



METEOROLOGY PANEL



Meteorology Panel (METP)
Working Group on Meteorological Operations Group (WG-MOG)
International Airways Volcano Watch (IAVW) Work Stream
Eighth Meeting
(METP/WG-MOG/8-IAVW)

Wellington, New Zealand, 12 to 14 November 2018

MEETING REPORT



INTERNATIONAL CIVIL AVIATION ORGANIZATION

LIST OF METP WG-MOG/8 – IAVW ACTIONS

Action Agreed 8/1: VAAC KPIs

Action Agreed 8/2: Increased ASH/NO ASH pilot reports

Action Agreed 8/3: Increasing volcanic ash encounter reports

Action Agreed 8/4: Severity Index Update

Action Agreed 8/5: Re-suspended volcanic ash in VONA (Doc 9766)

Action Agreed 8/6: Volcanic Ash in ASHTAM/NOTAM

Action Agreed 8/7: Aviation colour code in VAA and status of the VONA

Action Agreed 8/8: Roadmap of the IAVW and ConOps

Action Agreed 8/9: Quantitative Volcanic Ash Information and Forecasts

Action Agreed 8/10: Use of Infrasound Data in Support of IAVW

Action Agreed 8/11: Consolidated VAAC Management Report Inclusions

Action Agreed 8/13: Draft Updates to Job Card 3 Relating to the IAVW

LIST OF WG-MOG/8 – IAVW Decisions

Decision 8/12: Consolidated VAAC Management Report

1. AGENDA ITEM 1: OPENING OF THE MEETING

1.1 The Eighth Meeting of the Meteorology Panel (METP) Working Group on Meteorological Operations Group (WG-MOG) International Airways Volcano Watch (IAVW) Work Stream (METP/WG-MOG/8 - IAVW) took place in Wellington, New Zealand, at the premises of the Civil Aviation Authority of New Zealand (CAA NZ) from 12 to 14 November 2018.

1.2 Mr. Colin Hord, Policy Lead MET/AIM Civil Aviation Authority of the United Kingdom (CAA UK), and Rapporteur of the METP WG-MOG, chaired the meeting.

1.3 Mr. Peter Lechner, Chairman of the MET Panel, welcomed the participants to CAA NZ and Mr. Mark Hughes, Deputy Director Air Transport and Airworthiness CAA NZ, addressed the meeting on behalf of the Director CAA NZ. Mr. Hughes thanked the attendees for traveling to Wellington and complimented the Work Stream on the work they have done and will continue to do, to ensure safe and efficient air travel in areas impacted by volcanic ash clouds.

1.4 The meeting was opened at 09:00 local time by the Chair, and he looked forward to a productive meeting where concrete actions would be agreed to take the work of the IAVW further into the future. He noted that on this occasion all VAACs except for VAAC Buenos Aires had provided a representative. He also noted that there was increased scrutiny on the work of this group by other ICAO Panels and also by IATA, who has requested a holistic review of the IAVW (METP/4 Recommendation 4/1 refers).

2. AGENDA ITEM 2: ORGANIZATIONAL MATTERS

2.1 The meeting adopted the agenda presented in information paper IP/01.

2.2 Referenced study notes (SN) and IPs are available on the ICAO METP MOG public website, under: <https://portal.icao.int/METP/MOG/Pages/MOG-Meetings.aspx>.

2.3 The list of attendees is contained in **Appendix A**.

3. AGENDA ITEM 3: MATTERS RELATING TO IAVW

3.1 Terms of Reference

3.1.1 The meeting reviewed the Terms of Reference (ToR) of the WG-MOG. The meeting noted that the ToR document posted on [WG-MOG public website](#) was outdated and the Rapporteur would notify the Secretariat to post the most recent version (**Appendix B**). The Rapporteur would also alert the Secretariat that the ToR from the legacy IAVW Operations Group (IAVWOPSG) should be removed from the public website.

3.2 New Work Programme Plan

3.2.1 The meeting agreed that the list of agreed actions would serve as the work programme plan for the MOG/IAVW from this meeting forward.

3.3 **Guidance Material (Handbook, Manual, etc.)**

3.3.1 The meeting noted that the IAVW Handbook is due for a refresh, including updating reference material. Given that the amount of ICAO Secretariat support has become more limited recently, it was agreed that the WG-MOG IAVW Work Stream will need to take on more of this work. The Rapporteur will contact the Secretariat to discuss the need and the best course to follow.

Postscript: The update of guidance material is listed in the Job Card for the IAVW as well as item k) of the WG-MOG ToR and thus was not made into a separate action from the meeting.

3.3.2 The Rapporteur informed the meeting that the Flight Operations Panel at their fifth meeting (FLTOPSP/5) included a paper on updating the FLTOPSP job card, stating that there was a significant amount of guidance material, including ICAO Doc 9974 (Flight Safety and Volcanic Ash) that needed updating. However the meeting noted that it was unclear who was the custodian of the Doc 9974 and would be seeking clarification from the ICAO Secretariat. The FLTOPSP paper also noted concerns regarding the definitions of discernible and visible ash in the guidance material. The meeting recalled the IAVWOPSG (Melbourne 2014) agreed on a definition of discernible ash and that guidance is already provided on those definitions in Doc 9691 and the group should be sure that any further actions are realistic given the limited resources of this group.

3.4 **Executive summary of the Conjoint WMO VAAC BP/6 and WMO/IUGG VASAG/8**

3.4.1 Mr. Greg Brock (WMO) provided an executive summary of the Conjoint WMO VAAC BP/6 and WMO/IUGG VASAG/8 meeting, held the prior week. This meeting was the first joint meeting of these two groups and was agreed to be a success by those who attended. A lot of ground was covered, with 52 presentations made, with many directly feeding into the WG-MOG IAVW work. All presentations made at the conjoint VAAC/VASAG meeting, the outcomes (in the form of an executive summary) and the resulting meeting report can be found at the [WMO website](#).

4. **AGENDA ITEM 4: MOG (IAVW) WORK PLAN AND ACTIVITIES**

4.1 **Progress Reports from each activity**

4.1.1 **MOG/5/1:** Terms of Reference. Refer to paragraph 3.1.1.

4.1.2 **MOG/5/2:** Key performance indicators for volcanic ash products

4.1.2.1 Key performance indicators (KPI) from the VAACs were included in the Combined VAAC Management Report, SN/13. From 1 January 2018, the VAACs began tracking KPIs relating to the issuance of VAA and VAG products, as follows:

- Following the collection of sufficient evidence of volcanic ash in the atmosphere within a VAAC's Area of Responsibility (AOR), the Initial VAA/VAG product should be issued within 20 minutes of credible report of eruption on 95% of occasions.
- Following the collection of sufficient evidence of volcanic ash in the atmosphere within a VAAC's AOR, the first forecast VAA/VAG product should be issued within 75 minutes on 95% of occasions.

Volcanic Ash Advisory Centre	Initial Advisory	Forecast Advisory	Next Advisory
Anchorage	98%	100%	98.0%
Buenos Aires	N/A	90%	91.4%
Darwin	100%	100%	Not Available
London ²	100%	88%	100%
Montreal	N/A	N/A	100%
Tokyo	100%	100%	98.6%
Toulouse	67% ³	100%	100%
Washington	100%	100%	98.8%
Wellington ¹	Not Available	Not Available	95.4%

¹VAAC Wellington implemented KPIs from Aug 2018 and at this stage too few examples have occurred to draw any real trend, however “Next Advisory” statistics have been retrospectively calculated.

²VAAC London recorded test and exercise VAAs only – there were no live volcanic ash events

³VAAC Toulouse had a sample size of only three “initial” VAAs, one of which was an exercise VAA that was issued 2 minutes late.

4.1.2.2 When discussing an appropriate “start time” for the timeliness KPIs, the airline operators consider that “the clock starts” when the eruption occurs, thus providing a metric on the whole system, not just the VAAC component. The meeting agreed that by including the full timeliness of the system, any weaknesses can be highlighted and cooperation between VAACs and SVOs is further encouraged. However, for the purpose of these KPIs, VAACs consider the “start time” to be when credible information on an eruption is received, but there is confusion on whether this relates to when internal systems receive the data or the VAAC forecaster. The meeting agreed that while there should be no hiding of any issues, measuring the VAAC component of the system is a good first step, since it avoids over complicating the metric when considering the actions of SVOs.

4.1.2.3 The meeting considered further ways to enhance the usefulness of the KPI data, including the addition of raw figures (e.g. 2998/3000 forecast advisories were issued within 75 minutes) and to potentially separate the statistics on test or exercise advisories. Additionally, the meeting noted that the “compliance” KPI (*Subsequent forecast VAA/VAG to be issued not later than the time stated in the ‘Next advisory’ element of the VAA/VAG, until no further advisories*) was more a measure of timeliness.

4.1.2.4 Several VAACs informed the meeting that a manually intensive review of issued VAAs is undertaken to uncover any compliance issues. Due to the large numbers of VAAs that could be issued in some regions, the meeting agreed that taking a representative sample may be a more achievable action. It was also noted that there are IWXXM translators that could be used to check whether the VAA is compliant and that the ICAO Planning and Implementation Regional Groups (PIRGs) may be in a position to report this information once IWXXM becomes a standard.

4.1.2.5 Regarding the measurement of accuracy, it was noted that verification of ash extent can often be difficult with current observation technology and with the constrictions of the format of the VAA itself. However, in the future, it is envisaged that some accuracy assessment will be able to be undertaken.

4.1.2.6 After a discussion the meeting formulated the following action:

Action Agreed 8/1: VAAC KPIs

That, the VAACs, Graham Rennie and Paula Acethorp (with Paula as Task Lead) be tasked to:

- a) Review the current KPIs, by mid-December 2018, and create guidance on their implementation, that will:

- i. Address when the “clock starts” for the timeliness KPIs;
 - ii. Determine whether ‘test’ and ‘exercise’ VAAs should be included in the reporting statistics;
 - iii. Determine whether re-suspended ash events should be included in the reporting statistics;
 - iv. Determine whether additional information on the statistics should be provided (e.g. total number of events versus percentages); and,
- b) Propose suitable compliance and accuracy metrics for VAACs to report on by the next meeting of the WG-MOG IAVW Work Stream.

4.1.3 **MOG/5/4:** Model VAG and Model SVA in Appendix 1 to Annex 3

4.1.3.1 IP/03 informed the meeting of the progress made concerning the MODEL VAG and MODEL SVA in Appendix 1 to ICAO Annex 3 – *Meteorological Service for International Air Navigation*. WP/4103 was presented to the fourth meeting of the Meteorology Panel (METP/4) held 10 to 14 September 2018 in Montreal. WP/4103 contained the proposed amendments to Annex 3 for the MODEL VAG and MODEL SVA in Appendix 1.

4.1.3.2 The meeting was informed that the proposals submitted to METP/4 differed slightly from the specifications formulated for WG-MOG/5 (IAVW) in June 2017. For example, during the development of the new model charts it became evident that the preferred orientation for a MODEL VAG was landscape rather than portrait, consistent with the VAACs current practice. Notwithstanding these aspects and following coordination with VAAC representatives, the proposals submitted to METP/4 were considered to be the most reliable, up-to-date examples for appropriate inclusion into Appendix 1 to Annex 3 and were consistent with the 20th Edition of Annex 3 (July 2018).

4.1.3.3 METP/4 consequently recommended that the proposed changes be included as part of Amendment 79 to Annex 3 with intended applicability in November 2020 (METP/4 Recommendation 6/4 refers).

4.1.4 **MOG/5/6:** No Ash Reports

4.1.4.1 The meeting noted that while the original action related to the gathering of NO ASH reports, it was seen as important to address the encouragement of reporting and dissemination of both ASH and NO ASH reports.

4.1.4.2 The VAACs outlined various methods used to gather aircraft/pilot reports of the presence or otherwise of ash clouds, including participating in teleconferences with local ANSPs, educating pilots through flight safety magazines and soliciting reports directly from airline operators. The meeting recalled that at the ICAO EANPG METG/28 (September 2018) meeting there was a proposal to encourage pilots to report observations of hazardous weather via special air reports. In addition, there is ongoing work by France to increase the number of special air reports, including those for volcanic ash.

4.1.4.3 The meeting recalled that the receipt of pilot reports on the presence of ash has been a long standing issue, and that pilots are in fact required to make such reports. The meeting discussed the

possibility of requesting the IATA Flight Operations Support Task Force to encourage routine reports of ASH/NO ASH by pilots and whether there may be opportunity for cross Panel collaboration with the ICAO FLTOPSP on encouraging more reports. Regardless, the meeting noted that progress has been made in this area and VAACs are encouraged to continue work in this space.

4.1.4.4 The meeting then formulated the following action:

Action Agreed 8/2: Increased ASH/NO ASH pilot reports

That, Graham Rennie be tasked to raise the issue of the need for increased reporting and dissemination of volcanic ash reports (both NIL encounter reports and actual encounter reports) at the next IATA Flight Operations Support Task Force (FOSTF) meeting, to help the VAACs improve the quality of their advisory information.

4.1.5 **MOG/5/7: VA aircraft encounter information**

4.1.5.1 SN/01 reported on the progress concerning volcanic ash aircraft encounter information, notably in the context of a severity index and an aircraft encounter database included in ICAO Doc 9691 – *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds*.

4.1.5.2 In 2017 the WMO/IUGG VASAG had commenced its review of the findings from DLR (Germany) and the USGS (United States) with regards to aircraft encounters with volcanic ash, and has also commenced its review of proposed modifications to a volcanic ash encounter severity index in view of its potential inclusion in Appendix F to ICAO Doc 9691. Proposed changes to Appendix F were discussed at VASAG/8 (2018), including the removal of the physical discomfort criteria – seen as subjective and unnecessary, as they can be linked to observable phenomena. The changes emanating from VASAG/8 were reviewed by the MOG. It was agreed that they should be included in a future update to Doc 9691.

4.1.5.3 The meeting was informed of an IFALPA concern that there was no severity index criterion relating to the incapacitation of the crew, but also noted that the index criteria did not aim to provide a definitive list of all possible outcomes of a volcanic ash encounter, but only the outcomes that had been observed in the data base (*Encounters of Aircraft with Volcanic Ash Clouds: A Compilation of Known Incidents, 1953-2009*). The meeting agreed that the purpose of the severity index was to increase the understanding of the types of encounters that have been reported in the past, but noted that it was likely that there were many Class 0 or Class 1 encounters that have not been reported. The meeting was informed that the method of collecting reports has been a “best efforts” endeavour, where airlines are proactively contacted to be asked to confidentially share their information.

4.1.5.4 The meeting agreed that Action Agreed 5/7 should be closed and a new actions be formed

Action Agreed 8/3: Increasing volcanic ash encounter reports

That, the METP Secretariat be invited to liaise with the FLTOPSP Secretariat to inform them of the need to ensure that all aircraft encounters with volcanic ash are reported using the Volcanic Activity Report (VAR) form, in accordance with PANS-ATM (ICAO Doc 4444).

Action Agreed 8/4: Severity Index Update

That the METP Secretariat be requested to update Appendix F of Doc 9691 with the updated Severity Index table given at **Appendix C** to this report.

4.1.6 **MOG/5/9:** Inclusion of re-suspended ash in Annex 3

4.1.6.1 SN/06 presented an overview of the progress made concerning the inclusion of re-suspended volcanic ash into ICAO Annex 3, including the latest outcomes of METP/4 in September 2018.

4.1.6.2 METP/4 Recommendation 6/5 b) had called for the METP WG-MOG (IAVW) to:

- 1) further review and, if necessary, propose an update to the VONA template and/or associated guidance within ICAO Doc 9766 in respect of the reporting of re-suspended volcanic ash; and
- 2) review the NOTAM format and the ASHTAM format in respect of the reporting of re-suspended volcanic ash with a view to providing a paper to the Information Management Panel (IMP) which discusses potential changes to ICAO Annex 15 – Aeronautical Information Services.

4.1.6.3 The MOG considered whether a VONA was necessary for a re-suspended ash event and it was proposed that because eruptions and re-suspended ash were not necessarily required to be concurrent, it may be useful to notify via the VONA. The meeting also agreed the VAAC is often the first to know about re-suspended ash occurrences due to the availability of satellite information, so VAACs can often inform SVOs and perhaps get confirmation.

4.1.6.4 The meeting considered whether there was utility in separately noting re-suspended ash events on WAFS SIGWX charts. The meeting heard from Mr. Jonathan Dutton (WAFS London) that it was not practical to introduce further complexity to the SIGWX chart, particularly given the move to data dissemination via XML schema rather than chart creation. It was also noted that WAFS SIGWX forecasts starts at FL100 and most re-suspended ash occurs below this level. It was noted however, that a move to an XML schema for SIGWX charts could allow for metadata to be used to identify the re-suspended nature of the ash.

4.1.6.5 Regarding the second part of the METP/4 action, the meeting recalled that in the NOTAM element E, there is opportunity to include information to indicate a re-suspended ash event. However, the ASHTAM is more prescriptive in format and does not allow opportunity to include such information and so it may be necessary to relay this to the Information Management Panel. The meeting also noted that most regions do not use ASHTAMs and when used, that they were at times in conflict with the VAA.

4.1.6.6 After a discussion the meeting formulated the following actions:

Action Agreed 8/5: Re-suspended volcanic ash in VONA (Doc 9766)

That, an ad-hoc group consisting of Kazuki Ito, Jeff Osiensky and Soledad Osoro (absentia) in addition to Greg Brock and David Schneider (with David as Task Lead), be tasked to:

- a) Undertake the follow-up to part b)1) of METP/4 Recommendation 6/5, “*further review and, if necessary, propose an update to the VONA template and/or associated guidance within ICAO Doc 9766 in respect of the reporting of re-suspended volcanic ash*”; and
- b) Report the results back to the next meeting of the WG-MOG IAVW Work Stream

Action Agreed 8/6: ASHTAM and NOTAM for volcanic ash

That, an ad-hoc group consisting of Greg Brock, Graham Rennie and Patrick Simon (with Patrick as Task Lead), be tasked to:

- a) Undertake the follow-up to part b)2) of METP/4 Recommendation 6/5, “*review the NOTAM format and the ASHTAM format in respect of the reporting of re-suspended volcanic ash with a view to providing a paper to the Information Management Panel (IMP) which discusses potential changes to ICAO Annex 15 – Aeronautical Information Services*”; and
- b) Consider the utility of the ASHTAM itself amongst users; and
- c) Report the results back to the next meeting of the WG-MOG IAVW Work Stream

4.1.7 MOG/5/10: Aviation Colour Codes

4.1.7.1 SN/09 presented draft updates to Annex 3 and Doc 9766 to remove the colour code from the VAA and elevate the use of the VONA from a note in Annex 3 to a recommended practice. The meeting was reminded of the widespread support given to this proposal at the last meeting, which was intended to help improve the quality of operator’s risk assessments.

4.1.7.2 SN/04 called for the colour code to be expanded beyond the VONA and also proposed the creation of hypothetical eruption information that would be issued for volcanoes with a colour code of yellow, orange or red. The meeting agreed that hypothetical model information does add value for route planning, with USGS also providing such information, and this may sit well with the eruption source parameter work undertaken within the VASAG. The meeting also noted that a few States provide this kind of information on a research or non-operational level. After a discussion the meeting agreed not to pursue this request as an operational service, however as a longer term aim it was considered possible that such information might be provided from one organisation rather than each individual VAAC or SVO, this would ensure consistency for operators moving between VAAC regions.

4.1.7.3 The status of SVOs was discussed by the meeting, noting that some have extremely limited resources and often competing expectations from local government. The meeting agreed that the SVOs are an important part of the system but must be supported to meet the requirements of the aviation industry and cost recovery can form a part of this effort. In addition, better collaboration between VAACs and SVOs can also assist, where two way information sharing can improve the work of both. Also, it was agreed that guidance on assigning colour code should be updated to assist SVOs in their work.

4.1.7.4 The meeting considered what the purpose of the VONA is and agreed that the needs of the industry should be ascertained, before requesting MIE to undertake any work on an IWXXM schema, to ensure any effort expended is the best use of the time. The meeting also agreed that a possible approach could be to extract the useful information from the VONA and then provide that to users, possibly in IWXXM format.

4.1.7.5 After a discussion the meeting formulated the following action:

Action Agreed 8/7 –Aviation colour code in VAA and status of the VONA

That;

- a) In light of the proposed removal of the aviation colour code from the VAA and the elevation in the status of the VONA from a Note to a Recommended Practice and (eventually) a Standard, an ad-hoc group consisting of Kazuki Ito, Graham Rennie, Greg Brock, Jeff Osiensky, Patrick Simon and David Schneider (with David and Patrick as Co-Task Leads) be tasked to:
 - i. Create guidance for SVOs and VAACs, to ensure consistency in the creation and use of the VONA;
 - ii. Review the VONA and consider how it (or sub-elements of it) could be put in IWXXM format and feed into the SWIM environment;
 - iii. Report the results back to the next meeting of the WG-MOG IAVW Work Stream.
- b) The WG-MOG Rapporteur prepare a working paper to METP/5, for inclusion as part of Amendment 80 to Annex 3 – *Meteorological Service for International Air Navigation* with intended applicability in November 2022, the proposed amendment to Annex 3 concerning the removal of the aviation colour code from the VAA and the elevation in the status of the VONA from a Note to a Recommended Practice, given at **Appendices D and E** to this report.

4.1.8 **MOG/5/11: Roadmap and ConOps**

4.1.8.1 SN/02 presented an update to the Roadmap for the IAVW. The meeting was reminded that the draft update was coordinated with the work stream via electronic correspondence in late 2017 and finalized in December 2017. The update was a complete revision that consolidated several concepts and rewrote several sections with new or updated information. The updated draft was presented to METP/4, who endorsed the updated roadmap.

4.1.8.2 The meeting congratulated Mr Larry Burch on his work on getting the Roadmap to this point. The meeting noted that the Roadmap is valuable document for operators, allowing them to better plan their own future system upgrades. It was felt that this document should be more widely shared with other groups.

4.1.8.3 The meeting provided comments for further improvement of the Roadmap, noting that:

- It could be more specific regarding quantitative probabilistic information, add a mention of SWIM format.
- For section 3.2.1, the VONA may not remain in its current form and so should not necessarily have a digital format defined as yet – the meeting noted that there was opportunity for further discussion on this as part of the IAVW review.
- It was worth adding a small explanation to indicate that when an upgrade was “finished” in the roadmap (under 2.0), that it was therefore considered that the implementation was complete and the work was now moving into maintenance phase.

- A suggestion was agreed to change the second row on the table from: “*Increase the use of the aviation colour code alert system and provision of Volcano Observatory Notice for Aviation (VONA) by State Volcano Observatories*” to “*Enhance the capacity of State Volcano Observatories to provide improved pre-eruptive and eruptive information for their volcanoes of responsibility*”.
- The Roadmap should be looking at planning for integration of volcanic contaminant forecasts in the Block 1.
- Expansion of the term “contaminant levels” may be useful, to reinforce the move towards thresholds of volcanic ash contamination.
- Include the sharing of volcanic ash cloud analysis information using satellite imagery, when available and per appropriate agreements, as a form of best practice, as part of “collaborative decision analysis, forecasting and information sharing” (paragraph 5.1.4.3 of this report refers).

4.1.8.4 The meeting noted that the workflow for VAAC forecasters will also significantly change in the future as each Block comes online, and with that there will be new training requirements. Inevitably as the system becomes more complicated, the role of the forecaster will be further removed from the creation of the products themselves, analogous to the future WAFS plans. It was noted that the White Paper [Future Aeronautical Meteorological Information Service Delivery](#) could be used as a guide for this activity.

4.1.8.5 SN/03 presented a draft update to the Concept of Operations (ConOps) for the IAVW. The draft had been coordinated with the ad-hoc group in late September 2018. Comments were incorporated into the version attached to SN/03.

4.1.8.6 The meeting discussed whether the industry as a whole is ready for probabilistic information, but the Group felt that it cannot second guess how each user may interpret and use the data. It was also noted that the data must be consistent across VAACs, so that operators can use data from any authoritative source with the same confidence – but how do VAACs meet this requirement? It was noted that the ConOps outlines what the future system may look like (in alignment with the GANP) and the roadmap is how we get there. With that in mind, it may be worth adding an introductory paragraph to outline what the intention of the ConOps is and who it is intended for, e.g., executive management. In addition, in section 1.0, the meeting agreed that the statement “*This ConOps is not intended to describe **how** future volcanic hazard information is to be provided or by **whom** the future information is to be provided.*” should have an additional note saying that this is the role of the Roadmap.

4.1.8.7 During discussions it was highlighted that the ConOps should include a greater emphasis on contamination thresholds as well as mention operational workflows and relevant VA contingency plans.

4.1.8.8 The meeting then formulated the following action:

Action Agreed 8/8 — ConOps and Roadmap of the IAVW

That, the WG-MOG IAVW Work Stream (with Larry Burch as Task Lead) be tasked to:

- a) Update the ConOps and Roadmap of the IAVW, taking into account the proposed 2019 update to the GANP, and the comments provided at WG-MOG/8;

- b) Liaise through the METP Secretariat to ensure other METP work streams, other concerned Panels, and PIRGs are aware of this work; and
- c) Report the results back to the next meeting of the WG-MOG IAVW Work Stream.

4.1.9 **MOG/5/12: Quantitative Volcanic Ash Contamination Information and Forecasts**

4.1.9.1 SN/15, supported by IP/04, reported on the state of the science related to quantitative volcanic ash contamination information and forecasts. The state of the science review, prepared by the WMO/IUGG VASAG with complementary input from ICCAIA, covered satellite characterizations, advances in modelling, and the state of engine susceptibility science.

4.1.9.2 The WMO/IUGG VASAG proposed the following improvements for VA contamination forecasts:

- To continue research studies to take a better profit of satellite data for detecting and tracking volcanic ash, and to facilitate the transfer of new satellite products from research to operations;
- To keep improving the physics and the source term realism in atmospheric dispersion models, especially by encouraging use of assimilation techniques; and
- To carry on experiments on aircraft engine susceptibilities in order to generalize the last test results and to feed the discussion on the meaningful volcanic ash concentration thresholds

4.1.9.3 The meeting agreed that this is an extremely comprehensive report, bringing together all the related science together in one place and the ad-hoc group from the VASAG was congratulated on its excellent effort.

4.1.9.4 The meeting noted that part c) of Action 5/12 is to hand the work over to the MISD/VASD to consider the results of the review. The meeting was reminded that there is a METP development process ([*METP Requirements Development Process on the ICAO Secure Portal*](#)) that can be used to help plan the implementation of a new service and the MISD will use this process for developing the proposed quantitative ash data service.

4.1.9.5 The meeting noted that given the massive improvement in the science since 2012, we are now at a step-change for the provision of volcanic ash information. It is therefore now for the MOG to assemble a case for change to then go back to the MISD. However, given the MISD is currently addressing the development of the Regional Hazardous Weather Advisory System (RHWAS) (albeit with VA, radiation, space weather and tropical cyclone information currently excluded), perhaps the best way forward is for the MISD to take the quantitative ash requirement as part of the RHWAS development.

4.1.9.6 The meeting noted that verification and validation of the data is important, but must also not hold back for wanting the data to be perfect. If an estimation of the uncertainty can be provided, then users can work with that – and this could potentially be captured within an extension of an IWXXM schema.

4.1.9.7 After a discussion the meeting formulated the following action:

Action Agreed 8/9: Quantitative Volcanic Ash Information and Forecasts

That, the METP WG-MISD Volcanic Ash and Sulphur Dioxide (VASD) Work Stream be invited to address the future requirements for the delivery of quantitative volcanic ash information and forecasts, including the need to provide confidence information and improved structural efficiencies, utilising the METP requirements development process.

4.1.10 **MOG/5/14:** Infrasound data in support of the IAVW

4.1.10.1 SN/16 reported on the progress made in the use of infrasound data in support of the IAVW. VAAC Toulouse continued its collaboration with the Comprehensive Nuclear-Test-Ban Treaty Organization's (CTBTO) International Data Centre (IDC) of a European scientific initiative titled Atmospheric dynamics Research Infra-Structure in Europe (ARISE).

4.1.10.2 SN/20 outlined a Volcanic Information System (VIS) as a concept for the notification of possible volcanic activity based on infrasound observations. The meeting was informed that VIS continues to be developed and tested and that additional work and studies were needed to make the system robust enough to be deployed in a near real-time environment and used as an operational notification system.

4.1.10.3 After a discussion the meeting formulated the following action:

Action Agreed 8/10: Use of infrasound data in support of IAVW

That, an ad-hoc group consisting of Philippe Hereil, Dov Bensimon and Marcel Roux plus David Schneider (with Philippe as Task Lead), be tasked to:

- a) Pursue, in collaboration with CTBTO, the development and testing of the volcanic information system (VIS), with the objective to establish a real-time operational system for use by the VAACs; and
- b) Report the results back to the next meeting of the WG-MOG IAVW Work Stream.

4.1.11 **MOG/5/15:** Consolidated VAAC Management Report

4.1.11.1 SN/13 delivered the consolidated VAAC management report. The report focused on key changes and initiatives from each VAAC including, inter alia, dispersion model updates, user outreach, collaborations, competency frameworks, and general operational improvements. The meeting agreed that the consolidated report from the VAACs was a good initiative, giving an overview of each of the VAACs operations, and IATA informed the meeting that this was appreciated by users.

4.1.11.2 Suggestions for future inclusions to the consolidated report included further information from regional VAAC meetings and activities, and comments on progress by VAACs of how they are implementing the IAVW roadmap. The meeting also noted that a separate report on any SVO updates would be of interest and was advised that the World Organization of Volcano Observatories (WOVO) may be able to assist in this. It was agreed that this should be an iterative approach, with the VAAC consolidated report initially including SVO information that VAACs can collate, and it was hoped that this would eventually lead to a standalone SVO report.

4.1.11.3 After a discussion the meeting formulated the following decision and action:

Decision 8/11: Consolidated VAAC Management Report

The meeting endorses the consolidated VAAC management report as presented at WG-MOG/8 (IAVW) and agrees that a consolidated report versus individual reports is the way forward. In addition, it is agreed that the lead responsibility for future consolidated reports be shared amongst all VAACs on a rotating basis, and that a maximum of two VAACs lead the production of each consolidated report.

Action Agreed 8/12: Information to be included in the Consolidated VAAC Management Report

That;

- a) Tristan King be tasked to lead an ad-hoc group consisting of all the VAACs to determine the information (and reporting period) to be included in the consolidated VAAC management report, by June 2019; and
- b) Tristan King and Dov Bensimon (with Tristan King as Task Lead) prepare the next consolidated management report for delivery at the next meeting of the WG-MOG IAVW Work Stream.

4.2 WG-MOG Job Card and links to WG-MOG

4.2.1 The meeting reviewed the Job Card 3 (METP.003.02) assigned by the ANC (SN/17) and noted suggested minor updates to the dates of the deliverables as well as minor edits to the specific details and references. The meeting noted that the MOG (IAVW) will meet again before METP/5 and thus the next MOG (IAVW) can formally agree on changes to the Job Card at that time, the suggested changes to date are detailed at **Appendix F**.

4.2.2

5. AGENDA ITEM 5: IDENTIFICATION OF NEW AND ADDITIONAL TASKS

5.1 New Tasks

5.1.1 SN/07 proposed additional data fields in the VAA template, to include the eruption status, plume height, confidence in the assessment, and confidence in the source term.

5.1.1.1 The meeting agreed that the VAA was designed for the conveyance of airborne ash information, not the status of the eruption. However, it would be difficult to include this information without VAAC forecasters interrogating satellite data and making an assumption on the activity. The meeting agreed that making inline adjustments to a product that may not exist in the coming years would not be the best approach to meet this need and in addition, it has previously been agreed that TAC products are now frozen, unless a significant safety risk is posed. It was agreed that this additional information requirement should be reflected in the IAVW Roadmap.

5.1.1.2 The meeting agreed it would be easier to instead encourage VAACs to include an indication of the requested information in the RMK section of the VAA.

5.1.2 SN/08 proposed that the name of the numerical weather prediction (NWP) model used to drive the dispersion model that formed the basis of the VAA should be information included in the VAA itself. IATA felt that this information was particularly relevant near an aerodrome, where small scale information is critical as some operators would like to run their own model using the same NWP data.

5.1.2.1 The meeting noted that there could be more than one dispersion model used by a VAAC and more than one NWP model, and that in the future, models may not be singular but a consensus of many models. Also, it was noted that even if the information was disseminated, the specification of the source term is probably of more importance, as it may lead to a larger difference in results. However, over time this may form part of the metadata to be included with the dispersion model data in the SWIM environment.

5.1.3 SN/10 by IATA proposes a holistic approach to the IAVW review that places the VAACs at the centre of the system, and so responsible for developing key coordination and communication processes with each SVO and hence this requirement becomes subject to some performance measurement.

5.1.3.1 The meeting noted that cost recovery was an issue and such a proposal could not be universally achieved until there was an equitable regional cost recovery system in place. The meeting also noted that it may be worth targeting certain areas for initiatives for example to improve, through capacity building activities, the communication from SVOs to VAACs. It may also be possible to place responsibility for supporting SVO activity with the PIRGs. The meeting agreed that these issues were worth considering under the holistic review of the IAVW as called for by METP/4 Recommendation 4/1.

5.1.4 SN/05 by IFALPA presented a proposal for all VAACs to produce and make available colour satellite images with ash contours (VA-nephanalysis), and that this service be included in the Roadmap, Annex 3 and Doc 8896 as a matter of urgency.

5.1.4.1 Some VAACs advised that they already provided such images, while others only did so on an ad hoc basis, usually only for large eruptions. The meeting noted that VAACs use satellite imagery as a tool to provide evidence of ash presence, to help constrain the observed ash polygon.

5.1.4.2 IATA highlighted that there is no current capability to supply it to the cockpit at the resolution that it would be required. Also, it is of limited use since it is hours old when it has been produced, disseminated and received by aircraft. It was also noted that animations of satellite imagery are required to understand the presence and extent of ash cloud, so providing a single image may not be useful outside of very obvious ash clouds. IATA further pointed out that this does not stop this type of information being included in the development of near term quantitative forecast situational awareness information for pilots.

5.1.4.3 The meeting noted that under the Roadmap, this request may sit under the collaborative decision making (CDM) action as an example of a good example of best practice i.e. something that can be done, but not necessarily as something that *must* be done. It was agreed that it would be added to the Roadmap as a best practice example of an ad hoc CDM product where the VAACs' host agency (i.e. National Met Service) produce annotated satellite images in agreement with local users.

5.2 **Funding of Research in Support of ASBUs**

5.2.1 The meeting was informed that a Volcanic Cloud Analysis Tool (VOLCAT), developed by Michael Pavolonis (US/NOAA/NESDIS and WMO/IUGG VASAG member) and available to the VAACs, was supported by research funding and that in order to continue to develop, including its use by SVOs, it would need support from WMO and ICAO. It was noted that tools such as VOLCAT from

authoritative sources were an important component of the IAVW, both now and into the future, in support of the air transport modernization strategy conveyed in the ICAO GANP and its ASBU methodology.

6. AGENDA ITEM 6: VAAC MANAGEMENT REPORTS

6.1 VAAC Management Reports

6.1.1 SN/13 delivered the consolidated VAAC management report, which included information from all the VAACs, and addressed Action Agreed MOG/5/15 (the above paragraph 4.1.11 refers).

6.1.2 In addition, SN/11 presented the combined report for VAACs Anchorage and Washington; SN/12 presented the report from VAAC Buenos Aires; SN/14 the report from VAAC Montreal; SN/17 the report from VAAC Darwin; SN/18 the report from VAAC Tokyo; and IP/05 the report from VAAC Toulouse.

7. AGENDA ITEM 7: LINKAGES TO ICAO METP

7.1 The meeting's attention was drawn to the ICAO METP/4 Recommendation 4/1 requesting a holistic review of the IAVW. The MOG was not clear on who was leading this activity and whether the members of the METP ad hoc group were there in their capacity as rapporteurs or as expert panel members. The meeting was also interested in what the terms of reference for the review would be. Regarding any SVO aspects of the IAVW review, Mr. Hord advised the group as the MOG rapporteur that he would ensure that liaison with SVOs occur during the review. The meeting also agreed that a White Paper on the future of the IAVW would be a useful outcome of the METP ad hoc group's work.

8. AGENDA ITEM 8: ADMINISTRATION AND NEXT MEETING

8.1 The meeting noted with thanks to Ms. Tammy Flowe that the USA's FAA has offered to host the next meeting on the WG-MOG IAVW Work Stream in the United States (specific location to be determined), provisionally scheduled for the week of 11 November 2019. Mr Hord, as WG-MOG Rapporteur, agreed that he would confirm the date, once agreed, and communicate matters pertaining to the next meeting in due course.

9. AGENDA ITEM 9: CLOSURE OF THE MEETING

9.1 The meeting expressed its gratitude to those from MetService NZ and the CAA NZ for their kind hospitality and excellent arrangements during this meeting.

9.2 The Meeting was closed on 14th November 2018 at 11.15 hours by Mr. Colin Hord, Rapporteur of the METP WG-MOG.

Appendix A - List of Attendees

AFFILIATION	NAME	E-MAIL
AUSTRALIA	DENMAN, Jarrad	jarrad.denman@bom.gov.au
	KING, Tristan	tristan.king@bom.gov.au
CANADA	BENSIMON, Dov	dov.bensimon@canada.ca
FRANCE	HEREIL, Philippe	philippe.hereil@meteo.fr
	SIMON, Patrick	patrick.simon@meteo.fr
JAPAN	ITO, Kazuki	kazuki.ito@met.kishou.go.jp
NEW ZEALAND	LECHNER, Peter (METP Chair)	peter.lechner@caa.govt.nz
	ACETHORP, Paula	paula.acethorp@caa.govt.nz
	MACKERSY, Keith	keith.mackersy@caa.govt.nz
	ROUX, Marcel	marcel.roux@metSERVICE.com
	LUNNY, James	james.lunny@metSERVICE.com
UNITED KINGDOM	HORD, Colin	Colin.Hord@caa.co.uk
	DUTTON, Jonathan	jonathan.dutton@metoffice.gov.uk
UNITED STATES	FLOWE, Tammy	tammy.flowe@faa.gov
	BURCH, Larry	burch@avmet.com
	KIBLER, Jamie	jamie.kibler@noaa.gov
	OSIENSKY, Jeff	jeffrey.osiensky@noaa.gov
	SCHNEIDER, David	djschneider@usgs.gov
WMO	BROCK, Greg	gbrock@wmo.int
	LISK, Ian	ian.lisk@metoffice.gov.uk
IATA	RENNIE, Graham	grennie@qantas.com.au
ICCAIA	CLARKSON, Rory	rory.clarkson@rolls-royce.com

Appendix B – Terms of Reference

METP-WG MET OPERATIONS GROUP (WG-MOG)

Terms of Reference

The aim of the MET Operations Group is to ensure that the following ICAO systems meet the agreed user requirements:

- WAFS
- SADIS / WIFS
- IAVW

In the longer term it is considered that other global MET related systems will be added to the remit of the working group. The MET Operations group should:

- a) Establish Key Performance Indicators for the provision of services based on the performance requirements in coordination with other METP WGs and final agreement by the METP
- b) Define the continuity / availability of services based on the performance requirements, in coordination with the other METP WGs and final agreement by the METP
- c) Arrange for the reporting of KPIs from each provider State (e.g. verification and timeliness metrics) which are aligned with user's operations
- d) Receive reports from each provider State on the management of their system(s)
- e) Set out, review and maintain the back-up arrangements and include relevant details in management reports
- f) Ensure that coordination and harmonisation takes place between WAFCs, VAACs and SADIS / WIFS providers
- g) Monitor, assess and provide advice on potential scientific and technological developments to meet the current, future and evolving performance requirements to the METP in coordination with WMO
- h) Assess the financial and technical implications of proposed developments to services and their implementation, and inform any relevant cost recovery groups accordingly
- i) Ensure that developments have measurable success criteria for implementation j) Establish the timescales, pre-operational tests and implementation of services
- k) Maintain and, when required, create guidance material on the implementation and provision of services
- l) Identify any weaknesses in the current service provision and coordinate updates to the requirements with other METP WGs

- m) Ensure that the necessary remedial actions are in place when necessary to overcome identified deficiencies
- n) Where necessary assist the Secretariat in the coordination of the arrangements between the various international organizations
- o) Maintain an up to date action list
- p) Review all Job Cards relevant to the ICAO systems
- q) Review the WAFS CONOPS and Roadmap as appropriate
- r) Following each meeting provide a report and make it available on the METP website

Appendix C - Severity Index Update

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

- | | |
|--|-----------------------------------|
| 1. Text to be deleted is shown with a line through it. | text to be deleted |
| 2. <u>New text to be inserted is highlighted with grey shading.</u> | new text to be inserted |
| 3. Text to be deleted is shown with a line through it <u>followed by the replacement text which is highlighted with grey shading.</u> | new text to replace existing text |

Table F-1. Ash-encounter severity index

<i>Class</i>	<i>Criteria</i>
0	<ul style="list-style-type: none"> + sulphurous sulfur odour noted in <u>cockpit and/or</u> cabin <u>+ anomalous atmospheric haze observed</u> + electrostatic discharge (St. Elmo's fire) on windshield, nose, or engine cowls + <u>volcanic</u> ash reported or suspected <u>by flight crew</u> but no other effects or damage noted
1	<ul style="list-style-type: none"> + light dust observed in cabin + <u>volcanic</u> ash deposits <u>deposited</u> on exterior of aircraft + fluctuations in exhaust gas temperature (EGT) with return to normal values <u>+ volcanic ash observed in cockpit and/or cabin</u>
2	<ul style="list-style-type: none"> + heavy cabin dust ("dark as night") in cabin + contamination of air handling and air conditioning systems requiring use of oxygen + abrasion damage to exterior surfaces (<u>wind screens</u>, engine inlet and /or compressor engine fan blades) + pitting, frosting or breaking of windscreen or windows + minor plugging of pitot-static system, insufficient to affect instrument readings + deposition of ash in engine <u>+ deposition of volcanic ash in engine</u> <u>+ volcanic ash deposited in cockpit, cabin, and/or air systems</u> <u>+ volcanic ash deposited in pitot-static system, insufficient to affect instrument readings</u>
3	<ul style="list-style-type: none"> + vibration or surging of engine(s) + plugging of pitot-static system to give erroneous instrument readings + contamination of engine oil <u>and/or</u> hydraulic system fluids + damage to electrical <u>and/or</u> computer systems + engine damage <u>affecting engine performance</u> <u>+ interference of navigation and/or communication systems</u>
4	<ul style="list-style-type: none"> + temporary engine failure requiring in-flight restart <u>or permanent shutdown</u> of engine <u>(s)</u>
5	<ul style="list-style-type: none"> + engine failure or other damage leading to crash <u>resulting in loss of aircraft</u>

Appendix D - Proposed Changes to Annex 3, making VONA a Recommended Practice

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

Text: text to be added

~~Text:~~ text to be deleted

Element	Detailed content	Template(s)	Examples
1	Identification of the type of message (M)	Type of message VA ADVISORY	VA ADVISORY
2	Time of origin (M)	Year, month, day, time in UTC DTG: nnnnnnnn/nnnnZ	DTG: 20080923/0130Z
3	Name of VAAC (M)	Name of VAAC VAAC: nnnnnnnnnnn	VAAC: TOKYO
4	Name of volcano (M)	Name and IAVCE ¹ number of volcano VOLCANO: nnnnnnnnnnnnnnnnnnn [nnnnn] or UNKNOWN or UNNAMED	VOLCANO: KARYMSKY 1000-13 VOLCANO: UNNAMED
5	Location of volcano (M)	Location of volcano in degrees and minutes PSN: Nnnnn or Snnnn Wnnnnn or Ennnnn or UNKNOWN	PSN: N5403 E15927 PSN: UNKNOWN
6	State or region (M)	State, or region if ash is not reported over a State AREA: nnnnnnnnnnnnnnn	AREA: RUSSIA
7	Summit elevation (M)	Summit elevation in m (or ft) SUMMIT ELEV: nnnnM (or nnnnnFT)	SUMMIT ELEV: 1536M
8	Advisory number (M)	Advisory number: year in full and message number (separate sequence for each volcano) ADVISORY NR: nnnn/nnnn	ADVISORY NR: 2008/4
9	Information source (M)	Information source using free text INFO SOURCE: <i>Free text up to 32 characters</i>	INFO SOURCE: MTSAT-1R KVERT KEMSD
10	Colour code (O)	Aviation colour code AVIATION COLOUR CODE: RED or ORANGE or YELLOW or GREEN or UNKNOWN or NOT GIVEN or NIL	AVIATION COLOUR CODE: RED

Element	Detailed content	Template(s)	Examples	
104	Eruption details (M)	Eruption details (including date/time of eruption(s))	ERUPTION DETAILS: Free text up to 64 characters or UNKNOWN	ERUPTION AT 20080923/0000Z FL300 REPORTED
112	Time of observation (or estimation) of ash (M)	Day and time (in UTC) of observation (or estimation) of volcanic ash	OBS (or EST) VA DTG: nn/nnnnZ	OBS VA DTG: 23/0100Z

(Annex 3 Table A2-1. Template for advisory message for volcanic ash)

FVFE01 RJTD 230130	
VA ADVISORY	
DTG:	20080923/0130Z
VAAC:	TOKYO
VOLCANO:	KARYMSKY 1000-13
PSN:	N5403 E15927
AREA:	RUSSIA
SUMMIT ELEV:	1536M
ADVISORY NR:	2008/4
INFO SOURCE:	MTSAT-1R KVERT KEMSD
AVIATION COLOUR CODE:	RED
ERUPTION DETAILS:	ERUPTION AT 20080923/0000Z FL300 REPORTED
OBS VA DTG:	23/0100Z
OBS VA CLD:	FL250/300 N5400 E15930 – N5400 E16100 – N5300 E15945 MOV SE 20KT SFC/FL200 N5130 E16130 – N5130 E16230 – N5230 E16230 – N5230 E16130 MOV SE 15KT
FCST VA CLD +6 HR:	23/0700Z FL250/350 N5130 E16030 – N5130 E16230 – N5330 E16230 – N5330 E16030 SFC/FL180 N4830 E16330 – N4830 E16630 – N5130 E16630 – N5130 E16330
FCST VA CLD +12 HR:	23/1300Z SFC/FL270 N4830 E16130 – N4830 E16600 – N5300 E16600 – N5300 E16130
FCST VA CLD +18 HR:	23/1900Z NO VA EXP

RMK:	LATEST REP FM KVERT (0120Z) INDICATES ERUPTION HAS CEASED. TWO DISPERSING VA CLD ARE EVIDENT ON SATELLITE IMAGERY
NXT ADVISORY:	20080923/0730Z

Annex 3 Example A2-1. Advisory message for volcanic ash

4.1 Information from State volcano observatories

4.1.1 Recommendation — *The information required to be sent by State volcano observatories to their associated area control centres (ACCs)/flight information centres (FICs), meteorological watch office (MWO) and VAAC should comprise*

- a) *for significant pre-eruption volcanic activity: the date/time (UTC) of report; name and, if known, number of the volcano; location (latitude/longitude); and description of volcanic activity; and*
- b) *for volcanic eruption: the date/time (UTC) of report and time of eruption (UTC) if different from time of report; name and, if known, number of the volcano; location (latitude/longitude); and description of the eruption including whether an ash column was ejected and, if so, an estimate of height of ash column and the extent of any visible volcanic ash cloud, during and following an eruption; and*
- c) *for volcanic eruption cessation: the date/time (UTC) of report and time of eruption cessation (UTC); name and, if known, number of the volcano; and location (latitude/longitude).*

Note 1. — Pre-eruption volcanic activity in this context means unusual and/or increasing volcanic activity which could presage a volcanic eruption.

Note 2. — The State volcano observatories may use the Volcano Observatory Notice for Aviation (VONA) format to send information to their associated ACCs/FICs, MWO and VAAC. The VONA format is included in the Handbook on the International Airways Volcano Watch (IAVW) — Operational Procedures and Contact List (Doc 9766) which is available on the ICAO website.

4.1.2 Recommendation — *The State volcano observatories should use the Volcano Observatory Notice for Aviation (VONA) format to send information to their associated ACCs/FICs, MWO and VAAC.*

Note . — The State volcano observatories may use the Volcano Observatory Notice for Aviation (VONA) format to send information to their associated ACCs/FICs, MWO and VAAC. The VONA format is included in the Handbook on the International Airways Volcano Watch (IAVW) — Operational Procedures and Contact List (Doc 9766) which is available on the ICAO website.

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Appendix E - Proposed Changes to DOC 9766 following the VONA becoming a Recommended Practice

The text of the amendment is arranged to show deleted text with a line through it and new text highlighted with grey shading, as shown below:

Text: text to be added

~~Text:~~ text to be deleted

4.2 ACTION TO BE TAKEN BY THE STATE VOLCANO OBSERVATORY IN THE EVENT OF A VOLCANIC ERUPTION

4.2.1 In the event of significant pre-eruption volcanic activity, a volcanic eruption occurring or a volcanic ash cloud being formed over a volcano under its vigilance, the State volcano observatory should take the following actions:

- a) immediately forward the available information to its associated ACCs, MWOs and VAACs by telephone to verbally inform them of the significant activity, and then follow up with a faxed or e-mailed volcano observatory notice for aviation (VONA). This will enable rapid notification of air traffic control (ATC) authorities about operationally critical information. VONA may also be distributed directly to interested operators in accordance with local arrangements; and
- b) maintain an up-to-date contact list of relevant agencies and conduct routine testing of the agreed dissemination pathway.

Note 1.— The key role of State volcano observatories in providing timely reports of volcanic unrest and eruptions to the aviation sector has been well established within the framework of the IAVW. Each State is required to provide information on volcanic activity to its associated ACCs, MWOs and VAACs in accordance with Annex 3 Part 4. International Airways Volcano Watch 4-3.

Note 2.— The map of VAAC areas of responsibility is shown in Part 2. A list of State volcano observatories, ACCs, MWOs and FIRs is given in Part 5.

Note 3.— The VONA has been developed for State volcano observatories (or equivalent scientific agencies) to disseminate critical, operationally relevant information about volcanic activity. It should strictly follow the format defined in appendix E.

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APPENDIX A

...

Attachment

GUIDELINES FOR HANDLING VOLCANIC ACTIVITY RELATIVE TO AERONAUTICAL INFORMATION DISSEMINATION

*(Complementary to Part 4 of the Handbook on the International Airways Volcano Watch (IAVW) —
Operational Procedures and Contact List (Doc 9766))*

STEP 1

1.1 Action to be taken by the volcanological observatory

1.1.1.1 The volcanological observatory shall immediately provide information on significant pre eruption volcanic activity, volcanic eruptions or the presence of volcanic ash clouds to the relevant ACCs [*list the centres*], [VAAC] and the associated MWOs [*list the offices*]. As stated in Annex 3, The information provided should ~~be in accordance with~~ strictly follow the format of the volcano observatory notice for aviation (VONA) ~~format~~ given in Appendix E of Doc 9766.

...

— END —

Appendix F - Job Card 3 update

Proposed changes to Job Card 3 (additions in grey shade, deletions in strikeout)

METP.003.02		Further development of the International Airways Volcano Watch (IAVW)			
Source		MET Divisional Meeting 2014 (Recommendations 1/2 and 2/10 a))			
Problem Statement		The international airways volcano watch (IAVW) was established to provide notification (via advisory messages, warnings and other) regarding the existence of volcanic ash in the atmosphere. The IAVW needs to be maintained and further developed including the integration of future system wide information management (SWIM) in support of the ASBU methodology.			
Specific Details		<p>The IAVW consists of a number of international arrangements for monitoring the atmosphere and to provide notification to aircraft regarding volcanic ash in the atmosphere. The system comprises nine volcanic ash advisory centres (VAACs), provided by eight Provider States, tasked to monitor volcanic ash, forecast its movement and to provide advisory information to meteorological authorities and other users.</p> <p>It was recommended by the MET Divisional Meeting (Recommendation 2/6) that an appropriate ICAO expert group, in close coordination with the World Meteorological Organization (WMO), further develop the requirements for the IAVW consistent with the Fifth Edition of the Global Air Navigation Plan and the information produced by the system into the future system wide information management (SWIM) environment using, as a basis, the International Operations (CONOPS).</p> <p>Further development should take into consideration the main legacy tasks from the international airways volcano watch operations group and consider human factors in accordance with recommendation 2/14.</p> <p>This development will be supported by the World Meteorological Organization (WMO) and the International Union of Geophysics and Chemistry through various initiatives and forums.</p>			
Expected Benefits		Provide information to support safety risk management of aircraft operations related to areas of volcanic ash VA in the atmosphere. Information produced, under the IAVW, into the SWIM environment in line with the GANP.			
Reference Documents		Annex 3 — Meteorological Service for International Air Navigation, Global Air Navigation Plan (Doc 9750), Manual on Volcanic Ash, Manual on Volcanic Ash, Volcanic Ash Clouds (Doc 9691), Handbook on the International Airways Volcano Watch (Doc 9766), Manual of Aeronautical Meteorological Practice, Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services (Doc 9377), Meteorology (METP) Agenda Item 2, Appendix C. Roadmap for International Airways Volcano Watch (IAVW) in Support of International Air Navigation-, Coordination between Air Traffic Services, Aeronautical Information Services and Aeronautical Meteorological Services (Doc 9377), Meteorology (METP) Information for International Air Navigation in Support of the Global Air Navigation Plan and the Aviation System Block Upgrades, Electronic Air Navigation Plans (eANP), Volcanic Ash (VACP), Flight Safety and Volcanic Ash (Doc 9974).			
Primary Expert Group:		Meteorology Panel (METP)			
	WPE No.	Document Affected or Actions Needed	Description of Amendment proposal or Action	Supporting Expert Group	Status
✓	1707	Actions	Assist ICAO in the coordination of the arrangements between the States/Provider States, international organizations and other stakeholders comprising the IAVW and in ensuring that the global requirements for IAVW information are met.		On-schedule
✓	1703	Annex 3	Proposals to update Annex 3 to meet current and evolving operational requirements in line with the GANP and to integrate IAVW information into the SWIM.		On-schedule
✓	1689	Electronic Air Navigation Plans (eANP)	Based on Annex 3 provisions, provide draft amendment proposals for eANPs as necessary		On-schedule
✓	1690	Manual of Aeronautical Meteorological Practice (Doc 8896)	Update related guidance material to support the implementation of Annex 3 Amendment.	WMO	On-schedule
✓	1691	Manual on Coordination between ATS, AIS and AMS (Doc 9377)	Update related guidance material to support the implementation of Annex 3 Amendment.	WMO	On-schedule

✓	1692	Manual on VARMTCC (Doc 9691)	Update related guidance material to support the implementation of Annex 3 Amendment.	WMO	On-schedule
✓	1694	Manual on IAVW (Doc 9766)	Update related guidance material to support the implementation of Annex 3 Amendment.	WMO	On-schedule
Status:			Priority:	Initial Issue Date:	Date Approved by ANC:
Approved			-	17 June 2015	07 June 2017
RATIONALE					