MODEL SVA graphics in Appendix 1 to Annex 3 to see if it is necessary to update them with regard to projections used.

and,

**Action agreed 2/8:** **Guidance material regarding the display of VA advisory and VA SIGMET information**

In view of the above review that, ICAO in coordination with WMO consider including guidance within relevant ICAO documents (such as Doc 8896 – Manual on Aeronautical Meteorological Practice) advising users to apply appropriate corrections when displaying VAA and VA SIGMET information on a different map projection from that used to generate the original message.

4.1.15 **Activity 3.15**: Trial product for volcanic ash information at T+24 hours.

4.1.15.1 With regard to this activity, the group agreed that IATA will provide validation of the requirement for T+24 VAG. Some VAACs mentioned that it was difficult to provide T+24 VA information, but in the meantime it was agreed that those VAACs in a position to do so, should continue to provide T+24 VAG on a trial basis. Therefore the meeting agreed on the following action:

**Action agreed 2/9: Trial on the provision of T+24 supplementary guidance by VAACs**

That VAACs, which are in a position to do so, provide T+24 supplementary guidance via their operational webpages on a trial basis, in the following situations:

a) When the VAAC expects ash to remain discernible beyond T+18 hours;

b) Upon request from a party with which the VAAC has an established arrangement.

4.1.16 **Activity 3.16**: Trial of operational allocation of forecast confidence in the production of VA advisories

4.1.16.1 This task is addressed under activity 3.3.

4.1.17 **Activity 3.17**: Further improvement of the dissemination of aircraft reports of volcanic ash to VAACs

4.1.17.1 The group discussed the inconsistencies in the provision and dissemination of aircraft reports relating to volcanic ash and agreed that this was a complex issue that warranted further analysis. The meeting then considered a proposal regarding the reporting of NO ASH through Airline Operations Centres (SN/002) refers. After thorough discussion the group agreed that it would be advantageous to review all ICAO documentation relating to the provision of AIREP for VA and the utility of introducing guidance on the provision of the reporting of NO ASH. The meeting agreed to establish an ad-hoc group to progress this work.

**Action agreed 2/10: Reporting of NO ASH via special Air-report**

That anad-hoc group formed of Andrew (Rapporteur), Anton, Graham and Patrick be tasked to:

a) review ICAO documentation relating to the provision of AIREP for VA and “NO ASH” reporting, and,

b) provide a report on the utility and ways of reporting “NO ASH”

4.1.18 **Activity 3.18**: Progress regarding aerosol observation capabilities and related activities

4.1.18.1 This was addressed under activity 3.6

4.1.19 **Activity 3.19**: Collection and sharing of engineering and/or technical data from aircraft encountering the Kelut volcanic ash cloud.

4.1.19.1 In follow up to IAVWOPSG Conclusion 8/26, the meeting noted that Dr Clarkson (on behalf of ICCAIA), VAAC Darwin, and a group of scientists had undertaken considerable follow-up on the effects of the 2014 Kelut ash cloud on the aircraft principally affected.  A questionnaire had been provided to the airline concerned, which they had responded to, and the (relatively minor) impacts on the aircraft were better understood and incorporated into the broader understanding of ash-aviation encounters. However, some details remained to be officially confirmed after over two years.

4.1.19.2 The meeting was also informed that the VASAG/6 meeting had discussed progress on this matter from the broader perspective:

*Activity continues to occur in regard to the 2014 encounter of an aircraft encounter with ash from Kelud volcano, which the former International Airways Volcano Watch Operations Group (IAVWOPSG) had particularly requested follow-up on.  One published paper so far has used an inverse modelling technique to estimate volcanic ash concentrations.  Other work has progressed on modelling the cloud and using remote sensing techniques to better define the cloud characteristics as it dispersed. Professor Michael Herzog (Cambridge) has been approached to coordinate the update of the ATHAM model to assist in further cloud modelling (reintegrating the microphysics scheme with the dynamical core), and Drs. Alexa Van Eaton and Larry Mastin have agreed to assist in modelling the cloud with ATHAM and Ash3d.  Resources have been identified to assist with the Cambridge element of the work. The bureaucratic process of getting those resources to Professor Herzog’s team has been somewhat problematic.*

*The (VASAG) meeting recalled the earlier discussion on ash encounters in general, and how the analysis of such encounters might be encouraged, noting that this action item derives from a request from ICAO to the International Coordinating Council of Aerospace Industries Associations (ICCAIA) at IAVWOPSG/8.  The active engagement of ICCAIA members since then has been warmly welcomed, and should be further encouraged from an institutional point of view.  It was suggested, for example, that ICAO METP should be asked to promote the importance of sharing the outcomes of incident safety oversight audits with the science community to facilitate more focused research.  Together with the earlier described work to update the ash encounters database and to produce relevant guidelines for scientists, this would be of assistance in filling the obvious gaps in the ash encounters analysis effort, at least for the more significant incidents.*

4.1.19.3 The issue of obtaining information was discussed under a separate agenda item. Concerning the Kelud encounter itself, the meeting noted that the airline involved had reviewed procedures and had developed a much closer group relationship with the VAAC.

**Agenda Item 5: Identification of new and additional tasks**

5.1 The meeting considered a proposal regarding updates to the standardized international volcano database provided by the Smithsonian Institution onto each VAAC’s database (SN/008 refers). In this regard the meeting noted that volcanic Ash Advisory Centres (VAACs) use the standardized international volcano database provided by the Smithsonian Institution. However, SN/008 suggested that it has not yet been discussed when to reflect updates of the standardized international volcano database onto each VAAC’s database. Additionally SN/008 highlighted the need of announcements by the Smithsonian Institution on when it has made major changes such as volcano numbers and/or names in its database. In this regard the meeting recalled an established procedure already agreed by the group in May 2014 when the Smithsonian Institution indicated that corrections or updates to the Global Volcano Database would be incorporated as they were brought to its attention.  It was suggested that the VAACs refer to the database available at <http://volcano.si.edu/list_volcano_holocene_excel.cfm> every 3 to 6 months and update their records accordingly.  The Smithsonian Institution would alert the VAACs to major updates to the database through notifications sent through the ICAO Secretariat, but this would be done on an irregular basis, as dictated by the number and types of changes made.

5.2 The meeting noted SN/15 regarding procedure for ensuring that damage reports are made available to the scientific and operational International Airways Volcano Watch communities.

In this regard the meeting noted that, while it is relatively straightforward to promote the importance of sharing the outcomes of incident investigations with the scientific (and operational) community, the procedures to do so do not necessarily exist to the satisfaction of all concerned. In this regard the meeting agreed that the good operations of the IAVW may be improved by ensuring sufficient procedures exist to ensure that volcanic ash incident information is shared with the scientific and operational communities. The meeting also noted that the development of these procedures may require careful consideration of current arrangements and their adequacy.

Therefore the Meeting agreed on the following action:

Action agreed 2/11: Improvement of VA aircraft encounter information

That an ad-hoc group formed by David (Rapporteur), Andrew, Graham, Ian and Rory be tasked to work on ways to improve volcanic ash aircraft encounter information.

5.3 The meeting considered SN/010 which contained a proposal to introduce provisions related to re-suspended ash in Annex 3. It was noted by the group that many VAACs already issue VAA in case of re-suspension of ash considering the aviation safety implications. Issuance of VA SIGMET for re-suspended ash is unclear as it is currently not possible within the template for SIGMET to indicate the origin of the volcanic ash (re-suspended or from a live eruption).

5.4 The meeting discussed a proposal by the member from Japan to change the definition of VAAC in Annex 3, but the group did not reach consensus on this issue and therefore it was decided that the work be continued with a view to fully consider the impacts of including re-suspended ash within ICAO documentation and the template for SIGMET. The group agreed to the following action:-

Action agreed 2/12: Work on re-suspended ash

That an ad-hoc group, formed by all the VAACs with Yohko as rapporteur, be tasked to:-

1. propose a change to the SIGMET template to include re-suspended ash
2. consider the changes required to ICAO documentation to support the inclusion of re-suspended ash in both VAA and VA SIGMET.
3. Report back to the next MOG-VA Meeting.

Agenda Item 6: VAAC Management Reports

6.1 VAAC Management Reports: Anchorage, Buenos Aires, Darwin, London, Montreal, Tokyo, Toulouse, Washington, Wellington.

6.1.1 The working group recalled that it had requested the VAAC Provider States to prepare concise management reports to be presented at every meeting of the METP WG-MOG/2 –Work Stream 3: IAVW for consideration by the group. The group reviewed the management reports presented (SNs 04, 11, 12, 13, 14, 17, 18, 21and 22), noted their contents, discussed issues emanating from them and agreed that they satisfied the intent of the request.

Agenda Item 7: Administration and Next Meeting

7.1 The working group agreed that the next meeting of the METP WG-MOG –

Work Stream 3: IAVW should be convened in May 2017.

Agenda Item 8: Closure of the Meeting.

8.1 The working group expressed its gratitude to the Servicio Meteorológico Nacional de Argentina for its kind hospitality and excellent arrangements during this meeting.

8.2 The Meeting was closed on 28th April at 16.00 Hs by Mr. Nigel Gait, Regulated Aviation Services Manager, United Kingdom Met Office.

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**APPENDIX 1**

**List of participants**

**NAME STATE ORGANIZATION**

Acethorp, Paula New Zealand VAAC Wellington

Albersheim, Steve United States FAA, Aviation Weather Division

Andrioli, Miriam Argentina SMN, VAAC Buenos Aires

Bekcic, Biljana Canada EC, VAAC Montreal

Bensimon, Dov Canada EC, VAAC Montreal

Burch, Larry United States FAA (CTR), Aviation Weather Div.

Clarkson, Rory United Kingdom UK Advisor (ICCAIA)

Gait, Nigel United Kingdom Met Office, International Aviation

Gutierrez Cisternas, Reinaldo Chile CAA

Igarashi, Yohko Japan JMA, VAAC Tokyo

Ivanov, Dimitar WMO WMO

Jansons, Emile Australia BOM, VAAC Darwin

Kibler, Jamie United States NESDIS, VAAC Washington

Lisk, Ian WMO WMO

Lechner, Peter New Zealand CAA

Masson, Fabien France Météo-France, VAAC Toulouse

Miner, Cecilia United States NWS, Aviation and Space Weather

Muscat, Anton United Kingdom Met Office, VAAC London

Rennie, Graham IATA IATA

Ribero, Claudia Argentina SMN

Romero, Raúl ICAO ICAO

Sonnabend, Hans-Rudi IATA IATA

Schneider, Dave United States USGS, Alaska Volcano Observatory

Simon, Patrick France Météo-France, VAAC Toulouse

Tupper, Andrew Australia BOM

Zhang, Zhongfeng China CAA, Aviation Met. Centre