



**FIRST MEETING OF THE INTERNATIONAL AIRWAYS
VOLCANO WATCH
OPERATIONS GROUP (IAVWOPSG)**

(Bangkok, Thailand, 15 to 19 March 2004)

INTERNATIONAL CIVIL AVIATION ORGANIZATION

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Agenda Item 1: Opening of the meeting**1.1 Place and duration**

1.1.1 The first meeting of the IAVW Operations Group (IAVWOPSG) was held in the Kotaite Wing of the ICAO Asia/Pacific Regional Office, Bangkok, 15 to 19 March 2004.

1.1.2 The meeting was opened at 0900 hours by Mr. Lalit B. Shah, Regional Director, ICAO Asia/Pacific Regional Office, who gave an overview of the main tasks of the group and underscored the role of the group in ensuring that the international airways volcano watch (IAVW) continued to meet evolving global and, where appropriate, regional operational requirements.

1.2 Attendance

1.2.1 The meeting was attended by eighteen representatives from the eight volcanic ash advisory centre (VAAC) Provider States, one User State, International Air Transport Association and the World Meteorological Organization. The list of participants is given at Appendix A.

1.2.2 The group recognized with appreciation the presence of all present and, in particular, representation from all the VAACs.

1.3 Election of Chairman and Vice-Chairman

1.3.1 Mr. Peter Lechner (New Zealand) was elected Chairman of the group; and Mr. Peter Chen (Canada) was elected Vice-Chairman of the group. Mr. Lechner, the Chairman of the group, presided over the meeting throughout its duration.

1.3.2 Mr. Raul Romero, from ICAO Headquarters, Montreal, was Secretary of the meeting and he was assisted by Mr. Dimitar H. Ivanov, Regional Officer, Aeronautical Meteorology from the Asia/Pacific Regional Office.

1.4 Adoption of working arrangements and the agenda

1.4.1 The meeting adopted appropriate working arrangements. The following agenda was adopted:

Agenda Item 1: Organizational matters

- 1.1 Opening of the meeting
- 1.2 Election of Chairman and Vice-Chairman
- 1.3 Adoption of working arrangements and the agenda

Agenda Item 2: Tasks of the IAVWOPSG**Agenda Item 3: Operation of the IAVW****Agenda Item 4: Development of the IAVW****Agenda Item 5: Future work programme****Agenda Item 6: Any other business**

Agenda Item 2: Tasks of the IAVWOPSG**2.1 INTRODUCTION**

2.1.1 It was recalled that the International Airways Volcano Watch Operations Group (IAVWOPSG) had been established in response to Recommendation 1/22 of the Meteorology (MET) Divisional Meeting (2002) in order to ensure that the operation and development of the international airways volcano watch (IAVW) continued to meet current and evolving operational requirements in a cost effective manner.

2.1.2 It was noted that, in accordance with the terms of reference given at Appendix B to this report and approved by the ICAO Air Navigation Commission (referred to as the Commission hereafter) the group was expected to:

- a) undertake work on specific tasks included in its work programme as agreed by the Commission;
- b) ensure, in accordance with its terms of reference, the currency of:
 - 1) IAVW-related provisions in Annex 3; and
 - 2) IAVW-related procedures in the basic air navigation plan/facilities and services implementation documents (ANP/FASID).

2.2 SPECIFIC TASKS OF THE GROUP

2.2.1 It was noted that the group was expected to take over all of the outstanding tasks of the disbanded Volcanic Ash Warnings Study Group (VAWSG). Furthermore, the group was aware that the MET Divisional Meeting (2002) had raised additional IAVW-related issues which had since been referred by the Commission to the IAVWOPSG for follow-up.

2.2.2 The group noted that, in view of the evolving nature of the IAVW, the specific tasks in the work programme would have to be regularly updated and future changes thereto were expected to come from two main sources: those originated by the group itself or those raised by the planning and implementation regional groups (PIRGs). It was emphasized that the group could propose the introduction of new tasks or deletion of an existing task at any IAVWOPSG meeting. Furthermore, issues related to IAVW planning raised by the PIRGs would be automatically referred to the IAVWOPSG for consideration; all the IAVW planning was now global or multi-regional in nature and could not therefore be considered in isolation by a single region. The matters raised by PIRGs which could not be immediately resolved by the IAVWOPSG and which therefore require follow-up work beyond the IAVWOPSG meeting would be proposed for inclusion in the work programme of the group.

2.2.3 It was pointed out that any proposed change to the work programme would have to be endorsed by the Commission which is the body to which the IAVWOPSG was expected to report. In practice, as a routine follow-up of every IAVWOPSG meeting, the Secretary would present the report of the IAVWOPSG meeting for consideration by the Commission and include therein any proposals for changes to the work programme, as necessary.

2.3 ANNEX 3 PROVISIONS RELATED TO THE IAVW

2.3.1 The group was aware that its terms of reference called, *inter alia*, for proposals for the development of the IAVW in order to ensure that it continued to meet evolving global and, where appropriate, regional operational requirements. It was noted that such proposals for requirements should be made “under ICAO procedures for the amendment of Annex 3” which meant that any amendment proposal developed by the IAVWOPSG would have to be subject to the standard consultation and review process.

2.3.2 The group noted that in practice, its terms of reference required that the IAVW-related provisions contained in Chapter 3 and Appendix 2 of Annex 3 be kept under continuous review and that amendment proposals thereto be developed, as necessary. It was realized that there were IAVW-related provisions in other parts of Annex 3, e.g. Chapters 4, 5, and 7 and Appendices 3, 4, 5, 6, 8, 9 and 10. It was noted that in view of the proximity of the applicability date of Amendment 73 to Annex 3 (i.e. 25 November 2004) which had already been adopted by the ICAO Council on 25 February 2004, any amendment proposals formulated by the IAVWOPSG would have to wait for Amendment 74 to Annex 3 (applicability in 2007) and should be presented against approved Annex 3 provisions at the IAVWOPSG/2 Meeting foreseen to be convened during the second half of 2005. Under these circumstances, the group agreed not to undertake a review of Annex 3 provisions at this meeting.

2.4 BASIC ANP/FASID PROCEDURES RELATED TO THE IAVW

2.4.1 The group was aware that the regional air navigation plans (ANP), which currently consist of a BASIC ANP and a facilities and services implementation document (FASID) included procedures related to the IAVW. Hitherto, the maintenance of the currency of these procedures had been the responsibility of the planning and implementation regional groups (PIRGs). However, with the applicability of Amendment 73 in November 2004, the regional procedures related to the IAVW would become *de facto* global, and any changes in one ICAO region would imply changes in all other ICAO regions. Therefore, most of the regional planning related to the IAVW would have to be carried out by the IAVWOPSG, in accordance with its terms of reference.

2.4.2 It was noted that the PIRGs, through their respective MET sub-groups, may continue to propose amendments to the regional procedures related to the IAVW, but any such amendments should be formulated as PIRG conclusions and be addressed to the IAVWOPSG which would consider the proposals from the global perspective. The IAVWOPSG would have to review the “global” IAVW procedures contained in the ANPs/FASIDs at every meeting and initiate, at the request of its members or PIRGs, amendments to all the ANPs/FASIDs. Such amendment proposals would subsequently be referred to the ICAO Regional Offices concerned for normal processing.

2.4.3 The group noted that there were two areas where the PIRGs would continue to play an important role in the regional planning of IAVW. One was the determination of the areas of responsibility for the VAACs and the second was the inclusion of requirements for information from selected State volcano observatories in air navigation plans. These were the only Annex 3 provisions that would remain subject to regional air navigation agreement after the adoption of Amendment 73 to Annex 3.

2.4.4 With regard to the IAVW implementation, the group realized that the role of the PIRGs would not change and that their MET sub-groups would continue to address all the implementation issues, in particular, regarding States’ progress in their capability to resolve deficiencies related to the implementation of IAVW procedures for the provision of warnings of volcanic ash clouds to aircraft in the form of SIGMET messages. A routine item would continue to be included in the agenda of the MET sub-groups of the PIRGs

related to the IAVW implementation and, as a minimum, the FASID Table MET 3B (Volcanic Ash Advisory Centres) would be reviewed and updated by these groups. Some inconsistencies regarding Table MET 3B were noted by the group and they will be referred by the Secretariat to the Regional Offices for action, as necessary.

2.4.5 The group reviewed the procedures related to the IAVW which would be introduced in all ANPs/FASIDs as shown in Appendix C to this report and proposed the necessary amendments to the regional plans. A new format for FASID Table MET 3B, volcanic ash advisory centre was agreed as shown in Appendix D. In this regard the group formulated the following conclusion:

Conclusion 1/1 — Amendment to IAVW-related regional procedures in the Basic ANP/FASID

That, the IAVW-related regional procedures in all Basic ANPs/FASIDs as shown in Appendix C to this report be referred to the ICAO Regional Offices concerned for processing and onward transmission to States for comments, as necessary.

Note:— The information contained in Appendix C regarding FASID Table MET 3B — Volcanic Ash Advisory Centres to this report should be rearranged according to the format shown in Appendix D prior to the consultation with States.

Agenda Item 3: Operation of the IAVW**3.1 INTRODUCTION**

3.1.1 The group was aware that, in accordance with its terms of reference, the International Airways Volcano Watch Operations Group (IAVWOPSG) was expected to provide advice and guidance to the Secretariat concerning the operation of the international airways volcano watch (IAVW), and its effectiveness in meeting current operational requirements.

3.1.2 Under this agenda item the group dealt with the tasks related to the operation of the IAVW that had arisen from the MET Divisional Meeting (2002) and other outstanding tasks of the former Volcanic Ash Warnings Study Group (VAWSG). The update of *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* (Doc 9691) was also addressed.

3.2 OVERSEEING THE IMPLEMENTATION AND OPERATION OF THE IAVW

3.2.1 The group was aware that overseeing the implementation of the IAVW was one of the technical work programme (TWP) tasks of the organization in the air navigation field which was expected to be progressed with the assistance of the IAVWOPSG.

3.2.2 In order to facilitate future discussions related to the operation and implementation of the IAVW, it was suggested that, the VAAC Provider States would prepare a management report for consideration at each meeting of the IAVWOPSG. This report would cover the period elapsed since the previous meeting addressing the main features of the IAVW operations and highlighting any recent developments or difficulties, and future plans.

3.2.3 In this regard, the group formulated the following conclusion:

Conclusion 1/2 — Preparation of IAVW management report

That,

VAAC Provider States be invited to provide a *concise* IAVW management report to be presented at every IAVWOPSG meeting covering the period elapsed since the previous meeting and addressing the main features of the IAVW operations, highlighting any recent developments and difficulties and future planned developments.

Note. — The Secretariat, in consultation with the VAAC Provider States will develop an appropriate format for the IAVW management report that will also include any relevant information received from the PIRGs.

3.2.4 With regard to this subject, the group noted that a special implementation project (SIP) on SIGMET for volcanic ash was conducted in 2003 in the ASIA/PAC and CAR/SAM Regions, as a follow up of the Recommendation 1/11 of the MET Divisional Meeting (2002). The main objectives of the SIP were to provide assistance to States' meteorological authorities in eliminating the deficiencies related to the provision of SIGMET volcanic ash and in improving the coordination between the air traffic services (ATS) units (area control centre (ACC) or flight information centre (FIC) and their associated meteorological watch

offices (MWO), and the vulcanological agencies. The group also noted that the operational issues related to the deficiencies in the issuance of SIGMET for volcanic ash had been addressed through the SIP and that important feedback from the States had been received. However, it was recognized that these problems were of long-term nature and required additional attention. The group agreed that there was a need to assist the States in developing a sample formal letter of agreement between the States' authorities and agencies involved in the IAVW implementation. In this regard, the group formulated the following conclusion:

Conclusion 1/3 — Assistance to States in enhancing the coordination between the States' authorities/agencies involved in the implementation of IAVW

That, the Secretariat develop a sample letter of agreement between the States' meteorological authorities, ATS authorities and vulcanological observatories/agencies, covering the coordination and the corresponding responsibilities for the provision/exchange of information relevant to volcanic ash, for inclusion in Doc 9766, *Handbook on the International Airways Volcano Watch (IAVW) — Operational Procedures and Contact List*.

3.3 UPDATES TO DOC 9691, MANUAL ON VOLCANIC ASH, RADIOACTIVE MATERIAL AND TOXIC CHEMICAL CLOUDS

3.3.1 The group was aware that the IAVWOPSG was expected to assist the Secretariat in the development of appropriate guidance material for aircraft operations with volcanic ash in the atmosphere and with volcanic ash deposited at aerodromes. The group reviewed the proposal for amendment of the *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* (Doc 9691) given at Appendix E. It was felt that an additional review of the whole manual was required and that a reasonable period of time was considered necessary for the group to review and update the manual to include the latest developments related to the detection, modelling and forecast of the movement of volcanic ash and the operation and development of the IAVW. In this regard, it was agreed that a period of four months was appropriate to carry out this review. In order to expedite the publication of the updated *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* (Doc 9691), it was also agreed that the coordination of the final version should be carried out through correspondence.

3.3.2 In this regard, the group formulated the following conclusion:

Conclusion 1/4 — Update of Doc 9691, *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds*

That, after the review by correspondence of the manual, the Secretariat introduce the amendments proposed by the group in Doc 9691, *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* and issue the amended pages as a matter of urgency.

Note. — The comments for changes should reach the Secretariat by 20 July 2004, at the latest.

3.4 UPDATING OF THE WORLDWIDE ASH ENCOUNTER DATABASE

3.4.1 The group was aware that the updating of the worldwide ash encounter database was one of its tasks which had originated from the Eight Meeting of the ASIA/PAC Air Navigation Planning and Implementation Regional Group (APANPIRG/8). In this regard, it was noted that Annex 3, Chapter 5 contained provisions related to special observations to be made by all aircraft in case of an encounter or observation of a volcanic ash cloud, pre-eruption activity or a volcanic eruption (Annex 3, 5.5 refers). In addition to the standard provisions for transmission and exchange of these special air-reports to appropriate ATS units, MWOs and world area forecast centres (WAFCs) (Annex 3, 5.7 and 5.8 refer), specific provisions for the recording and post-flight reporting of aircraft observations of volcanic activity were in place (Annex 3, 5.9 and the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444, Appendix 1). The almost total lack of aircraft reports related to encounters with volcanic ash and the existence of related implementation problems were noted with considerable concern by the group. However, the group was informed that action was being taken in ICAO regions, and in particular in the Asia/Pacific Region, in order to address this issue. The group was of the opinion that these reports were of particular importance for the successful operation of the VAACs and agreed that airlines should be encouraged to issue these reports. In this regard, the group formulated the following conclusion:

Conclusion 1/5 — Reporting, recording and post-flight reporting of aircraft observations of volcanic activity

That,

- a) the International Air Transport Association (IATA) be invited to urge its member airlines to adhere to the existing provisions in Annex 3 regarding the reporting, recording and post-flight reporting of aircraft observations related to volcanic activity, required for the successful operation of the IAVW;
- b) ICAO encourage States to strictly adhere to ICAO provisions in place for the dissemination of special air-reports on volcanic ash in order to contribute with the efficiency of the IAVW and the safety of international air navigation.

3.5 EXCHANGE OF INFORMATION AND REPORTS ON INCIDENTS INVOLVING ASH ENCOUNTERS BY AIRCRAFT

3.5.1 The group was aware that the existing provisions in Annex 3 required that special air-reports reached the MWO responsible for the provision of meteorological watch for the flight information region in which the volcanic activity had been observed. The group noted that there were no provisions or established procedures related to the archiving and compilation of a database of aircraft encounters with volcanic ash. The group noted that a summary of aircraft encounters with volcanic ash was provided in the *Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* (Doc 9691). The group also noted that, as agreed by the former Volcanic Ash Warning Study Group (VAWSG), the special air-reports on volcanic ash were to be sent, in a non-real time, to the Smithsonian Institution for updating their global database. The group felt that it was necessary to define ways and means of sending this information to ICAO for onward transmission to the Smithsonian Institution for the continuous update of their respective databases. It was agreed that the best approach would be for each MWO to send the information to its related VAAC

which would then relay the information to the Secretary of the IAVWOPSG, copied to the Smithsonian. The group was of the opinion that the Smithsonian Institution should continue to be responsible for the update of the volcanic ash encounter database.

3.5.2 In this regard, the group formulated the following conclusion:

Conclusion 1/6 — Information related to aircraft encounters to ICAO and the Smithsonian Institution by the VAACs

That the Secretariat develop appropriate procedures for inclusion in Doc 9766, *Handbook on the International Airways Volcano Watch (IAVW) — Operational Procedures and Contact List* related to the transmission by MWOs to VAACs and subsequently to ICAO and the Smithsonian Institution of information related to aircraft encounters with volcanic ash.

Note. — On completion of the development of these procedures, the IAVWOPSG would be informed accordingly.

3.6 DEVELOPMENT OF VAAC BACK-UP PROCEDURES FOR INCLUSION IN THE HANDBOOK ON THE INTERNATIONAL AIRWAYS VOLCANO WATCH (IAVW) — Operational Procedures and Contact List (Doc 9766)

3.6.1 The group recalled that the third meeting of the former VAWSG (VAWSG/3) had called for the amendment of the IAVW operational procedures in order to include a new section providing an overview of back-up procedures for inclusion in *Handbook on the International Airways Volcano Watch (IAVW) — Operational Procedures and Contact List* (Doc 9766) and on the group's website. The group noted that no progress had been made in this area. One VAAC Provider State supported the need for the development of back-up procedures and informed the group that need for timely dissemination of volcanic ash products had been identified with a high priority by a user needs analysis of volcanic ash carried out in 2002 by the United States. The group, therefore, agreed that VAACs Anchorage and London should be tasked with drafting the VAACs back-up procedures and the Secretariat should subsequently circulate them to all the VAACs for comments and suggestions. Once these procedures were agreed to, the Secretary of the IAVWOPSG would be responsible for their inclusion in the Handbook and on the IAVWOPSG website. In this regard, the group formulated the following conclusion:

Conclusion 1/7 — Development of VAAC back-up procedures for inclusion in Doc 9766, *Handbook on the International Airways Volcano Watch (IAVW) — Operational Procedures and Contact List*

That,

- a) VAACs Anchorage and London be invited to draft the VAAC back-up procedures for onward transmission to the Secretariat;
- b) the Secretariat circulate these procedures to all the VAACs for comments and suggestions in order to reach an agreement on these procedures; and
- c) on completion of sub-item b) above, the Secretariat arrange for their inclusion in Doc 9766, *Handbook on the International Airways Volcano Watch (IAVW) — Operational Procedures and Contact List* and on the IAVWOPSG website.

3.7 ICAO VOLCANO LEVEL OF ALERT COLOUR CODE AND ITS USE BY VULCANOLOGICAL AGENCIES

3.7.1 The group noted that the former VAWSG at its third meeting (Conclusion 3/2 refers) had called for ICAO to consider requesting the International Union of Geodesy and Geophysics (IUGG) to provide guidance on the aviation volcano level of alert colour code to relevant member organizations so that vulcanological agencies could provide vulcanological information direct to VAACs, ACCs and MWOs using this code. This issue had not been progressed since the VAWSG/3 Meeting, the group reconfirmed the importance of this matter and formulated the following conclusion:

Conclusion 1/8 — Coordination with the International Union of Geodesy and Geophysics (IUGG)

That,

- a) the Secretariat inform the IUGG concerning the progress of the IAVW; and
- b) the Secretariat coordinate with IUGG the provision of guidance to its relevant member organizations on the use of aviation volcano level of alert colour code so that vulcanological agencies would provide, if possible, using this code, vulcanological information and/or any other relevant information direct to the VAACs and ACCs/MWOs.

3.7.2 The group also noted that at the same meeting, the VAWSG had formulated a related conclusion (Conclusion 3/3 refers) regarding an amendment to the current wording of the colour code in Annex 15 — *Aeronautical Information Services*. Since no progress had also been made on this issue, the group reconfirmed the need for the amendment and formulated the following conclusion.

RSPP	Conclusion 1/9 — Amendment to Annex 15 regarding the level of alert colour code
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That the proposal to amend Annex 15 — <i>Aeronautical Information Services</i> given in Appendix F to this report be included as part of Amendment 34 to Annex 15 with the understanding that the guidance material included in Doc 9766, <i>Handbook on the International Airways Volcano Watch (IAVW) — Operational Procedures and Contact List</i> be amended accordingly.

3.7.3 The group discussed different issues related to the volcano level of alert colour code. These issues were related mainly to the height of the ash cloud, the appropriateness, in some cases, of the assignment of a colour code by the VAACs (if the colour code had not been provided by the vulcanological agency) and the need to introduce the name of the entity that had assigned the colour code in the volcanic ash advisory. The group was informed on the problems encountered on the use of aviation colour code from the users point of view. It was considered that the current use of the colour code was not suitable for tactical and strategic planning. It was pointed out that the interpretation of the alert colour code YELLOW was the most problematic. However, the group felt that the colour code as defined in Annex 3 and Annex 15 provided useful information and that the existing deficiencies should be addressed by the group. In this regard the group formulated the following conclusion:

Conclusion 1/10 — Establishment of an ad hoc working group to assess the application of the aviation volcanic ash colour code

That an ad hoc working group with participation of the members from Australia, Japan, the United States (Rapporteur), IATA, IFALPA and IUGG be tasked to:

- a) assess the application and utility of aviation volcanic ash colour code; and
- b) prepare a report in time for consideration at the IAVWOPSG/2 Meeting.

Note. — If the proposal is to amend the colour code chart or remove the use of the colour code, the Secretariat would prepare the corresponding draft amendment for consideration by the IAVWOPSG/2.

3.8 STUDY OF THE POSSIBILITY OF INTRODUCING THE SOURCE OF VOLCANIC INFORMATION IN SIGMETs FOR VOLCANIC ASH

3.8.1 The group noted that this was an outstanding issue from the Asia Pacific Regional Workshop on Volcanic Ash (Darwin, 1995). At that time a proposal had been made that the SIGMET for volcanic ash should contain the source of the information on which the SIGMET was based. This was to preclude instances where a SIGMET was issued based on a volcanic ash advisory and the following volcanic ash advisory was then based on the SIGMET forming a dangerous closed loop, into which no new information was inserted. The group also noted that Annex 3 stipulated as a mandatory requirement, that an element indicating the nature of information (i.e. an observation or a forecast) had to be included therein and that the volcanic ash advisories clearly indicated the information source. The group concurred that the work on this task had been completed and formulated the following decision:

Decision 1/11 — Introduction of the source of volcanic information in SIGMETs for volcanic ash

That, in view of the availability of relevant and timely information on the source of volcanic information through volcanic ash advisories, there is no need to propose amendments to SIGMETs concerning the source of volcanic information.

Note.— The corresponding task of the group is proposed for deletion from the work programme under Agenda Item 5.

3.9 CONSIDERATION OF THE EXTENSION OF THE AREAS OF RESPONSIBILITY OF VAACs

3.9.1 The group was aware that while the areas of responsibility of VAACs had now a quasi-global coverage, there were still some areas that could possibly be affected by volcanic ash which had no VAAC coverage. During the former VAWSG/3 Meeting (2000), the United States had indicated that they would

consider extending the VAAC Washington area of responsibility southwards to 10° south and west of 90° degrees west up to 140° west in order to cover the oceanic areas west of Central America. Until now no official notification had been received from the VAAC Washington Provider State. In this context the United States confirmed their willingness to undertake such an extension.

3.9.2 In this same context, it was also noted that there were a number of volcanoes in China currently not covered since they lay between the coverage of VAACs Tokyo and Toulouse. In this regard the meeting was informed by France that VAAC Toulouse had the capability to extend coverage of its area of responsibility up to the western boundaries of VAAC Tokyo and Darwin areas of responsibility. In this regard, the group formulated the following conclusion:

Conclusion 1/12 — Extension of the areas of responsibility of VAACs

That,

- a) VAAC Washington be invited by ICAO to consider extending the area of responsibility to 10° south, 140° west to cover the oceanic area west of South America; and
- b) VAAC Toulouse be invited by ICAO to consider extending its area of responsibility eastward to VAAC Tokyo and VAAC Darwin areas of responsibility.

3.10 DESIGNATION OF SELECTED STATE VOLCANO OBSERVATORIES IN THE ANP/FASID

3.10.1 The group was aware, that part a) of Recommendation 1/14 of the MET Divisional Meeting (2002) regarding the requirement for direct notification of volcanic activity by volcano observatories to ACCs, MWOs and VAACs was introduced with Amendment 73 to Annex 3 which would become applicable on 25 November 2004. The group noted that in order to comply with this provision, the work would have to be carried out by the PIRGs through the amendment process to the ANP/FASID. This involved the introduction of a new table (FASID Table MET 3C) listing the State volcano observatories from which this information was required and the ACC, MWO and VAAC to which each volcano observatory should send the information.

3.10.2 In order to assist the PIRGs in developing this new table, the group agreed that a set of principles should be developed which would allow an equitable evaluation by the PIRGs of those State volcano observatories eligible for inclusion in the ANP/FASID.

3.10.3 In this regard, the group considered that the following principles should be followed by the PIRGs:

- a) the proposed State volcano observatory should have in place a system for the monitoring of at least one volcano of concern to international civil aviation;
- b) the State volcano observatory should be in a position to send the required information in a timely manner to ACCs, MWOs and VAACs;

- c) the number of observatories to be included in the ANP/FASID should be kept to an optimum level; and
- d) the inclusion should be made in consultation with the corresponding VAAC.

Note. — Those PIRGs which have a volcanic ash task force (or similar group) will receive the advice of the VAAC through this task force. In case of the PIRGs with no such task force, the consultation process should be undertaken through the ICAO Regional Office.

3.10.4 In this regard, the group formulated the following conclusion:

Conclusion 1/13 — Designation of selected State volcano observatories to be included in the ANP/FASID

That, the Secretariat invite the PIRGs to take into account the following principles developed by the IAVWOPSG when designating State volcano observatories to be included in a new FASID Table MET 3C in the respective ANP/FASID:

- a) the proposed State volcano observatory should have in place a system for the monitoring of at least one volcano of concern to international civil aviation;
- b) the State volcano observatory should be in a position to send the required information in a timely manner to ACCs, MWOs and VAACs;
- c) the number of observatories to be included in the ANP/FASID should be kept to an optimum level; and
- d) the inclusion should be made in consultation with the corresponding VAAC.

Agenda Item 4: Development of the IAVW**4.1 INTRODUCTION**

4.1.1 Under this agenda item the issues addressed included all of the items related to the development of the IAVW. Section 4.2 deals with the tasks related to the development of IAVW while Section 4.3 addresses the tasks related to the monitoring and provision of warnings to aircraft of radioactive material and toxic chemical clouds.

4.2 MATTERS RELATED TO VOLCANIC ASH**4.2.1 Monitoring of the development of plans by States for future satellite sensors**

4.2.1.1 The group noted that, with regard to the detection of volcanic ash by satellites, the MET Divisional Meeting (2002) had noted with satisfaction the work being done in some States in order to improve satellite-based techniques for the detection of volcanic eruptions and volcanic ash clouds. The divisional meeting also had taken note of additional capabilities that would assist future research offered by the second-generation METEOSAT satellites recently launched by EUMETSAT. In this context, the MET Divisional Meeting (2002) had formulated Recommendation 1/19 — Research in the detection of volcanic ash from satellite data calling for WMO to encourage Provider States of the VAACs to continue, and if possible accelerate, research on the detection of volcanic ash. The recommendation had since been referred to World Meteorological Organization (WMO) for follow-up action.

4.2.2 Completion of the assessment of the usefulness of seismic and infrasonic data

4.2.2.1 The group recalled that the MET Divisional Meeting (2002) had formulated Recommendation 1/18 — Completion of the assessment of the usefulness of seismic and infrasonic data from the Comprehensive Nuclear Test-Ban Treaty Organization (CTBTO) observing networks to the IAVW, requesting that ICAO, with the assistance of WMO, invite the United Nations CTBTO to complete its assessment of the usefulness of global seismic and infrasonic data from CTBTO treaty verification networks for the detection of volcanic eruptions as soon as practicable. Subsequently, a letter had been sent to the CTBTO; in its reply, the CTBTO had expressed its readiness to undertake such a study. In this regard, the group noted that an ICAO focal point had been nominated by the Secretary General and that informal discussions were expected to take place at the WMO CBS Coordination Group on Emergency Response, March 2004. It was noted with interest that some work had already been carried out in this area by the CTBTO but the results had not yet been made known to the Secretariat.

4.2.3 Graphical format for volcanic ash advisories and SIGMETs

4.2.3.1 The group noted that the twelfth meeting of the ASIA/PAC Air Navigation Planning and Implementation Regional Group (APANPIRG/12) (2001), in Conclusion 12/32 — Volcanic ash advisory and SIGMET in graphical format, had called for ICAO to give consideration to further improvements of the format in which the graphical advisory should be issued by VAACs and to the development of proposals for the format of a graphical SIGMETs for volcanic ash, including the necessary guidance procedures for the dissemination of information. Subsequently, during the MET Divisional Meeting (2002), one VAAC

Provider State had proposed the introduction of a new specification and format for the graphical volcanic ash advisory (VAG). The MET Divisional Meeting (2002) had considered that the proposal had considerable merit and formulated Recommendation 1/17 — Proposed volcanic ash advisory in graphical format, requesting that ICAO forward the proposed format to an appropriate body for consideration. The Air Navigation Commission approved the intent of this recommendation and requested the Secretary General to develop proposals, with the assistance of the IAVWOPSG, for consideration by the Air Navigation Commission in time for Amendment 74 to Annex 3.

4.2.3.2 The group was informed by the member from Australia of the recent improvements introduced in the original proposal presented at the MET Divisional Meeting (2002) for the graphical volcanic ash advisory. In the ensuing discussions, the group noted that different approaches existed in the States related to the improvement of the graphical volcanic ash advisories.

4.2.3.3 With regard to SIGMETs for volcanic ash in graphical format, the group noted that the Secretariat, with the assistance of the Meteorological Information Data Link Study Group (METLINKSG), was responsible for the development of all graphical SIGMETs, including those for volcanic ash and tropical cyclones. The METLINKSG/7 Meeting (2003) had agreed that graphical SIGMETs should, as a minimum, contain all the information that would appear in the corresponding SIGMET in alphanumeric form. However, it could contain additional information, if required.

4.2.3.4 In this regard, the group reviewed an extract of the current template for SIGMET messages (in alphanumeric form) included in Appendix 6, Table 6-1 of Annex 3 (Amendment 73) and reproduced at Appendix G, in order to assess whether any additional or modified information was desirable in graphical SIGMETs for volcanic ash. The group agreed that no fundamental changes were required and that the only desirable improvement in the graphical SIGMET should be the display of the area affected by volcanic ash which would no longer be limited to a polygon with, at most, five sides.

4.2.3.5 The group noted that Annex 3 specified that BUFR code should be used for graphical volcanic ash advisories and SIGMETs. Concern was expressed on the lack of guidance regarding how the BUFR code should be used for this purpose. The group felt that this issue should be further addressed and that WMO assistance was necessary once the format of the volcanic ash advisories and SIGMETs in graphical format had been agreed.

4.2.3.6 The group noted that the current implementation of the AFS (i.e. AFTN) was unable to be used for the promulgation of BUFR encoded products (e.g. BUFR encoded VAGs and graphical SIGMETs). Although an enhancement of the ATN was progressing, it was noted that in some regions of the world a network that could be used for the distribution of binary products were unlikely to be available within ten years. However, the group also noted the on-going work within the SADIS Operations Group that involved a study regarding the possible introduction of a two-way second generation (2G+) SADIS system that would be capable of handling BUFR encoded products.

4.2.3.7 It was agreed that in view of the obvious advantages of the graphical products, the work on the improvement of the graphical formats should continue to be pursued by the group. In this regard, the group agreed that the development of graphical products (volcanic ash advisories and SIGMETs) should be carried out by ad hoc working group and formulated the following conclusion:

Conclusion 1/14 — Graphical format for volcanic ash advisories and SIGMETs

That, an ad hoc working group with participation of the members from Australia (Rapporteur), France, United Kingdom, the United States, IATA and WMO be tasked to:

- a) recommend a format for the graphical volcanic ash advisory to be issued by the VAACs in the future; and
- b) assess whether any additional or modified information is desirable in graphical SIGMET for volcanic ash taking into account that the information contained in SIGMET for volcanic ash in graphical format should be identical to that contained in alphanumeric format with the exception of the display of the area affected which would not be limited to a polygon with, at most, five sides; and
- c) prepare a report in time for consideration by the IAVWOPSG/2 Meeting.

4.2.4 Upgrade of the status of the volcanic ash advisory to a “warning”

4.2.4.1 The group recalled that during the MET Divisional Meeting (2002), concern had been expressed that there was a risk that, in spite of considerable efforts over the last few years (e.g. a series of regional special implementation projects (SIPs), regarding the implementation of SIGMET requirements), the problem of non-issuance of SIGMETs for volcanic ash would not be completely resolved. To address this issue, it had been proposed that the volcanic ash advisory message be transformed to the primary hazard warning message for volcanic ash. The divisional meeting had considered that such a fundamental change would have very far-reaching implications for OPMET data banks, flight planning, communication routing and priorities. In this regard, it had formulated Recommendation 1/13 — Upgrade of volcanic ash advisory message to a “warning” requesting that ICAO seek the views of an appropriate group on the proposal to upgrade the status of the volcanic ash advisory to a “warning”. The Air Navigation Commission approved the intent of this recommendation and requested the Secretary General to develop proposals, with the assistance of the IAVWOPSG, for consideration by the Commission in time for Amendment 74 to Annex 3.

4.2.4.2 The group expressed serious concern regarding the operational, regulatory and legal consequences that may emerge from changing the status of the volcanic ash advisory. It was expressed that SIGMETs are under the jurisdiction of States and the upgrade of the volcanic ash advisory to a warning was not acceptable by most of the VAAC Provider States due to the legal and technical implications of such a change. Therefore, the prevailing opinion was in support of keeping the current *status quo* as defined in Annex 3, i.e. the SIGMET should continue to be the primary warning related to volcanic ash.

4.2.4.3 At the same time, the group was fully aware of the existing implementation problems related to SIGMET for volcanic ash, echoed the concerns expressed by the MET Divisional Meeting (2002), and emphasized that they should continue to be in the focus of the PIRGs due to their negative impact to the effectiveness of the IAVW.

4.2.4.4 In the absence of a SIGMET, it was noted that some air carriers utilise the volcanic ash advisory as a warning message in lieu of SIGMET, a purpose for which it was not specifically designed.

4.2.4.5 Based on the above discussion, the group felt that it was not feasible to upgrade the volcanic ash advisory to a “warning”. In this regard, the group formulated the following decision:

Decision 1/15 — Feasibility of the upgrade of the volcanic ash advisory message to a “warning”

That, in view of the far-reaching operational regulatory and legal implications that may emerge from changing the status of a volcanic ash advisory, the upgrade of a volcanic ash advisory message to a “warning” is not feasible.

Note. — The corresponding task of the group be proposed for deletion from its work programme under Agenda Item 5.

4.2.5 Amendment of ASHTAM/NOTAM for volcanic ash in Annex 15 — Aeronautical Information Services to facilitate routing of messages

4.2.5.1 The group was aware that the European Air Navigation Planning Group (EANPG) at its fortieth meeting had identified potential shortcomings in the procedures for distributing volcanic ash information for the purposes of air traffic flow pattern and flight planning decisions. To that end, EANPG/41 had formulated Conclusion 41/13 a) tasking the Meteorology Communications Group (MOTNEG) (since disbanded) and the Satellite Distribution System Operations Group (SADISOPSG) to seek ways of ensuring that volcanic ash information and in particular ASHTAMs and relevant NOTAMs for volcanic activities were disseminated on the aeronautical fixed service (AFS) including SADIS. Subsequently during the analysis of this issue, it had been concluded that it would be necessary to test the existing distribution of ASHTAM/NOTAM for volcanic ash on the SADIS. Therefore, in 2001, ICAO had organized a global test to disseminate these NOTAMs. The test had showed that, to route these NOTAMs successfully at that time, it had been necessary to use the “dummy” WMO GTS abbreviated header (inside the usual AFTN envelope).

4.2.5.2 The “dummy” header was required principally by the London message switching centre at the SADIS uplink since the software at this centre (and at most VSAT stations) could only accept messages with a WMO header. However, the inclusion of a WMO header involved extra work for the NOFs which had to compile two NOTAMs: one standard NOTAM, in accordance with ICAO Annex 15, without the “dummy” header (issued automatically by most NOFs) and another NOTAM with the “dummy” header (issued manually by a vast majority of NOFs).

4.2.5.3 It was suggested that the problem in 2001 occurring at the London message switching centre could have been resolved with the implementation of the SADIS Gateway. (Furthermore, in view of the fact that the SADIS strategic assessment tables, displaying the expected future message traffic, had included NOTAMs for an ICAO region for the last few years, it could be expected that an increasing number of software vendors for VSAT stations had adjusted their software to receive NOTAMs, where necessary.) In view of this, and because it was expected that it would be difficult to justify the introduction of a provision in Annex 15 requiring the inclusion of a “dummy” header, since this procedure would *de facto* double the workload at most NOFs worldwide. The group agreed that there was no need, in principle, to pursue work on the introduction of a WMO header in ASHTAMs/NOTAMs for volcanic ash

4.2.5.4 The group was informed that a “dummy” header would still be required at the SADIS Gateway, though it may be possible for the Gateway itself to assign this header. The possible cost implications of the assignment of a “dummy” WMO header to ASHTAM/NOTAM for volcanic ash at the SADIS Gateway were noted by the group. It was agreed that the decision not to require the inclusion of the “dummy” header in ASHTAM/NOTAM for volcanic ash be brought to the attention of the SADISOPSG.

4.2.5.5 In this regard, the group formulated the following decision:

Conclusion 1/16 — Amendment of ASHTAM/NOTAM for volcanic ash in Annex 15 to facilitate routing of messages

That, in view of the implementation of the SADIS Gateway, the Secretariat confirm with the SADISOPSG that there is no need to amend the format of ASHTAM/NOTAM for volcanic ash in Annex 15 — *Aeronautical Information Services*.

Note. — *The Secretariat should ascertain with the ISCS Provider State if the same issues are relevant to the ISCS users.*

4.2.5.6 The group noted that a related issue had been raised at the recent EANPG/45 Meeting which had formulated Conclusion 45/18 calling for the IAVWOPSG to consider the global operational requirements to disseminate ASHTAMs and NOTAMs for volcanic ash on SADIS. The EANPG had been of the opinion that these messages should be disseminated on the SADIS, independent of the dissemination of other types of AIS information. It was pointed out that, if a genuine global requirement for the dissemination of ASHTAMs and NOTAMs for volcanic ash was confirmed by the group, these messages would also have to be broadcast on the international satellite communications system (ISCS).

4.2.5.7 The group concurred that it was essential that any data on volcanic activity should reach the States and users concerned with a minimum of delay. Therefore, the group agreed that ASHTAMs and NOTAMs for volcanic ash be required, in principle, for uplink on the ISCS and SADIS and formulated the following conclusion:

Conclusion 1/17 — Dissemination of ASHTAMs and NOTAMs for volcanic ash on the ISCS and SADIS broadcasts

That,

- a) ASHTAMs and NOTAMs for volcanic ash be required for dissemination on the ISCS and SADIS broadcasts, and invite the SADISOPSG to coordinate this task accordingly; and
- b) the Secretariat develop the corresponding proposal for inclusion in a draft amendment to Annex 15, for consideration by the IAVWOPSG/2 Meeting.

Note. — *This task should be coordinated with the SADISOPSG.*

4.2.6 **Introduction of provisions in Annex 3 requiring MWOs to acknowledge receipt of volcanic ash advisories**

4.2.6.1 It was noted that the EANPG/40 Meeting through its Conclusion 40/21 part b) had called for ICAO to review Annex 3 provisions for SIGMET messages for volcanic ash cloud in order to introduce a requirement for meteorological watch offices (MWO) to acknowledge the receipt of all volcanic ash advisories, including the case when no SIGMET had been issued. The idea behind this conclusion had been to increase the impact of the volcanic ash advisories on the issuance of SIGMETs by the MWOs. At a first glance this appeared to be an excellent idea but when the operational benefits were weighed, the acknowledgement would imply that a VAAC should closely monitor the reception of the advisories by the MWOs. This monitoring would place an additional burden on the VAACs; it would imply the possible re-transmission of the information to certain MWOs until an acknowledgement was received. Concern was, however, expressed by one member who considered the acknowledgement of receipt of volcanic ash advisories by the MWOs as a possible measure to improve the availability of SIGMETs. In this regard, the group noted that the PIRGs should monitor the availability of SIGMETs as part of their tasks.

4.2.6.2 Based on the above considerations, the group agreed that the proposal for acknowledgement receipt of volcanic ash advisory by MWOs would be difficult to implement and that work on this issue should be discontinued. In this regard, the group formulated the following decision:

Decision 1/18 — Acknowledgement of the receipt of volcanic ash advisories by MWOs

That, in view of its impracticability, work on the development of the proposal to introduce provisions in Annex 3 acknowledging the receipt of volcanic ash advisories by MWOs be discontinued.

Note. — The corresponding task of the group be proposed for deletion from its work programme under Agenda Item 5.

4.2.7 **Consideration of the possibility of inclusion of the smell of sulphur as a condition prompting the issuance of a special air-report**

4.2.7.1 It was noted that the Air Navigation Commission during consideration of the final review of Amendment 73 to Annex 3, had agreed that the ICAO Secretariat with the assistance of the IAVWOPSG, should consider whether the smell of sulphur should be considered as a condition prompting the issuance of a special aircraft observation. Sulphur dioxide (SO₂) was often associated with volcanic ash and the smell of sulphur was one of the unusual effects which indicated that the aircraft had entered a volcanic ash cloud (*Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* (Doc 9691), paragraph 3.2.2 refers). It was also noted that frequently, volcanic ash and SO₂ would separate to some extent in eruption clouds and drift in different directions, with the SO₂-rich clouds generally at a higher level. The ash concentrations in these clouds may be too low to be detected. Nevertheless, recent developments in remote sensing had made it easier to detect SO₂ in real time, with data such as Tiros Observational Vertical Sounder (TOVS), Moderate Resolution Imaging Spectroradiometer (MODIS) and Total Ozone Mapping Spectrometer (TOMS). However, without an IAVW requirement for SO₂ detection, these data may be underutilised. The

group also noted that some agencies may wish to use the smell of sulphur as an indicator of the existence of volcanic ash.

4.2.7.2 The group agreed that the smell of sulphur should therefore be included in Annex 3, and related IAVW procedures as one of the phenomena that prompt the issuance of an aircraft special observation. In this regard, the group formulated the following conclusion:

Conclusion 1/19 — Inclusion of the smell of sulphur in special aircraft observations

That,

- a) the smell of sulphur be included in Annex 3, as one of the conditions prompting the issuance of a special air report; and
- b) the Secretariat develop the corresponding proposal for inclusion in Amendment 74 to Annex 3 for consideration by the IAVWOPSG/2.

4.2.8 Desirability of the reference to first eruption in volcanic ash advisories in the graphical format

4.2.8.1 The group noted that the Air Navigation Commission during the final review of draft Amendment 73 to Annex 3 had considered a proposal made by one State for the removal of the word “FIRST” in the time label “DATE AND TIME OF FIRST ERUPTION” in the volcanic ash advisories in graphical format (VAG). It had been pointed out by that State that the date and time of the first eruption could mislead the users if subsequent depictions were used. The group agreed that the information on the first eruption in volcanic ash advisories could be misleading and should not form part of volcanic ash advisories in graphical format. In view of the fact that a new format for volcanic ash advisories in graphical format is expected to be developed by an ad hoc working group (Conclusion 1/14 refers), it was agreed that the action called for by this task would be undertaken by this group. In this regard, the group formulated the following conclusions:

Conclusion 1/20 — Reference to first eruption in graphical volcanic ash advisories

That the task of the removal of the word “FIRST” in the time label “DATE AND TIME of FIRST ERUPTION” in the volcanic ash advisories in graphical format be referred to the ad-hoc working group which will be dealing with graphical format for volcanic ash advisories and SIGMETs (Conclusion 1/14 refers).

4.2.9 Format of volcanic ash advisory messages

4.2.9.1 The group was pleased to note the improvement of the quality of volcanic ash advisories issued by the VAACs which was highlighted by the users. However, it was recognized that there was still some lack of implementation of the correct format of volcanic ash advisories by some VAACs. In this regard, different examples of non-adherence to the format prescribed by Annex 3 for volcanic ash advisories were considered by the group.

4.2.9.2 It was noted that, in the absence of SIGMET information, the volcanic ash advisory message was the only source of information available to the airlines. Under these circumstances a highly standardized format was required in order to allow a fully automated processing.

4.2.9.3 The group noted that long advisory messages issued by some VAACs had been divided into two separate messages due to AFTN limitations. The group noted that this problem should be taken into account when reviewing the volcanic ash advisory format for efficacy.

4.2.9.4 The group also considered a proposal introduced by one VAAC Provider State regarding changes in the volcanic ash advisory message. It was noted that experience with the existing format for the volcanic ash advisory had revealed that there were several elements that needed further definition, clarification or reviewed for utility as follows:

- a) Element No. 9 “INFORMATION SOURCE”: The group questioned its utility to the end user and proposed the element for deletion since users were not using this information and it was not included in the SIGMET;
- b) Element No. 12 “OBS ASH DATE/TIME”: The element had been interpreted in a number of ways by users; these different interpretations could have been misleading to MWO, other users of the product and could perhaps influence the accuracy of the SIGMET issued by the MWO. Examples of different interpretations were provided;
- c) Element No. 13 “OBS ASH CLOUD”: This element required that wind data be given at flight levels in knots during times that ash was reported but was not identifiable from satellite data. By allowing the VAACs to report the movement of ash cloud or wind in the same element it lent itself to possible confusion where ‘moving’ had been included with the wind field. It was noted that Table A2-1. Template for advisory message for volcanic ash introduced with in Amendment 73 to Annex 3 described the format, but still needed further clarification when reporting winds; the VAAC did not need to include movement in the element. Examples of the different interpretations were provided to the meeting;
- d) Element No. 16 “FCST ASH CLOUD+18HR”: This element was also addressed. It was noted that even though the airlines required longer lead times for flight planning purposes, the quality of the 18-hour was questionable (based on subjective judgement) and took away resources from critical information that was deemed safety related. The users would therefore have to re-validated the need of this element;
- e) Element No. 17 “NEXT ADVISORY”: With regard to this element, it was recommended that it should be the last entry in the volcanic ash advisory similar to the tropical cyclone advisory in order to align both types of messages following the normal practice that the last statement in an advisory or hazardous message was to inform the user when the next message was to be issued.

4.2.9.5 In this regard, the group formulated the following conclusion:

Conclusion 1/21 — Format of volcanic ash advisory messages

That,

- a) an ad-hoc working group with the participation of the members of Australia, France, New Zealand, United States (Rapporteur), IATA and WMO, be tasked to study the issues related to the elements 9, 12, 13, 16 and 17 of the format of the volcanic ash advisory and consider issues related to the length of the advisory messages; and
- b) prepare a proposal in time for consideration by the IAVWOPSG/2 Meeting.

4.2.9.6 The group recalled that the APANPIRG had formulated Conclusion 14/39 inviting the IAVWOPSG to review the format of the volcanic ash advisories aimed at harmonizing the format of those elements which are common to both volcanic ash and tropical cyclone advisories. The group was aware that there were some differences in the format of the volcanic ash advisory and the tropical cyclone advisory. volcanic ash advisories tended to use plain language while tropical cyclone advisories used the ICAO abbreviations contained in *Procedures for Air Navigation Services — ICAO Abbreviations and Codes* (PANS-ABC, Doc 8400). The group agreed that these differences should be further reviewed and formulated the following conclusion:

Conclusion 1/22 — Harmonization of the format of VA and TC advisories

That, in order to harmonize the format of VA and TC advisories, the:

- a) Secretariat develop a proposal for inclusion in draft Amendment 74 to Annex 3 to replace the plain language used in the elements identifiers in the volcanic ash advisory with approved ICAO abbreviations, where appropriate; and
- b) proposal be presented for consideration by IAVWOPSG/2 Meeting.

4.2.10 Inclusion of volcanic ash deposition information in volcanic ash advisories

4.2.10.1 The group noted that the former VAWSG Conclusion 3/8 had called for the Secretary to ascertain from aerodrome experts in ICAO if there was any interest in the inclusion of ash deposition data in the volcanic ash advisory information. Initial discussions regarding this issue had taken place at the Second Workshop on Volcanic Ash (Toulouse, 1998) and it had agreed (paragraph 3.10 refers) that the typical ash deposition should be added to the VEI-source term matrix being developed at that time. The VAWSG/3 Meeting had noted that it would be possible to provide an estimate of ash deposition for a distance around the volcano and that this information could be included in the volcanic ash advisory. However, serious concerns were expressed regarding the reliability of this information especially for aerodromes located far from volcanic ash eruptions. The meeting noted that it was not currently feasible to have a model output for the deposition on the ground which made it very difficult to include this information in the advisories. Nevertheless, the

group was aware of the problems originated by the ash in different airports during volcanic ash events and that the information of ash deposition at aerodromes was of considerable use to airport managers. Therefore, observations of volcanic ash deposit at the aerodromes were considered necessary. It was suggested that these observations could be included in the METAR/SPECI reports. The group felt that one option for such inclusion could be by using the group for reporting the state of the runway appropriately modified. In this regard, the group formulated the following conclusion:

Conclusion 1/23 — Feasibility of volcanic ash deposition observations at aerodromes and inclusion of this information in meteorological reports

That,

- a) the Secretariat, in coordination with the IAVWOPSG member from WMO, undertake a study on the feasibility of introducing volcanic ash deposition observations at aerodromes and the inclusion of this information in meteorological reports; and
- b) if feasible, the Secretariat develop the corresponding proposal for inclusion in draft Amendment 74 to Annex 3 for consideration by the IAVWOPSG/2 Meeting.

Note. — The possibility of using the state of the runway group of the METAR/SPECI reports for reporting volcanic ash deposit at aerodromes should be explored.

4.2.11 Development of a VEI/source term matrix

4.2.11.1 The group recalled that the task related to VEI/source term matrix had been initially proposed at the Second International Workshop on Volcanic Ash (Toulouse, 1998) and had been readdressed at the third meeting of the disbanded VAWSG in 2000. At the recent Third International Workshop on Volcanic Ash (Toulouse, 2003), it was concluded that some closure on the VEI/source matrix was needed. To that effect, the Secretary-General of the IAVCEI was contacted by a group representing three VAAC Provider States (Australia, Canada and the United States) in early March 2004. It had been noted that even if dispersion models could fully describe the source term and concentration could be accurately calculated, there were still uncertainties regarding the delineation of acceptable concentrations compared to concentrations known to impact on aircraft operations in terms of safety and maintenance. The VAACs had been encouraged to work towards a consistent approach on this issue. The group agreed that this issue should be progressed by the VAAC Provider States and formulated the following conclusion:

Conclusion 1/24 — Development of a VEI/Source term matrix

That,

- a) the IAVCEI, through its parent body IUGG, and VAAC Provider States be encouraged to progress work on the development of a VEI/Source matrix; and
- b) the VAAC Provider States prepare a report in time for consideration by the IAVWOPSG/2 Meeting.

4.2.12 Model inter-comparisons

4.2.12.1 An initial inter-comparison study had been conducted in 1998 following the Second Workshop on Volcanic Ash (Toulouse, 1998). The results were generally similar when archived meteorological data were used, but differences were observed when forecast meteorological data were used.

4.2.12.2 The purpose of inter-comparison studies as was noted by the former VAWSG was to provide end-users an indication about the similarities and differences among the models. To illustrate the importance of this issue users had indicated that if the model output was inconsistent and was inaccurate or different by just 500 miles for flight planning 2 to 12 hours in advance of the actual flight, airlines had to account for a number of operational impacts.

4.2.12.3 It was noted that model inter-comparison was different from model verification. As part of a standard operating procedure, the VAACs should be conducting verification studies on their models against observations to assess the accuracy of their forecasted trajectories of the ash cloud. These verification studies were used internally to improve the model capabilities. With this in mind, the VAACs are encouraged to establish common case study databases to facilitate model inter-comparisons.

4.2.12.4 It was noted that most volcanic ash transport and trajectory models used by the VAACs were independent of each other and there were no assurances that these models would agree during situations when the ash cloud was transported into another VAAC's area of responsibility. End users needed assurances that there would not be significant changes in the projected trajectory as originally forecasted when another VAAC assumed the responsibility after the ash cloud drifts in its area. For instance, if one model included wet deposition, but another did not, or if one model used significantly larger ash particles than another, different results might be expected.

4.2.12.5 It was also noted that Annex 3 required VAACs to activate a “volcanic ash numerical trajectory/dispersion” model for forecasting purposes, but there was no requirement for the model output to be issued. Instead, the model output could be used in preparing the volcanic ash advisory, which, in turn, was used as guidance for preparing SIGMET for volcanic ash by the meteorological watch office (MWO).

4.2.12.6 The VAACs Provider States agreed that informal model inter-comparisons should be conducted on a routine basis. In this regard the group formulated the following conclusion:

Conclusion 1/25 — Model inter-comparisons exercises

That,

- a) the VAACs Provider States conduct, in coordination with WMO, regular model inter-comparisons exercises to endeavour to ensure that the model outputs provided by the different models used are meeting operational requirements; and
- b) the VAAC Provider States, where appropriate, include the results in the management report.

4.2.13 Inclusion of volcano number in SIGWX charts

4.2.13.1 The group was aware that the APANPIRG/8 had formulated Conclusion 8/27 — Volcanic ash warning system, calling for ICAO to make arrangements for the inclusion of the volcano number in significant weather charts. In this regard it was noted that Amendment 72 to Annex 3 applicable since 1 November 2001, had introduced a Standard (Appendix B, 4.3.1.1 refers) requiring that significant weather charts (SIGWX) shall show the international number of the volcano responsible for eruptions which are producing ash cloud of significance to aircraft operations. Therefore, the group concurred that the work on this task had been completed and that the work programme be amended accordingly under Agenda Item 5.

4.2.13.2 However, the group noted that the current SIGWX weather charts are not meeting the Standard. It was also noted that IATA and IFALPA had no utilization of the inclusion of the volcano number on the SIGWX weather charts. Therefore, even though the work was completed, further evaluation was required to bring the practice into alignment; it would be brought to the attention of the WAFSOPSG. In this regard, the group formulated the following conclusion:

Conclusion 1/26 — Inclusion of volcano number in SIGWX charts

That, the Secretary of the IAVWOPSG bring to the attention of the Secretary of the WAFSOPSG that the Standard related to the inclusion of the volcano number on the SIGWX weather charts is not being met and that the users, IATA and IFALPA, had no utilization for its inclusion on the SIGWX .

Note. — The corresponding task of the group be proposed for deletion from its work programme under Agenda Item 5.

4.2.14 Workload of the Volcanic Ash Advisory Centres

4.2.14.1 The group noted that Conclusion 1 of the Third International Workshop on Volcanic Ash, (Toulouse, 2003) stated that “The workshop expressed its support to the volcanic ash advisory centres, who have taken on a great part of the eruption monitoring load and devoted resources to the international airways volcano watch (IAVW). This had contributed significantly to aviation safety”.

4.2.14.2 The emerging complexity of volcanic ash cloud monitoring, with many well-documented scientific and operational challenges, suggested that the workload of most VAACs would, if anything, increase. Therefore, the group considered it to be important that the greater requirement for VAAC resources be widely

understood, in the context of the continuing threat of volcanic ash clouds to aviation safety. In this regard the group agreed in inviting ICAO, in coordination with WMO, to consider sending a letter to VAAC Provider States supporting the excellent work being done by the VAACs and the need for continuous support of these centres by the States. In this regard the group formulated the following conclusion:

Conclusion 1/27 — Increase of the workload of the volcanic ash advisories centres

That, ICAO, in coordination with WMO, be invited to consider informing the VAAC Provider States of their essential role in providing advice on volcanic ash and highlighting the considerable workload on VAACs which has been increasing as a result of evolving requirements of the IAVW.

4.3 MATTERS RELATED TO THE ACCIDENTAL RELEASE OF TOXIC CHEMICALS AND RADIOACTIVE MATERIAL INTO THE ATMOSPHERE

4.3.1 Development of international arrangements for the exchange of information on the accidental release of toxic chemicals into the atmosphere

4.3.1.1 The group noted that it was expected that the IAVWOPSG should assist the Secretariat in the development of possible international arrangements for the exchange of information on the accidental release of toxic chemicals into the atmosphere. This was a problematic task and progress had been delayed due to the fact that there was no lead international organization in this respect, and accidents tended to be on a small scale. However, a number of accidents involving toxic chemicals had been reported which had affected aircraft operations (*Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Clouds* (Doc 9691), Chapter 7 refers). Although, States with highly-developed chemical industries had infrastructures and networks for dealing with emergencies involving toxic chemical releases, the group noted that there was no international authority to set-up standards for exchange of information regarding toxic chemicals. Therefore, the issue of toxic chemicals accidents was being considered as an internal matter of each individual State and the national practices varied considerably from State to State.

4.3.1.2 The group noted that, from the users point of view, the information on release of toxic chemicals was necessary and therefore, development of procedures for obtaining such information and its transmission to aircraft in flight in a timely manner, should be pursued by the group. It was noted, in this regard, that the intention should not be for ICAO to set up its own monitoring infrastructure but to participate in the arrangements which already were in place. It was agreed that ICAO should establish cooperation in this respect with other worldwide interested and active bodies, in particular with WMO.

4.3.1.3 Since no work had yet been undertaken in this area, the group concurred that the only way to progress the issue was to establish an ad-hoc working group which would undertake a study in time for consideration by the IAVWOPSG/2 Meeting. In view of the similarity of this subject with the one related to the accidental release of radioactive materials in the atmosphere, discussed in 4.3.2.7 to 4.3.2.8, it was agreed that one ad hoc group should deal with both tasks (Conclusion 1/31 refers).

4.3.2 Development of international arrangements related to the accidental release of radioactive materials into the atmosphere

4.3.2.1 The group was aware that, under the heading of “accidental release of radioactive materials into the atmosphere”, there were four tasks to be progressed:

- a) direct notification of an ACC by the International Atomic Energy Agency (IAEA) of an accidental release of radioactive materials into the atmosphere;
- b) feasibility of the WAFCs including information on the trajectory of radioactive material on a separate chart;
- c) determination of the altitude to which trajectory forecasts of radioactive materials should be provided; and
- d) assess and enhance, as necessary, the current operational procedures on the accidental release of radioactive materials into the atmosphere.

4.3.2.2 Regarding the notification by the IAEA of an accidental release of radioactive materials into the atmosphere, it was noted that, in accordance with the arrangements in place, the ACCs concerned should receive the information through their associated MWOs; however, this information did not reach MWOs directly; it came through a number of other units (as a minimum, through the WMO regional specialized meteorological centres (RSMCs), which inevitably led to delays. Furthermore, it was pointed out that the IAEA was reluctant to advise more than one international aviation focal point. It was also noted that the ICAO Secretariat had had informal contacts with some States to assess whether it would be possible that an ACC under their jurisdiction be designated as the global focal point for receiving the early notification of the accidental release of the radioactive material provided by the IAEA and for being responsible for the dissemination of this information to other ACCs concerned. So far the results had not been conclusive; in general ACCs did not seem to be prepared to accept this additional responsibility which was of a global scope, far beyond their customary area of responsibility (i.e. the FIR).

4.3.2.3 The group concurred that the task *per se* was fairly simple: it consisted of forwarding the early notification provided by the IAEA *without any modification or interpretation* to the ACCs concerned. The early notification (Appendix H refers) included the coordinates of the accident; therefore, the task consisted of converting the geographical position to a FIR and to choose the ACCs which could be affected. Under these circumstances, it could be postulated that almost any operational centre with an ICAO AFS connection and 24-hour operations could accept the responsibility, provided that there were semi-automated means of finding the correspondence between the geographical position contained in the notification and the location of the ACCs. Before speculating on the possible designation, the group agreed that the Secretariat should investigate whether a database converting positions expressed in latitude and longitudes into FIRs and their associated ACCs could be made available and kept up-to-date. Without such a database, it would be more difficult to find any operational centres accepting this duty. In this regard, the group formulated the following conclusion:

Conclusion 1/28 — Early notification of ACCs of an accidental release of radioactive materials into the atmosphere

That, the Secretariat undertake a study as to whether a database converting positions expressed in latitude and longitude into FIRs and their associated ACCs could be provided and kept up-to-date and report its findings to the IAVWOPSG/2 Meeting.

4.3.2.4 With regard to the feasibility of the inclusion, by the WAFCs, of information on the trajectory of radioactive material on a separate chart, it was recalled that, in 1999, the Air Navigation Commission had referred this task to the former VAWSG for initial consideration. The Commission had agreed that only information concerning the accidental release of radioactive materials into the atmosphere should be included in WAFS SIGWX forecasts while the forecast of trajectories of radioactive materials should not be included therein due to the possible increase of clutter. At the same time, the Commission had agreed that the Secretariat should study, in consultation with IAEA and WMO, the feasibility of the implementation and transmission of a separate product by the WAFCs and the utility of this product for pre-flight planning.

4.3.2.5 The group expressed its serious misgivings about the utility of this information within the WAFS which, by definition, was expected to provide meteorological information at the pre-flight planning stage and agreed that the provision of this type of “perishable” and time critical information should be kept outside the WAFS. The inclusion of the location of the accident in the WAFS SIGWX forecasts as currently required, was considered sufficient. In this regard, the group formulated the following decision:

Decision 1/29 — Feasibility of the inclusion, by the WAFCs, of information on the trajectory of radioactive material on a separate chart

That, due to the nature of radioactive material in the atmosphere, the provision by the WAFCs of information on the trajectory of radioactive material on a separate chart not be considered appropriate.

Note. — The corresponding task of the group be proposed for deletion from its work programme under Agenda Item 5.

4.3.2.6 The group further noted that the Air Navigation Commission had agreed that a proposal should be developed for the amendment of the relevant Annexes and PANS to take account of the altitude to which trajectory forecasts of radioactive concentrations should be provided by WMO RSMCs. The effect on the aircrew and the passengers was unlikely to be sudden or immediate except if the aircraft flew very close to the source. However, it was clear that, in spite of the infinitesimal risk associated with flying *over* nuclear clouds at typical cruising altitudes, no aircraft crew wished to fly over such clouds. Under these circumstances, the group agreed that such a height should only be specified in ICAO Annexes and PANS if an official expert view were obtained from the IAEA ruling out the occurrence of radioactive clouds above a certain altitude. Without such a statement, it would be impossible to amend ICAO documents. It was agreed that there was no need to pursue work on this task and the group formulated the following decision:

Decision 1/30 — Amendment of Annex 3 to include altitude to which trajectory forecasts of radioactive materials should be provided

That, until such a time that an official confirmation by the IAEA is received related to the maximum altitude to which radioactive material of radiological significance may reach, the trajectory forecasts of radioactive materials should continue to be provided across the troposphere, with no amendments to Annex 3.

Note. — The corresponding task of the group be proposed for deletion from its work programme under Agenda Item 5.

4.3.2.7 With regard to the assessment and enhancement of existing operational procedures and notification practices on the accidental release of radioactive material from nuclear facilities, it was noted that the MET Divisional Meeting (2002) had formulated Recommendation 1/20 a) calling for the assessment, by a suitable body of ICAO, in consultation with WMO, of the existing operational procedures and notification practices on the accidental release of radioactive material from nuclear facilities and the possibility of their enhancement. The Commission had approved the intent of this recommendation and had requested the Secretary General to develop proposals with the assistance of the IAVWOPSG in time for Amendment 74 to Annex 3.

4.3.2.8 The group agreed that the existing operational procedures and notification practices for radioactive materials should be carefully assessed by an ad-hoc working group, which as discussed in paragraph 4.16.3, should also undertake the study on the operational procedures and notification practices for accidental release of toxic chemicals into the atmosphere. In this regard, the group formulated the following conclusion:

Conclusion 1/31 — Study on operational procedures and notification practices for accidental release of toxic chemicals and radioactive materials

That an ad-hoc working group consisting of the members from Canada, New Zealand, United Kingdom (Rapporteur)¹, United States, IAEA², IATA, IFALPA and WMO, be tasked to:

- a) undertake a study related to the feasibility of the establishment of international arrangements for the exchange of information on the accidental release into the atmosphere of toxic chemicals; including the procedures to be used for transmission of such information to aircraft in flight;

¹ Subject to confirmation by the UK MET Authority.

² Subject to confirmation by IAEA.

- b) undertake an assessment of the existing operational procedures and notification practices related to accidental release of radioactive materials into the atmosphere, considering the possibility of enhancing these procedures and practices; and
- c) prepare a report in time for consideration by the IAVWOPSG/2 Meeting.

4.3.3 Study of the need for a message format for the provision to aircraft of information on radioactive and hazardous materials accidentally released into the atmosphere

4.3.3.1 The group recalled that the MET Divisional Meeting (2002) had formulated Recommendation 1/20 b) calling for ICAO to arrange for a suitable body to assess, in consultation with WMO, the need to develop an international format for advisories for all radioactive and hazardous material accidentally released into the atmosphere. It had been agreed that the coordination among ATS providers and airlines should be undertaken to ensure that any product can be easily interpreted by the operational units concerned for tactical and strategic planning. The Air Navigation Commission approved the intent of this recommendation and requested the Secretary General to develop proposals, with the assistance of the IAVWOPSG, for consideration by the Commission in time for Amendment 74 to Annex 3.

4.3.3.2 The group noted that currently MWOs were expected to supply information to ACCs and AIS units on the location, time and date of the accident, and the forecast trajectories of the radioactive materials (Annex 3, 3.4.2 g) refers) and that the format in which the information was provided was not specified. In practice, it was understood that in most cases, the MWOs would use the forecasts received from the WMO RSMCs and simply forward the information to the ATS and AIS units concerned. The group agreed that for aeronautical users, it would be a step forward if the most basic information, i.e. the location and date and time of the accident, could also be provided in a message in abbreviated plain language well understood by all aeronautical users. Since the proliferation of message types should be avoided, the group concluded that the best suited option would be a SIGMET. The group, concurred that the inclusion of trajectories in an alphanumeric SIGMET message would not be feasible and in this regard, continuing reliance on the output from the WMO RSMCs would be necessary.

4.3.3.3 The group agreed that the Secretariat should develop a draft amendment to Annex 3, for review by the IAVWOPSG/2 Meeting, related to the inclusion of basic information on radioactive materials accidentally released in the atmosphere. The group realized that the future inclusion of other hazardous materials in SIGMET would depend on the results of the study related to toxic chemicals, to be completed in time for consideration by the IAVWOPSG/2 Meeting. In this context, the group formulated the following conclusion:

Conclusion 1/32 — Message format for the provision to aircraft of information on radioactive materials accidentally released into the atmosphere

That,

- a) the Secretariat, in coordination with the IAVWOPSG Member from WMO, undertake a study on the possibility of inclusion of the required basic information for accidental release of radioactive material into the atmosphere in the SIGMET information; and
- b) the Secretariat develop the corresponding proposal for inclusion in draft Amendment 74 to Annex 3 for consideration by the IAVWOPSG/2 Meeting.

4.3.4 Assessment of the need of provision of information on solar radiation storms and other bio-hazards

4.3.4.1 It was noted that Recommendation 1/20 c) of the MET Divisional Meeting (2002) had called for the assessment of the need for the provision of information for international air navigation on solar radiation storms and other bio-hazards by an ICAO suitable body, in consultation with WMO. At the time of the divisional meeting, it had been proposed that this information should be provided to aircraft, in addition to the existing arrangements for the provision of information on radioactive materials released accidentally into the atmosphere. It had been pointed out that with the opening of new polar routes, aircraft operating in these high latitudes could be exposed to hazardous levels of solar radiation that could affect health, communications and the global positioning system.

4.3.4.2 The group noted that Annex 15 (5.1.1.1 t) refers) already required the issuance of a NOTAM when a forecast of solar cosmic radiation was provided. The group exchanged views on this issue and considered that it would be necessary to issue other warnings (e.g. SIGMET messages) on solar radiation storms or other bio-hazards.

4.3.4.3 Questions were, however, raised how the MWOs could have access to the necessary background information in order to be in a position to issue the required SIGMETs. It appeared that, as a first step, the need for the provision of additional information on solar radiation storms and other similar bio-hazards be assessed.

4.3.4.4 Concerns were expressed by some members of the group regarding the lack of expertise within the group on solar radiation storms and other bio-hazards. It was noted that the study of solar radiation storms and other bio-hazards was not under the terms of the reference of the IAVWOPSG. It was, however, recalled that the follow-up of Conclusion 1/20 c) of the MET Divisional Meeting (2002) had been referred to this group by the Commission and that it was understood that, to be able to carry out such a task, this group should be suitably strengthened by the addition of experts as advisors in these fields.

4.3.4.5 The group noted that these issues were being addressed in the United States. Therefore, the group requested the member from the United States to present a report for consideration at the IAVWOPSG/2 Meeting. In this regard, the group formulated the following conclusion:

Conclusion 1/33 — Report on developments related to solar radiation storms and other bio-hazards

That, the member from the United States present a report on developments related to solar radiation storms and other bio-hazards in time for consideration by the IAVWOPSG/2 Meeting.

Agenda Item 5: Future work programme

5.1 It was noted that at every IAVWOPSG Meeting, the group was expected to review its work programme and make the updates thereto, as necessary.

5.2 The group agreed that a number of editorial changes to the work programme should be made to align the presentation and the order to those of the “Technical Work Programme of the Organization in the Air Navigation Field (TWP)”. This would facilitate to maintain the work programme of the group harmonized with the TWP.

5.3 The group noted that the Aeronautical Meteorology Sub-group (AERMETSG) of the CAR/SAM Regional Planning and Implementation Group (GREPECAS) at its Sixth Meeting (Brazil, 20 to 27 June 2003) had formulated draft Conclusion 6/10 requesting the IAVWOPSG to study the possibility of harmonizing the aviation colour code indicating the level of alert of volcanic activity with the codes used by vulcanological organizations and by International Federation of Air Line Pilots’ Associations (IFALPA). This conclusion would be considered at the forthcoming Twelfth Meeting of GREPECAS (8 to 12 June 2004), and if subsequently endorsed by the Air Navigation Commission, would be included in the work programme of the group.

5.4 The group reviewed the work programme and proposed additional changes based on the discussions under Agenda Items 2, 3 and 4 and formulated the following conclusion:

Conclusion 1/34 — Update of the work programme of the IAVWOPSG

That, the work programme of the IAVWOPSG be replaced with that shown in Appendix I to this report.

Agenda Item 6: Any other business

6.1 With regard to the IAVWOPSG/2 Meeting, the group recalled that it was the intention to convene IAVWOPSG Meetings about every 18 months and that the meetings would be held at ICAO Regional Offices on a rotational basis. The group agreed that for planning purposes, the IAVWOPSG/2 Meeting should be convened at the South American Regional Office, Lima in November 2005. The exact dates would be coordinated during the next few months with the ICAO Regional Director and the group.

6.2 The group expressed its gratitude to the ICAO Regional Director for excellent arrangements during this meeting.
