W O R L D M E T E O R O L O G I C A L O R G A N I Z A T I O N

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FINAL REPORT

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PICTURE

1. ORGANIZATION OF THE SESSION

1.1 Opening of the session

1.1.1 The meeting was opened by Mr Chi Ming Shun, president of the Commission for Aeronautical Meteorology (P/CAeM). In his opening remarks, Mr Shun emphasized the importance of this Management Group (MG) meeting given that it would be the last MG meeting prior to the sixteenth session of the CAeM (CAeM-16) scheduled for July 2018 and it was also his last MG meeting while serving as president of the commission. Mr Shun indicated the need for a smooth handover from the current presidency to the next. Appreciating the significant amount of work accomplished by the MG and the CAeM Expert Teams (ETs) since the last MG meeting in Hall-in-Tirol (Innsbruck) in November 2016, as evidenced by the working documentation for the meeting, Mr Shun highlighted that there were deliverables yet to be completed such as the development of a long-term plan for the Aeronautical Meteorology Programme (AeMP). Mr Shun also acknowledged emerging issues such as public-private partnership, 'Big Data' and implementation of the seamless global data-processing and forecasting system that would have widespread implications on the CAeM community and WMO Members in general. Mr Shun alluded to ongoing WMO constituent body reform discussions, to which he was an active contributor, as well as to anticipated imminent changes within the Secretariat of the Aeronautical Meteorology (AEM) Division of WMO (also referenced at 1.1.4 below). In closing, Mr Shun emphasized that the work of the CAeM would continue to be a major thrust of the Organization, in whatever form the WMO reform considerations may take.

1.1.2 Mr Ian Lisk, vice-president of the CAeM, concurred with the remarks of the president and also took the opportunity to welcome two new members to the MG – namely Ms Kathy-Ann Caesar (British Overseas Caribbean Territories) in her capacity as a new co-chair of ET-ETC and Mr Matt Strahan (United States of America) in his capacity as a new co-chair of ET-ASC.

1.1.3 The meeting was also addressed by Dr Xu Tang, Director of the WMO Weather and Disaster Risk Reduction Services (WDS) Department. Dr Tang welcomed participants on behalf of the WMO Secretary General, Prof. Petteri Taalas, and emphasized the importance of this meeting in the context of the upcoming CAeM-16 session and its Technical Conference (TECO), where corresponding arrangements would be discussed. Dr Tang also alluded to the WMO reform discussions, where ideas were emerging for the restructuring of WMO constituent bodies, including technical commissions such as the CAeM. Dr Tang appreciated the progress being made by the CAeM ETs in the work programme deliverables and, most especially, expressed deep appreciation to all involved in the successful conducting of the WMO Aeronautical Meteorology Scientific Conference (AeroMetSci-2017) in Toulouse, France in November 2017. Dr Tang acknowledged the introduction by the International Civil Aviation Organization (ICAO) of an operational global space weather information service for aviation for which CAeM and the Commission for Basic Systems (CBS) were playing a key and active role. Dr Tang closed by thanking all concerned for their commitment to the work of the CAeM in support of the AeMP and wished everyone a productive meeting and a pleasant stay in Geneva.

1.1.4 Mr Dimitar Ivanov, Chief of the AEM Division of WMO, also welcomed participants. Further to the remarks made by Mr Shun, Mr Ivanov advised that he was in the process of transitioning to a new role within WMO that would address public-private partnership (also known as public-private engagement) and the global weather enterprise and that there would be imminent changes within the AEM Division in terms of the available Secretariat support. Notwithstanding, Mr Ivanov indicated that he was expecting to be able to provide partial support to preparations for the CAeM-16 session and was likely to attend the session. Mr Ivanov also advised that Ms Brigitte Vuitteney-Gelman, Senior Secretary of the AEM Division, had retired in December 2017 and that her AEM-related duties were soon to be handled by Ms Adriana Oskarsson on a shared basis between the AEM Division and the Marine Meteorology and Oceanography (MMO) Division. Ms Oskarsson was introduced to the MG.

1.1.5 Mr Ivanov served as Secretary of the meeting assisted by Mr Greg Brock, Scientific Officer, AEM Division.

1.2 Adoption of the agenda (Doc. 1.2)

1.2.1 The meeting adopted the agenda as shown in Annex 1 to this report. The list of participants is as shown at Annex 2 to this report.

1.3 Working arrangements (INF. 3)

1.3.1 The meeting adopted appropriate working arrangements for the meeting.

2. REVIEW OF ACTION LIST (Doc. 2)

2.1 Actions arising from the CAeM-MG meeting in November 2016

2.1.1 The MG recalled that its last meeting (CAeM-MG-2016) had been held from 8 to 10 November 2016 in Hall-in-Tirol (Innsbruck), Austria and that the MG had formulated a total of twenty-six (26) agreed actions. The MG was pleased to note a majority of the actions arising from the last meeting could be considered complete and that the action list was maintained by the Secretariat on the MG website (under Work Programme).

2.1.2 The MG reviewed the CAeM-MG-2016 action list and, where necessary, updated the status of the actions as shown at Annex 3 to this report.

2.1.3 Stemming from this review the MG agreed that there was a need to:

a) [Action A13-2016 related] Make WMO-No. 770 obsolete in view of the outdated nature of the information and the fact that methods of interpreting numerical weather prediction output are considered to be sufficiently covered in other existing WMO publications;
b) [Action A14-2016 related] Make ICAO Doc 9873 and WMO-No. 1001 obsolete in view of the recent (2017) major update to WMO-No. 1100, *Guide to the Implementation of a Quality Management System for National Meteorological and Hydrological Services*, and to correspondingly develop a proposed amendment to the Note to paragraph 2.2.3 of ICAO Annex 3/WMO-No. 49, Technical Regulations, Volume II, *Meteorological Service for International Air Navigation*, to ensure that it references WMO-No. 1100 instead; and
c) [Action A15-2016 related] Make WMO-No. 842 obsolete because all provisions relating to meteorological service to support international helicopter operations are already covered by Annex 3/WMO-No. 49, Volume II provisions and their associated guidance material.

See ACTION A01-2018 and ACTION A02-2018 as shown at Annex 4 of this report accordingly.

2.2 Quarterly CAeM-MG teleconferences

2.2.1 The MG recalled that, since its last meeting, it had conducted teleconferences on a quarterly basis[1] primarily to assist and oversee the progression of the work of the MG and the CAeM ETs, to exchange information on recent meetings/events and prepare for upcoming meetings/events, and to address coordination needs including with ICAO. The MG appreciated that a summary of discussions had been prepared and circulated by the WMO Secretariat subsequent to each teleconference.

2.2.2 The MG appreciated that a schedule of quarterly teleconferences for 2018 had already been prepared as follows: 17 January (0700 UTC) (cancelled due to proximity of this MG meeting), 18 April (1400 UTC), 11 July (0600 UTC) and 17 October 2018 (1400 UTC). The MG acknowledged that, in view of changes to the composition of the MG likely to arise from the

[1] 18 January, 19 April, 5 July and 18 October 2017.

CAeM-16 session in July 2018, some of the existing MG members would not be required to participate in the October 2018 teleconference while any new MG members (by that stage) would be required to participate.

3. REPORT OF THE PRESIDENT OF CAeM (Doc. 3)

3.1 P/CAeM, Mr Chi Ming Shun, presented his report covering the period since the last full meeting of the MG. During this period four teleconferences of the MG had been conducted and a 'mini-MG' meeting had been arranged when the opportunity had arisen at the conclusion of AeroMetSci-2017. To alleviate the heavy workload of Dr Herbert Puempel in chairing the ET-ASC, P/CAeM in consultation with the MG had established an additional co-chair for ET-ASC (Mr Matt Strahan), while a new co-chair of ET-ETC (Ms Kathy-Ann Caesar) had also been established. It was noted that a joint meeting of the ET-ASC and ET-ISA had been held on 22 to 24 May 2017.

3.2 In his report, Mr Shun highlighted the following developments:

a) Successful organization of the **Special Dialogue on the Future of Aeronautical Meteorological Services** at EC-69 (2017) engaging national and private aeronautical meteorological service providers (AMSP) and aviation industry representing airlines and pilots with Decision 6.2(2)/1 calling for the development of a methodology and the conducting of a sensitivity analysis of various scenarios of future meteorological service delivery for aviation, including different degrees of engagement of private sector providers, to assess possible impacts both on the NMHSs as AMSPs and on the resulting service quality levels; such analytical information to inform WMO planning of aviation-related activities in the future, with first results of such analytics expected to be available in time for Cg-18 in 2019.

b) A summary of the outcomes of the **2016/17 CAeM Global Survey on Aeronautical Meteorology Service Provision** was presented to EC-69 by P/CAeM in the Special Dialogue. A new publication containing the outcomes of the global survey had been posted on the WMO website (available here). CAeM expert teams ET-GOV and ET-CCP, under the leadership of Mr Jan Sondij (co-chair of ET-GOV) had contributed to this milestone achievement of the Commission. Special thanks also go to WDS/AEM Division intern Mr Yi Wang for the preparation of the online survey and processing of the results.

c) EC-69 endorsed the methodology for the **draft Long-Term Plan for the WMO Aeronautical Meteorology Programme (LTP-AeMP)** and requested that the LTP-AeMP be finalized by EC-70 (2018).

d) Highly successful organization of the **WMO Aeronautical Meteorology Scientific Conference 2017 (AeroMetSci-2017)** held in Toulouse, France (Météo-France website and WMO AeMP website), with excellent feedback received from over 200 participants, which was only the second such event dedicated to aeronautical meteorology in the history of WMO, the last one being held in London, United Kingdom in March 1968. The 2017 conference opened new and promising ways for a fruitful information exchange between scientists, operational actors and end-user communities going forward. The conference also highlighted the need for a mechanism for enhancing the sharing and use of aircraft data, in particular turbulence data, for the improvement of science and operations.

e) EC-69 approved the amendment to the **WMO-No. 49, Technical Regulations, Volume II, Meteorological Service for International Air Navigation,** ensuring its necessary alignment with Amendment 77 (2016) to ICAO Annex 3. The updated version was subsequently published by WMO (see e-Library here) with some delay, however.

f) Participation of P/CAeM in PTC-2017 (9 January 2017), Joint PRA/PTC-2017 (9-11 January 2017), second 2017 session of EC WG/SOP (16-17 October 2017), Joint

PRA/PTC 2018 (17-19 January 2018) during which **WMO restructuring** was discussed. P/CAeM presented a SWOT (strengths, weaknesses, opportunities, threats) analysis for CAeM and provided his views on various restructuring options at PTC-2017. While various options of reducing the number of technical commissions (TCs) had been discussed, notably from eight TCs to two TCs (e.g. Commission for Basic Infrastructure and Commission for Applications and Services) or to four TCs (e.g. Commission for Basic Infrastructure, Commission for Applications and Services, Commission on Climate, and Commission on Water), with the existing service-oriented TCs such as CAeM continuing in the form of Standing Committees under the Commission for Applications and Services, there was not yet a consensus at the time of this MG meeting. It was expected that a consolidated proposal would be further deliberated by the next meeting of EC WG-SOP and EC-70 prior to approval by Cg-18 in 2019.

g) P/CAeM was involved in the approval of adoption of **Release 2.1 of IWXXM** by EC-69 and to start a "Fast Track" procedure for approval of adoption of sub-release 2.1.1 of IWXXM, with a proposed date of implementation of 15 May 2018. 2017 saw the start of IWXXM implementation by some Members supported by training events, e.g. an international workshop on "Implementation of the IWXXM for the Exchange of OPMET Data" organized by the Hong Kong Observatory in collaboration with the WMO VCP and ICAO Asia/Pacific Regional Office during 10-12 October 2017.

h) Also, 2017 witnessed the publication of a new version of the **WMO Guide to the Implementation of Quality Management Systems for National Meteorological and Hydrological Services and Other Relevant Service Providers (WMO-No. 1100)** which is one of the main deliverables agreed by EC-68 (2016) for furthering the WMO quality management framework, especially the provision of guidance to assist Members in successful transition from existing quality management systems (QMSs) based on the ISO 9001:2008 standard to the new ISO 9001:2015 QM standard. The ETR Office and ET-ETC had jointly developed a **WMO Guide on Competency**, under the expert leadership of Andrea Henderson of the Australian Bureau of Meteorology (as an ET-ETC core member). The Guide was expected to be published by WMO very soon. Apart from providing guidance on implementing competency frameworks, it highlights competency-based training which is a recommended way to initiate updating of Members' training programmes. ET/ETC had also upgraded the **CAeM moodle website** into a more contemporary version with content enhancements and revamps in the pipeline.

i) Workload continued to be heavy for CAeM ET members and the WMO Secretariat to attend and contribute to various working group meetings of the **ICAO Meteorology Panel (METP)** as well as periodic teleconferences during the respective intersession period. For example, an ad hoc Task Team on Aviation (TT-AVI) of the CBS/CAeM IPT-SWeISS, assisted by a CBS Expert Team on Centre Audit/Certification (ET-CAC) and the WMO Secretariat, had contributed actively to the coordination, preparation, site assessment and auditing for the imminent designation by ICAO of the provider States of **space weather centres**. CAeM ET members were also actively contributing to the work of the **Regional Hazardous Weather Advisory Centre (RHWAC)** work stream including the development of draft guidance material on improving SIGMET provision and coordination for inclusion in Doc 8896, developing the functional and performance requirements for hazardous enroute weather information for aviation system block upgrades (ASBU) Block 1, and maturing the concept of a globally-harmonized, multi-hazard information service to integrate into the future system-wide information management (SWIM) environment and to support development of draft provisions for Amendment 79 to Annex 3 (2020). The **SIGMET coordination** project initiated by WMO for three Members in SE Asia (Singapore, Malaysia and Indonesia) had become operational in August 2017. Since then, efforts were being made to extend the coordination to other neighbouring Members.

j) After launching the inaugural **CAeM Newsletter** in September 2016, two more issues were published in 2017 and the first issue of 2018 was in the pipeline. P/CAeM noted

with appreciation the proactive contributions by expert team members to the newsletters and expected that this would become a matter of routine supported by the WMO Secretariat.

k) Discussion was made between P/CAeM and Dr Jitze van der Meulen, CAeM representative on ICG-WIGOS, regarding further **consultation between CAeM and CIMO on methods of observation**, in particular automation issues, at the aerodrome and (increasingly) in the terminal area, and how the documentation under the respective responsibility of CAeM, CIMO and ICAO should be managed in the future.

l) P/CAeM noted with concern that the organization of the **African Conference on Meteorology for Aviation (ACMA)** for increasing the awareness of Members in RA I to the changes in aeronautical meteorological services arising from ICAO's Global Air Navigation Plan (GANP) and ASBU had yet to be rescheduled following its postponement in November 2016. For RA II, while a side event on aeronautical meteorology was organized at the RECO preceding the 16th session of RA II on 11 February 2017, a full-fledged awareness event for RA II may still need to be pursued.

In addition to the foregoing, Mr Shun remarked on the following important matters:

- Restructuring of WMO constituent bodies;
- Aircraft-based meteorological observations; and
- Finalization of LTP-AeMP and beyond.

3.3 Concerning the **restructuring of WMO constituent bodies**, P/CAeM noted that one of the possible options for the restructuring of the TCs was to consolidate application- and service-oriented TCs under one entity – working title: "Commission for Applications and Services" – with CAeM repositioned as one of its (non-intergovernmental) Standing Committees. It was envisaged that should stronger ties be established between the Standing Committee on Aeronautical Meteorological Services (SC-AeM) and the ICAO METP (for example where SC-AeM becomes an Inter-Agency Standing Committee (IASC)), international coordination and cooperation on aeronautical meteorology between WMO and ICAO would be further enhanced and the restructuring would see obvious benefits. The AeMP was also expected to continue playing a pivotal role in WMO as demonstrated in its leadership in promoting QMS, competency frameworks, compliance culture, public-private partnership (PPP), etc. within the Organization. On the other hand, P/CAeM expressed concern that in the midst of the restructuring and change in focus of the Organization, e.g. to accord higher priorities to PPP engagement, the availability of adequate WMO Secretariat staff resources supporting the AeMP was becoming an issue, especially in the imminent preparation of the next CAeM session to be held in July 2018 and deliverables for EC-70 and Cg-18.

3.4 Concerning **aircraft-based meteorological observations**, P/CAeM recalled that the MG meeting in November 2016 had questioned the need to reinstate aircraft-based observations in the CAeM work programme given, not least, the recognition in ICAO's GANP that aircraft-based meteorological observations are an enabler to enhanced operational decisions through integrated meteorological information, and their increasing importance to the wider meteorological community in view of their benefits in improving forecasting for the terminal area and airports. In this regard, the last MG meeting had agreed to determine the need and feasibility of reinstating aircraft-based observations in the work programme of the CAeM. This subject was again highlighted in AeroMetSci-2017 (see 3.2 d) above), recognizing that the enhanced availability of automated aircraft observations from both WMO and non-WMO sources would be useful not only for operational forecasting but also for validation and fine-tuning of hazardous weather detection and prediction algorithms. Discussion was also ongoing to increase collaboration between WMO and IATA on AMDAR programme operation (agenda item 7.2 refers), especially in the collection and provision of automated turbulence reports from aircraft. Thus, CAeM should play a proactive role in this discussion with a view to promoting enhanced sharing of all available aircraft observation data from WMO and non-WMO sources benefitting both the meteorological and aviation communities. P/CAeM remarked that

this collaboration may be considered as one of the "low-hanging fruit" in the PPP development initiative.

3.5 Concerning **finalization of the LTP-AeMP and beyond**, P/CAeM appealed for the support of the MG and ETs to finalize the LTP-AeMP based on the template drawn up by the Secretariat (INF.1 refers) for consideration by EC-70 (20 to 29 June 2018). Given the time constraint and the rather substantial outstanding work, the MG was requested to consider if there was scope for simplifying the LTP structure (e.g. to focus on Block 0 and Block 1 initially) and if a drafting team should be formed to carry out the work as a matter of priority. The MG was also invited to discuss if the methodology would need to be fine-tuned, e.g. to reflect not just the scientific/meteorological aspects but also the technological aspects, such as: 1) deployment of electronic flight bag (EFB) applications supported by on-board Wi-Fi, 2) IWXXM implementation, and 3) 'Big Data' analytics and artificial intelligence developments. The LTP was discussed further under agenda item 6.5.

3.6 Similarly, Mr Shun commented that the actions called for by Decision 6.2(2)/1 (EC-69) would need the attention of the present and incoming MG (after CAeM-16) to make sure that the deliverables – i.e. the development of a methodology and the conducting of a sensitivity analysis of various scenarios of future meteorological service delivery for aviation to assess possible impacts both on the NMHSs as AMSPs, and on the resulting service quality levels – would be available for consideration by Cg-18 in 2019. It was noted that a PPP landscape survey being planned to be conducted by WMO (not CAeM) in early 2018 may provide timely and pertinent inputs to this work.

3.7 In concluding his report, as this would be his last MG meeting as president of CAeM, Mr Shun expressed his heartfelt appreciation for the excellent support by all members of the MG including the Secretariat members of both WMO and ICAO. The significant progress made by the commission during the past eight years of his tenure as president would not have been possible without this support. Even though uncertainties on the future WMO restructuring were expected to exist for some time, Mr Shun was hopeful that the core values of strong scientific expertise, professionalism, close user engagement and partnership, agility, pro-activeness and inclusiveness would be able to guide the commission (or its successor), allowing aeronautical meteorological services worldwide to reach new heights in the decades to come.

3.8 In reviewing the president's report, the MG made the following observations:

a) In respect of the WMO regulatory framework for aeronautical meteorological service provision and the duplication that currently exists between ICAO Annex 3 and WMO-No. 49, Volume II, as well as some of the supporting guidance material, it was recalled that a bilateral meeting between the ICAO Secretary General and the WMO Secretary-General in April 2017 (refer to 4.3.5) had recommended that the two Organizations would seek opportunities to improve efficiency, including potentially eliminating WMO-No. 49, Volume II. The MG noted that the ongoing duplication of key documents such as Technical Regulations, including disparate document controls, was not consistent with the principles of QMS and does not set a good example to international AMSPs and the wider community;
b) In respect of WMO reform, it was noted that the interaction of 'services' with 'science' as well as inclusiveness between the developing and the developed world would be important considerations. Additionally, the restructuring of WMO constituent bodies may offer the opportunity for enhanced engagement between WMO and ICAO, perhaps as an IASC as remarked at 3.3 above;
c) In respect of consultation between CAeM and CIMO on methods of observation, it was acknowledged that several WMO and ICAO publications already exist in this connection for which there would be a need to ensure that they were consistent and avoid duplication; and
d) In respect of quality management systems and the recent (2017) update of WMO-No. 1100, it was remarked that benchmarking of services through, for example, the conducting of verification and other performance measures was becoming a key

consideration for many service providers but that there was currently a non-uniform, non-standardized approach in a WMO context which may demand attention.

4. OUTCOMES OF RECENT MEETINGS/EVENTS (Doc. 4)

4.1 EC-69 Special Dialogue on the Future of Aeronautical Meteorological Services

4.1.1 The MG was pleased to note that a one-day special dialogue on the future of aeronautical meteorological services had been held on 11 May 2017 in Geneva as part of the sixty-ninth session of the Executive Council of WMO (EC-69). The objective of the special dialogue had been to discuss the evolving requirements for the provision of meteorological services to international air navigation and the impacts of the envisaged changes on the National Meteorological and Hydrological Services (NMHSs) of WMO Members as well as on other AMSPs.

4.1.2 The MG appreciated that the special dialogue had helped to stimulate strategic thinking, had assisted the Executive Council to chart a path for WMO Members to address the challenges that lie ahead and had promoted new approaches to ensure that the delivery of meteorological services to aviation would be sustained at the required level of performance, quality and cost effectiveness.

4.1.3 The MG recalled that the special dialogue had addressed:

- The need for dialogue and partnership with the stakeholders;
- The need to understand the GANP and ASBU requirements (of ICAO) and their impacts on meteorological service provision;
- The growth of the private sector;
- Changing service delivery models (regionalization and globalization);
- Changing technology and information management;
- How less developed WMO Members (LDCs and SIDS) will cope with the foreseen changes;
- The need for research and development; and
- What WMO and ICAO can do to facilitate the process.

4.1.4 The MG noted with appreciation that a summary of the special dialogue highlighting the outcomes of the discussions that had taken place on these key topics was available on the WMO website (here).

4.2 Aeronautical Meteorology Scientific Conference (AeroMetSci-2017)

4.2.1 Following-on from discussions at the last MG meeting, the MG highly appreciated that AeroMetSci-2017 had been held at Météo-France in Toulouse from 6 to 10 November 2017 and had provided an excellent forum for representatives of the research community, service providers and users of aeronautical meteorological information and services to discuss the needs for science and research in support of current and future air transport operations.

4.2.2 The MG welcomed news that more than 200 participants from an array of aviation stakeholders had attended the conference and that the conference had comprised around 60 oral presentations, more than 60 poster presentations and four panel discussions across the following three thematic areas:

- Science underpinning meteorological observations, forecasts, advisories and warnings;
- Integration, use cases, fitness for purpose and service delivery; and
- Impacts of climate change and variability on aviation operations and associated science requirements

4.2.3 The MG appreciated the tremendous support that had been offered by an organizing committee and a scientific committee in the preparation and conducting of the conference,

with notable contributions from experts of CAeM ET-ISA and ET-ASC and other technical commissions including the Commission for Atmospheric Sciences (CAS), in particular Dr Peter Ping-Wah Li of the Hong Kong Observatory. The MG expressed its deep appreciation to Ms Stéphanie Desbios (co-chair of ET-ISA) for her exceptional support to the conference arrangements.

4.2.4 The MG was apprised that a series of recommendations and a statement had arisen from the conference which, together with a compilation of all the presentations and panel discussions, would form part of a Conference Proceedings publication expected to be available in early 2018. The MG noted that all presentations delivered at AeroMetSci-2017 were available online (here) for ease of reference and that the Météo-France conference website (here) would soon be decommissioned.

4.2.5 The MG discussed AeroMetSci-2017 further as part of the reports of ET-ASC and ET-ISA (see 5.1.1 and 5.1.5 respectively below).

4.3 ICAO meetings/events

4.3.1 The MG was informed that, since November 2016, ICAO had held a number of meetings of the working groups (WGs) of the METP. Specifically, the following METP WG face-to-face meetings had convened (work streams in brackets where applicable):

- WG-MOG (SADIS) and WG-MOG (WAFS), 4 to 7 April 2017, Exeter
- WG-MOG (IAVW), 12 to 14 June 2017, Tokyo
- WG-MISD (VASD), 14 June 2017, Tokyo
- WG-MIE, WG-MRI, WG-MISD (SWx, RRM and RHWAC) and WG-MCRGG, 10 to 20 July 2017, Montreal

4.3.2 The MG appreciated that many members of the CAeM expert teams as well as the WMO Secretariat had directly contributed to these meetings as well as the intersession progression of the work, including via periodic teleconferences of each working group. The MG was given an overview by Mr Yong Wang (ICAO) of the progress being made by each of the METP WGs (INF. 2 refers).

4.3.3 The MG was further informed that, from 11 to 15 December 2017, ICAO had convened its second Global Air Navigation Industry Symposium (GANIS/2) and first Safety and Air Navigation Implementation Symposium (SANIS/1) – ICAO News item available here and event materials (including presentations) available here. The MG was apprised that a half-day session of GANIS had been dedicated to aeronautical meteorology comprising a series of keynote presentations and panel discussions that had included WMO Secretariat representation. The outcomes of the GANIS (and, to some extent, the SANIS) would serve as inputs to the convening of ICAO's 13th Air Navigation Conference in October 2018 and 40th Assembly in Q4 2019.

4.3.4 The MG was pleased to note that CAeM expert team members and the WMO Secretariat had been involved in regional ICAO meetings/events over the past year in all ICAO regions.

4.3.5 Lastly and as alluded to at 3.8 a) above, the MG was pleased to note that on 28 April 2017 Prof. Petteri Taalas, Secretary-General of WMO, had held a bilateral meeting with Dr Fang Liu, Secretary General of ICAO, to discuss the cooperation between the two organizations in the field of aeronautical meteorology – WMO News item available here and joint statement available here. The MG was informed that, at the Secretariat level, the two Organizations were now engaged in dialogue to address the outcomes of the bilateral meeting.

5. REVIEW OF THE WORK PROGRAMME IMPLEMENTATION

5.1 Experts Teams reports and coordination of tasks

5.1.1 Expert Team on Aviation, Science and Climate (ET-ASC) (Doc. 5.1(1) and Att. 1)

5.1.1.1 Dr Herbert Puempel and Mr Matt Strahan presented a report on the key tasks and activities of the Expert Team on Aviation, Science and Climate (ET-ASC). The MG noted that the ET-ASC had undergone several changes in its membership and orientation since the last MG meeting held in November 2016. The new ET-ASC co-chair, Mr Strahan, had also acted as a link to the ICAO METP, particularly on WAFS issues within the WG-MOG.

5.1.1.2 The MG appreciated that, apart from answering any requests for scientific advice by other Expert Teams, partner organizations and industry, the preparation and conducting of AeroMetSci-2017 (4.2 above refers) had been the key activity of ET-ASC during 2017 in collaboration with other expert teams, including ET-ISA.

5.1.1.3 The MG also noted that extensive coordination between the ET-ASC and ET-ISA had been enabled through the conjoint meeting held in May 2017 (report available here), which was dedicated to addressing overlapping issues between the teams and the preparation of AeroMetSci-2017.

5.1.1.4 A scientific committee had been established for AeroMetSci-2017, drawing on the particular expertise of CAeM and CAS expert teams and invited experts from scientific research and development (R&D) institutes as well as from AMSPs of WMO Members. The scientific committee had been co-chaired by Dr Peter Ping-Wah Li of Hong Kong Observatory (as an ET-ASC core member) and Dr Puempel (as an ET-ASC co-chair) and well supported by others in the expert team. The 'Call for Papers and Posters' had been met with an overwhelming (if not always timely) response, and the scientific committee had diligently selected oral and poster presentations that appeared the most promising in terms of scientific novelty, user interest and alignment with the conference themes.

5.1.1.5 The conference had addressed three thematic areas (as in 4.2.2), each serving as a session. The first session on scientific methodologies and progress had been met with great interest, most subject areas had been covered by first-rate scientists from leading organizations/institutes and had led to rich discussions. Wrap-up panel discussions led by high-powered CAeM and scientific experts had helped to summarize and focus on the relevant outcomes of the presentations. The second session on service delivery had highlighted the strong need for further development of streamlined, coherent and focused information for all relevant stakeholders, including the need for communicating objectively-measured and unambiguously predicted reliability as well as achievable accuracy of forecasts and warnings with proper validation. The role of SWIM-based information systems and the need to support different user communities in their selection of fit-for-purpose data and products was noted. The third session on the impact of climate change and variability on aviation had addressed the critically important question of how well regional and even local impacts are objectively predictable, and how the potentially large uncertainty of the occurrence and severity of high-impact (extreme) weather events could be quantified, where possible reduced, and communicated in a way that would permit aviation stakeholders to optimize their risk management.

5.1.1.6 The MG was pleased to note that the conference had been, according to feedback received during the conducting of a post-conference satisfaction survey, a major success and potentially opened new and promising ways of a fruitful information exchange between forward-looking scientists, operational actors and end-user communities.

5.1.1.7 As a lesson learned, the MG was informed that it may be quite important to establish a solid consultation process between the different stakeholders on the merits and expected benefits of scientific methodologies as well as on the use and securing of non-standard

meteorological data (aircraft-based, ground-based/aerodrome-specific, remote sensing). The ICAO process of defining aeronautical user requirements for meteorological service may have to become the "last mile" of a much more open and scientifically sound analysis of existing issues, scientific and technological capabilities, and return-on-investment considerations. The need for governance (or, at least, a general agreement) on the use of aircraft data for the improvement of science and operations appeared urgently needed to circumvent an ineffective, resource-consuming competitive approach to data generation and use.

5.1.1.8 In the context of the climate change impacts on aviation issue, the MG considered that there may be further awareness-raising opportunities, such as at ICAO's Thirteenth Air Navigation Conference (AN-Conf/13) in October 2018, but that it was important to avoid 'leading the witness' and to instead ensure that ICAO and the aviation industry in general serve as the driver, coming to WMO to seek the expert science advice, if and when required.

5.1.1.9 In terms of the other subjects in the original work plan of ET-ASC, the MG was apprised that progress had been limited to a few issues and had turned out to depend, in many cases, on external inputs and coordination questions. It was therefore recommended to try to use the remainder of the intersession period to complete any activities where progress could be tangible and to refer any remaining/open items to the next intersession period.

5.1.1.10 In the context of Activity A2.1 in the ET-ASC work plan (status: ongoing) addressing the development of an "issues paper" for future WAFS development, the MG expressed caution in a proposal to take a paper to the upcoming ICAO METP WG-MOG meeting in April 2018, since WMO had not been requested to do so by ICAO. The MG recommended that, instead, it would be advisable to await such a request from ICAO. Should such a request materialize, WMO could then formally undertake a scientific/peer review of the WAFS developments. Mr Strahan advised that, in his capacity as a representative of WAFC Washington and advisor of the United States of America on the ICAO METP/WG-MOG, he would discuss the matter further with WAFC London with a view to submission of a joint WAFC Washington/London paper to WG-MOG rather than it being a WMO/ET-ASC paper.

5.1.1.11 As an attachment to the ET-ASC report (Att. 1 to Doc 5.1(1) refers), the MG was also provided with a status update on the Aviation Research Demonstration Project (AvRDP)[2]. Noting the Phase I or Phase II status of each of the six airports currently involved, the MG remarked that it would be beneficial for CAeM to obtain a formal report on Phase I implementation and the strategy for Phase II, perhaps as part of the working documentation for the upcoming CAeM-16 session. See ACTION A03-2018 as shown at Annex 4 of this report. In the context of a proposed three-day training workshop on AvRDP in October 2018, the MG was informed that this was intended mainly for the AvRDP participants, organized and supported under the auspices of the WWRP (World Weather Research Programme), not the AeMP per-se.

5.1.2 Expert Team on Communication, Coordination and Partnership (ET-CCP) (Doc. 5.1(2) and Presentation)

5.1.2.1 Ms Marina Petrova and Ms Gaborekwe Khambule presented a report on the key tasks and activities of the Expert Team on Communication, Coordination and Partnership (ET-CCP).

5.1.2.2 Dedicated to fostering regional/sub-regional links, the expert team thoughtfully formed its membership underpinned by experts from all the six WMO Regions. As core team members, these six regional representatives keep monitoring the implementation process and contribute to a comprehensive team report with regular inputs. Regarding the terms of reference, the team followed the recommendations made by the last MG meeting in November 2016 to identify, among others, the following main priorities in its work plan:

[2] AvRDP is a joint project between the Commission for Atmospheric Sciences (CAS) and the CAeM. More information available here.

- Enhance coordination with other expert teams, when necessary, to fulfil the cross-cutting tasks in the work plan;
- Provide continued support in issuing CAeM Newsletters as an essential tool to ensure connectivity across the MET community;
- Assist in preparations of regional conferences on meteorology, e.g. African Conference on Meteorology for Aviation (ACMA);
- Review and update the work plan and submit to Secretariat for posting on the website;
- Keep the Management Group informed on the regional/sub-regional activities; and
- Report regularly on progress to the President of CAeM.

5.1.2.3 Given the increased need in communication of AeM developments, ET-CCP optimized coordination with other CAeM expert teams. The MG noted with appreciation that the team had interacted closely with ET-GOV at the preparatory stage and during the conducting of the 2016/17 CAeM global survey on aeronautical meteorological service provision. Special focus had been placed on distribution of the outcomes of the global survey to national services. Similarly, close coordination had been established with ET-ISA to distribute critically important information on the publication of IWXXM versions to the meteorological community.

5.1.2.4 The MG appreciated the efforts of ET-CCP in identifying wide-ranging topics and soliciting inputs from its team members and other experts for the periodic newsletters on which there was agreement that they could be encouraging and accommodating regional and national innovations and initiatives in the provision of meteorological services to aviation. To date, three newsletters had been issued (6 October 2016, 13 February 2017 and 5 September 2017) and made available to the community via email distribution, as well as via the AeMP website. The MG confirmed that ET-CCP had been tasked not only to assist issuance of the newsletters but also to promulgate the newsletters inside and outside the community. It was further noted that the next issue of the CAeM Newsletter – Issue 1/2018 expected in February 2018 – would include an update of the latest developments and achievements.

5.1.2.5 With regard to the ET-CCP work plan, the MG was informed of the attempts within the team to upgrade the format of representation of team activities and deliverables. However, at a later stage it was decided to stay with the previous work plan template, making more clear-cut deliverables. The MG was advised that the current ET-CCP work plan had been made available to the CAeM website since 31 July 2017 (available here) but had not been significantly restructured in order to keep basic operating work principles.

5.1.2.6 The MG noted that communication amongst ET-CCP team members continues to grow via periodic teleconferences (two held since the last MG meeting) and regular email correspondence. It was further noted that regional/sub-regional implementation reports from all the WMO Regions had been exchanged regularly within the team and, in a consolidated format, further forwarded to the president and vice-president of CAeM in a timely manner.

5.1.2.7 When discussing the periodic CAeM Newsletters (mentioned at 5.1.2.4 above), the MG was pleased to note that three (soon to be four) newsletters had been issued over the past two years and disseminated currently to approximately 800 recipients within the WMO and aeronautical meteorology community. To better meet recipients' expectations, it was felt necessary to enhance the responsiveness of the newsletters to the needs of the MET community and make appropriate assessments. Therefore, the MG requested ET-CCP to conduct a short 'satisfaction survey' (in English), aiming to cover the challenge in the Regions for adequate MET information resources and enable CAeM to maintain its relevance in the MET community. Responding to a limited set of questions, the Members would be asked about the special features of the newsletters, i.e. the format, the content, the frequency of issuance, etc., to define the overall level of satisfaction with and suggestions for improvement in the newsletters. The MG was apprised that the satisfaction survey should be sent out around the time of the issuance of Newsletter-1/2018 and that once the survey had been completed (tentatively by the end of March 2018) the replies would be processed in order to deliver the outcomes to the MG. See ACTION A04-2018 as shown at Annex 4 of this report. The MG

appreciated that such feedback would, potentially, help inform on how the newsletters might evolve.

5.1.2.8 Concerning support and assistance to region-wide events, the MG appreciated that the African Conference on Meteorology for Aviation (ACMA), being organized in WMO Regional Association I (Africa) through the efforts of the WMO Office for Africa and Least Developed Countries (AFLDC), was considered 'urgent' on the agenda of ET-CCP. Following its postponement in November 2016, ACMA had been rescheduled first to 2017 and then to 2018. The MG was informed that there was continuing uncertainty about the timing and location of the revised event. The MG was advised that communication between the AFLDC, the AEM Division and a potential new host country (Senegal) was continuing with a view to arranging an event at the earliest opportunity. Great focus was placed on recently held regional MET-related events and future organizing opportunities, such as the RA I Regional Conference (RECO) likely to take place in early 2019. The MG encouraged such collaborative efforts with the Regions.

5.1.3 Expert Team on Education, Training and Competency (ET-ETC) (Doc. 5.1(3))

5.1.3.1 Mr Chris Webster and Ms Kathy-Ann Caesar presented a report on the key tasks and activities of the Expert Team on Education, Training and Competency (ET-ETC).

5.1.3.2 In respect of aeronautical meteorological personnel (AMP) competency and qualification standards, the MG recalled that the past four years or so had seen the passing of two significant milestones. Firstly, on 1 December 2013, the aeronautical meteorological observers (AMO) and aeronautical meteorological forecasters (AMF) competency standards had come into force. Secondly, on 1 December 2016, the AMF qualification standard had come into force. The MG appreciated that a key role of ET-ETC during this period had been to guide, coordinate and encourage all organizations in the aeronautical meteorology community in their efforts to comply with these WMO standards. In view of the CAeM's pioneering work in this regard, experts from other technical areas had looked to CAeM for advice on how they could implement comparable systems. In this context ET-ETC had always been responsive to such needs.

5.1.3.3 The MG acknowledged and appreciated that ET-ETC and the WMO Education and Training Office (ETR) had jointly prepared a new WMO Guide on Competency under the expert leadership of Andrea Henderson of the Australian Bureau of Meteorology (core member of ET-ETC). The guide, expected to be published by WMO soon, would meet a great demand within the international community. It included general material on defining and writing competencies, implementing competency frameworks that meet organizational needs, assessing for competencies, competency-based training and QMS-compliance. Furthermore, the new guide would interface with examples of various competency frameworks that already exist or that are being developed in a WMO context (e.g. for aviation, marine, etc.).

5.1.3.4 In respect of education, training and competency websites, the MG noted that the CAeM Moodle website had been progressively upgraded by ET-ETC, and new materials added, with continued kind technical support from the UK Met Office. The MG was informed that a review of the currency of the material and (where necessary) consequential updating of the material on the website was ongoing (linked with Action A17-2016 of the last MG meeting). Additionally, the MG recalled that the CAeM had developed a Competency Assessment Toolkit (CAT) in the previous intersessional period to assist with the introduction of the competency frameworks that were new at the time. The MG was pleased to note that in 2017 ET-ETC had reviewed and updated this CAT (available here) with the kind assistance of Hong Kong Observatory. The MG encouraged that multimedia or other such visuals should be considered for introduction into the online materials to further enhance their appeal.

5.1.3.5 Appreciating the progress being made by ET-ETC, notably in the context of supporting the introduction of the competency and qualification requirements, the updating of existing support materials (e.g. Moodle) and the development of new support materials (e.g. Guide on Competency), the MG considered whether there were further outreach efforts – similar to

those undertaken to introduce QMS requirements over previous years – to encourage implementation amongst WMO Members. For example, awareness raising or training events in the competency framework and new competency guide. In this connection the MG acknowledged that, through the WMO regional association (RA) mechanism, a consultative process was already in place to identify where and in what form such outreach was needed and that experts within the CAeM ETs, notably ET-ETC and ET-CCP, were occasionally requested to provide expert input. The MG appreciated that outcomes of the 2016/17 CAeM global survey, particularly in the context of expressions of national needs or regional gaps identified, would also add value to this effort.

5.1.3.6 In connection with the competency framework and its direct relevance to supporting ICAO Annex 3/WMO-No. 49, Technical Regulations, Volume II, 2.1.5 provisions, the MG considered whether the ICAO Universal Safety Oversight Audit Programme (USOAP) Continuous Monitoring Approach (CMA) adequately addresses competency and qualification, education and training aspects as part of the USOAP CMA Protocol Questions (PQs). The MG requested ICAO to review the PQs in this regard. See ACTION A05-2018 as shown at Annex 4 of this report.

5.1.3.7 Lastly, the MG was informed that one of the ET-ETC co-chairs (Mr Webster) was also a member of the Executive Council Panel of Experts on Education and Training (EC Panel on ETR) and that the Panel was currently addressing the establishment of a WMO Global Campus[3] designed to assist WMO Regional Training Centres (RTCs) and WMO affiliated Training Institutions work together more collaboratively to help meet the growing range and depth of education and training demands of WMO Members. In this connection the MG expressed that the establishment of the WMO Global Campus would be of significant benefit for the aeronautical meteorology community.

5.1.4 Expert Team on Governance (ET-GOV) (Doc. 5.1(4))

5.1.4.1 Mr Jan Sondij and Mr Kent Johnson presented a report on the key tasks and activities of the Expert Team on Governance (ET-GOV).

5.1.4.2 The MG was informed that ET-GOV had made progress in several areas since the last MG meeting, most notably the conducting of and reporting on the 2016/17 CAeM global survey on aeronautical meteorological service provision, but that progress in a number of other areas was comparatively slower. For example, the CAeM-15 session, held conjointly with the ICAO Meteorology Divisional Meeting in 2014, had established objectives with joint responsibility between WMO and ICAO. For some of these it was expected that the leadership would originate from the ICAO METP. Corresponding development had been slower than expected.

5.1.4.3 The MG accepted ET-GOV's view that issues in its work programme such as oversight and cost-recovery were very complex and that, moreover, in some cases it was challenging or even impossible to obtain accurate information on the status of implementation at the national or regional level, even from countries that had responded to the global survey. In other instances, certain governance issues were being pushed to WMO yet the organization may have neither the authority nor the expertise to resolve them.

5.1.4.4 The MG was informed that regionalization was another sensitive, complex subject. While some WMO Members and industry/user representative bodies had clearly defined a client-based need for regionalization, this need was considered to be rather less clear-cut from a broader WMO perspective. ET-GOV argued, for example, that a majority of WMO Members may not favour regionalization in view of their desire or need to sustain national interests. In view of this, ET-GOV questioned the role of WMO in the regional hazardous weather advisory centre concept currently being developed by the ICAO METP/WG-MISD. Notwithstanding these remarks, the MG did appreciate that best practice examples of regionalization/regional cooperation in aeronautical meteorological service provision were already in place or were

[3] Meteoworld November 2014 article available here and Frequently Asked Questions article available here.

emerging from which, potentially, to draw inspiration – the Northern European Aviation Meteorology Consortium (NAMCON) in WMO RA VI (Europe) was cited along with other known examples.

5.1.4.5 In respect of the global landscape of aeronautical meteorological service provision, the MG was very pleased that ET-GOV had finalized and published a final report (available here) on the outcomes of the 2016/17 CAeM global survey on aeronautical meteorological service provision. The survey had been conducted by ET-GOV between November 2016 and February 2017 with the primary objective of establishing a comprehensive, consolidated global view on the existing institutional arrangements for the provision of meteorological services to international air navigation, particularly at a national level, taking into account the supporting ICAO and WMO regulatory frameworks.

5.1.4.6 The MG deeply appreciated a very successful response rate to the survey, where 92% of WMO Members had responded. The exceptionally high response rate had been realized through an excellent coordination between ET-GOV and ET-CCP at the preparatory stage and during the conducting of the survey and, for the first time in many years, a consolidated picture of the global AMSPs was available covering the regulatory, institutional, organizational and technical landscape for MWO, AMO and AMS functions. The MG also appreciated the intensive analytical assessment undertaken by ET-GOV that had resulted in a comprehensive final report. In this connection, the MG was given an informal briefing by the ET-GOV co-chairs on those WMO Members that had not responded to the survey or that had responded to the survey and elaborated their responses with supplementary information on the status of implementation (at the national level) or that had requested assistance. In respect of those WMO Members that had not responded to the survey, the MG recognized that complex arrangements or other challenging circumstances often prevail at the national level that inhibit a response. In respect of the supplementary information that had been supplied by some WMO Members, the MG appreciated that it could be used by WMO to help identify where capacity building efforts could be targeted.

5.1.4.7 In concluding its consideration of the 2016/17 CAeM global survey, the MG requested ET-GOV in coordination with ET-CCP to:

a) Develop a communication strategy and supporting materials (e.g. reports, presentations and graphics such as coloured maps showing implementation status of Members) on the global and region-specific outcomes of the survey for use at CAeM-16 session, other WMO and ICAO meetings or other events; and
b) Develop an overview of the methodologies and techniques used to communicate and collect feedback on the survey that led to such a high response rate (92%) for future use by the MG or other interested parties.

See ACTION A06-2018 and ACTION A07-2018 respectively as shown at Annex 4 of this report.

5.1.5 Expert Team on Information and Services for Aviation (ET-ISA) (Doc. 5.1(5) and Presentation)

5.1.5.1 Ms Stéphanie Desbios and Mr Jun Ryuzaki presented a report on the key tasks and activities of the Expert Team on Information and Service for Aviation (ET-ISA).

5.1.5.2 The MG was informed that the members of ET-ISA had continuously provided their active contribution to the ICAO METP WGs and other relevant bodies regarding the development of future requirements, concepts and services and associated documentation. In this connection, the MG noted that Ms Desbios (ET-ISA co-chair), serving as one of three designated experts within the METP and gathering inputs from the members of ET-ISA, had contributed to the work of an ICAO ASBU Panel Project Team addressing a revision to the ASBU modules regarding advanced meteorological services (A-MET) modules to be included in the ICAO GANP 2019 version. Work for the development of A-MET modules in ASBU Block 2 would continue in early 2018. In addition, ET-ISA members had been involved in the METP WGs to develop concepts of operation (ConOps) for enhanced aeronautical meteorological

services and the relevant documentation, i.e. WAFS, space weather information service, regional hazardous weather advisory centres, and the release of radioactive material. The MG also appreciated that Mr Ryuzaki (ET-ISA co-chair) had led work within WG-MISD to develop guidance for the improvement of SIGMET harmonization, which would be included in the *Manual on Aeronautical Meteorological Practices* (ICAO Doc 8896).

5.1.5.3 As highlighted previously (5.1.1 above), the MG appreciated that AeroMetSci-2017 had been successfully held in Toulouse in November 2017, hosted by Météo-France with their excellent services and hospitality. The conference had been attended by more than 200 participants from various experts around the world, including atmospheric research institutes, meteorological service providers, airlines, pilots and the other aviation representatives. The MG noted that ET-ISA co-chairs had been involved in the organizing committee, scientific committee and also in the event itself as 'master of ceremonies' or as a session co-chair and panel moderator. The MG appreciated that the conference had concluded with a series of recommendations which would guide the direction of scientific research activities for the next 15 years to meet the needs of the global aviation industry and to address issues related to climate change.

5.1.5.4 In the context of other activities in support of the ET-ISA work programme, the MG was informed that the team had continued to gather information on meteorological progress within large air traffic management (ATM) modernization projects, e.g. NextGen (USA), SESAR (Europe), CARATS (Japan) and CMATS (Australia), for further understanding on how meteorological information will be utilized in the future ATM environment. Acknowledging ET-ISA Activity B1.1 (linked also with Activity A3.2), the MG expressed a strong desire to see the corresponding repository of information established and populated as soon as possible, complemented by information on any known national initiatives where available.

5.1.5.5 The MG was further informed that ET-ISA had contributed to both global and regional discussions for the facilitation of information exchange under SWIM, mainly through one ET-ISA co-chair (Ms Desbios) and a core member (Mr Bart Nicolai), including the publication of two CAeM Newsletter articles and the development of the short guiding text on the distinction between meteorological 'products', 'data' and 'information'.

5.1.5.6 With regard to performance metrics and validation methodologies for new or enhanced meteorological information and services (ET-ISA Work Package C), the MG was informed that this work had made little progress due to heavy workload associated with AeroMetSci-2017 but that ET-ISA had agreed with ET-ASC to jointly prepare a paper on this topic for future distribution. As with the remarks at 5.1.5.4, the MG expressed a strong desire to see progress made in this area as soon as possible with a view to ensuring that there would be inputs to the CAeM-16 session in July 2018. The MG recommended that the material developed should be kept at a high/strategic level at this time to ensure that a degree of progress can be made in the limited time available.

5.1.5.7 During the course of its consideration of the ET-ISA report, the MG acknowledged the many interfaces and, in some instances, overlaps between the work of ET-ISA and the work of the METP, particularly WG-MISD, and that many of the same experts were involved on both sides – WMO and ICAO – working on the same or very similar issues. The MG afforded lengthy discussions on this issue and appreciated that it was not unique to just ET-ISA and WG-MISD and that there was also interface and overlap, for example, between ET-GOV (WMO) and WG-MCRGG (ICAO). The MG emphasized that it was important for both organizations to make more effective and more efficient use of the limited resources available going forwards – notably the community of expertise (often also referred to as the 'voluntary workforce') – and appreciated that the ongoing review/update of the ICAO and WMO working arrangements, the outcomes of the WMO-ICAO bilateral meeting (4.3.5 above refers) and WMO reform offered opportunities to make progress in this connection. The MG appreciated that these considerations would be revisited under agenda item 6, notably 6.6 and 6.7.

5.2 Volcanic ash-related activities (Doc 5.2)

5.2.1 Fifth WMO Volcanic Ash Advisory Centre Best Practices Workshop (VAAC BP/5)

5.2.1.1 The MG was apprised that the 5th WMO Volcanic Ash Advisory Centre Best Practices Workshop (VAAC BP/5) had been held at the Japan Meteorological Agency (JMA) in Tokyo, Japan from 7 to 9 June 2017. The MG was pleased to note that representatives from all nine VAACs had participated in the meeting and that discussions had been held on the following key topics:

- VAAC collaboration tools and IWXXM/XML developments;
- Volcano monitoring and observing issues;
- Key performance indicators;
- VAA/VAG consistency;
- Supplementary volcanic ash products; and
- An update on volcanic ash impacts on jet engines.

5.2.1.2 The MG appreciated that a majority of the fifteen outcomes of VAAC BP/5 had served as direct inputs to ICAO METP working group meetings that had immediately followed the workshop[4]. The MG was informed that the report on the VAAC BP/5 workshop was available online (here).

5.2.1.3 In the context of volcanic ash impacts on jet engines issue, the MG was updated by Mr Lisk that Rolls-Royce had, in May 2017, published engine tolerance data which, it was considered, may encourage other original equipment manufacturers to do likewise. Such developments, if corroborated and brought into the ICAO arena through organizations such as ICCAIA[5], were likely to lead to formal requirements for quantitative volcanic ash information from the VAACs.

5.2.2 Seventh WMO-IUGG Volcanic Ash Scientific Advisory Group (VASAG/7)

5.2.2.1 The MG noted that the 7th WMO-IUGG Volcanic Ash Scientific Advisory Group (VASAG/7) had been held at the Cascades Volcano Observatory in Vancouver WA, United States of America from 21 to 23 August 2017. The MG was pleased to note that most of the VASAG members had attended the meeting in person and that a few members who had been unable to attend in person had instead joined the meeting periodically via teleconference.

5.2.2.2 The MG was informed that the VASAG had held discussions on the following key topics, several of which were in direct response to outcomes of the ICAO METP WG-MOG (IAVW) and WG-MISD (VASD) meetings held in June 2017:

- Eruption source term characterization;
- Remote sensing;
- Quantitative volcanic ash contamination information and long-range forecasts;
- Aviation colour code and Volcano Observatory Notice for Aviation (VONA);
- Aircraft encounters (with volcanic ash) database;
- Sulphur dioxide and other toxic gases;
- Other IAVW-relevant scientific developments; and
- Future events including the next International Workshop on Volcanic Ash (IWVA).

5.2.2.3 The MG was apprised that the VASAG/7 had formulated a total of eight agreed actions and that the report of the meeting was available online (here).

[4] Working Group on Meteorological Operations Groups (IAVW work stream) (WG-MOG (IAVW)) and Working Group on Meteorological Information and Service Development (Volcanic Sulphur Dioxide work stream) (WG-MISD (VASD)) held from 12 to 14 June 2017 at JMA in Tokyo.

[5] International Coordinating Council of Aerospace Industries Associations (ICCAIA).

5.2.2.4 In the context of remote sensing and in response to a query by Ms Caesar concerning the rapid advancement of satellite capabilities, Mr Lisk confirmed that the advances (such as through the launches of Himawari-8 and GOES-16) were, overall, a significantly positive development but that it was also creating new challenges. On the one hand the significant advances in spatial and temporal resolution and multi-spectral capabilities were enabling the VAACs to detect 'more' ash (particularly finer ash plumes), often for longer periods of time than previously had been possible. But, on the other hand, seeing more ash for longer was leading to an increase in the operational workload of the VAACs and potential downstream implications on end-users due to more volcanic ash advisories being issued.

5.2.3 Planning for a conjoint VAAC BP workshop and VASAG meeting

5.2.3.1 The MG was informed that VAAC BP/5 and VASAG/7 had both highlighted that it would be mutually beneficial for the two communities (volcanic ash science and VAAC operations) to convene simultaneously at a future point in time, possibly in 2018, particularly in recognition of the recent and upcoming advances in science and technology (e.g. Himawari-8, GOES-16 and future Meteosat Third Generation) that are of direct relevance to the operations of all nine VAACs.

5.2.3.2 The MG was pleased to note that the New Zealand MetService had offered to host a volcanic ash meeting in 2018 in Wellington and that planning was now under way to organize a conjoint event during week commencing 5 November 2018. To maximize use of resources, ICAO was expected to conduct its next METP WG-MOG (IAVW) and WG-MISD (VASD) meetings during the immediately following week (12 November 2018) also in Wellington.

5.2.4 Planning for the 8th WMO International Workshop on Volcanic Ash

5.2.4.1 The MG noted that international workshops on volcanic ash (IWVA) had been held every few years to foster scientific and technological advancement in volcanic ash-related issues of importance to aviation. The MG was apprised that the three most recent IWVA convened by WMO in collaboration with ICAO had been in 2010 (Santiago, Chile), 2013 (Citeko, Indonesia) and 2015 (Anchorage AK, USA).

5.2.4.2 The MG was informed that the VASAG/7 meeting in August 2017 had considered the need for and timing of a future IWVA and had concluded that there was a sufficiently strong justification for convening an IWVA/8 in the 2019 timeframe in view of the breadth of the continuing work being done by the meteorological and volcanological communities in support of the IAVW and acknowledging the strategic direction and evolving needs of aviation as conveyed in ICAO's GANP. In addition, it was noted that AeroMetSci-2017 had intentionally *not* dedicated a significant amount of attention on volcanic ash issues in view of the scope and frequency of the IWVA events.

5.2.4.3 The MG was apprised that, as a consequence of the foregoing, the VASAG had commenced the process of developing a concept note for IWVA/8 and the identification of a suitable hosting venue for an event in/around mid-2019.

5.3 Space weather-related activities (Doc 5.3)

5.3.1 CBS/CAeM Inter-Programme Team on Space Weather Information, Systems and Services (IPT-SWeISS)

5.3.1.1 The MG recalled that Decision 33 (EC-68, 2016) had approved terms of reference of a CBS/CAeM Inter-Programme Team on Space Weather Information, Systems and Services (IPT-SWeISS) with the objective of coordinating space weather activities within WMO Programmes, to maintain linkage with constituent bodies and their relevant subsidiary groups, to main linkage with partner organizations, and to provide guidance to WMO Members. The MG was informed that, preceding EC-68, the CBS Management Group at its meeting in February 2016 had assigned the responsibility of the IPT-SWeISS to the Open Programme Area Group on Data-Processing and Forecasting Systems (OPAG-DPFS).

5.3.1.2 The MG was informed that IPT-SWeISS had convened its first face-to-face meeting in June 2017 and that the IPT had established the following four task teams (each comprising members of the IPT):

- TT-SCI: Task Team on Science;
- TT-SYS: Task Team on Systems;
- TT-APP: Task Team in Applications; and
- TT-AVI: Task Team on Aviation (ad hoc).

5.3.1.3 The MG was informed that, in view of the joint-commission nature of IPT-SWeISS, the team was co-chaired by one CBS representative and one CAeM representative – respectively Mr Robert (Bob) Rutledge of the United States of America and Mr Xiaoxin Zhang of China.

5.3.2 IPT-SWeISS ad hoc Task Team on Aviation (TT-AVI)

5.3.2.1 The MG was pleased to note that an ad hoc Task Team on Aviation (TT-AVI) had been established by IPT-SWeISS and that it had been tasked, inter alia, to facilitate the establishment and maintenance, by ICAO in coordination with WMO, of an operational global space weather information service for international air navigation. The composition of TT-AVI had been finalized in July (six core members plus ICAO) prior to the commencement of its activities in August 2017. The MG was informed that Daniele Biron of Italy was serving as the TT-AVI team leader.

5.3.2.2 The MG was apprised that TT-AVI had led the development of suitable audit procedures and reporting templates as well as a working methodology and schedule for the conducting of site assessments and audits of prospective space weather information providers (see 5.3.3 below). The MG was pleased to note that TT-AVI had undertaken this work in consultation with the CBS OPAG on Information Systems and Services (OPAG-ISS) Expert Team on Centre Audit/Certification (ET-CAC) and that advice had also been sought from several experts of the (former) CAeM Task Team on Quality Management Systems (TT-QMS).

5.3.3 Site assessments and audits of prospective space weather information providers

5.3.3.1 The MG was apprised that, stemming from the ICAO METP/2 meeting in October 2016 and subsequently endorsed by the ICAO Air Navigation Commission, WMO had been requested to undertake the site assessment and audit of prospective space weather information providers in the October 2017 to February 2018 timeframe with a view to assisting ICAO in its designation of provider States not later than July 2018.

5.3.3.2 The MG was informed that on 23 October 2017, following an ICAO State consultation phase from June to September 2017, WMO was officially notified by ICAO that a total of twenty-two (22) States had expressed an interest in becoming a prospective space weather information provider; however, of these, only ten (10) actual site assessments and audits were to be expected – comprising nine States plus one European consortium of nine States (known as PECASUS[6]). ICAO notified that the remaining four States should not be audited at this time.

5.3.3.3 The MG appreciated that since receiving this official notification from ICAO, TT-AVI in coordination with ET-CAC had been actively pursuing all of the arrangements associated with conducting the site assessments and audits and that, at time of writing, site assessments and audits were scheduled to take place as follows:

[6] Pan-European Consortium for Aviation Space Weather User Services (PECASUS) comprising Austria, Belgium, Cyprus, Germany, Finland (as lead), Italy, the Netherlands, Poland and the United Kingdom.

State/Consortium	***Date***
Australia	21-22 February 2018
Brazil	*Unconfirmed*
Canada	27-28 February 2018
China	29-30 January 2018
France	15-16 February 2018
Japan	1-2 February 2018
Russian Federation	19-20 February 2018
South Africa	24-25 January 2018
United States of America	*Unconfirmed*
PECASUS	12-14 and 16 February 2018

5.3.3.4 The MG noted that by the end of February 2018 WMO expected to have completed all of the site assessments and audits and, moreover, that by the end of March 2018 a report on the audit findings was expected to have been submitted by WMO to ICAO. The MG was informed that, upon receipt of the WMO report, ICAO was then expected to take the information into consideration during its (ICAO's) designation of space weather information providers by July 2018 in advance of the anticipated applicability of the ICAO Annex 3 provisions for space weather in November 2018.

5.3.3.5 The MG was informed that attempts were being made to resolve outstanding issues with respect to prospective audits in Brazil and the United States of America with a view to ensuring that all audits could be completed according to the prescribed schedule defined by ICAO.

5.3.3.6 In response to a question by Mr Webster concerning the practicalities of the audits, the MG was informed that it was simply impossible to have one audit team (two experts) conducting up to 10 audits and therefore the decision had been taken by WMO at an early stage to assign multiple teams of two experts (from the composition of TT-AVI and ET-CAC) to undertake a maximum of one or two audits each. Concerning the consistency of the audits, guiding materials developed by TT-AVI in consultation with ET-CAC, as well as regular interactions amongst the experts and a standard reporting template were intended to achieve a high level of consistency. Furthermore, no expert would be involved in the conducting of an audit in their home organization, country or WMO region, to engender impartiality.

5.3.4 Future activities

5.3.4.1 The MG was apprised that the site assessment and audit activities outlined above formed just a subset of all the activities currently being pursued by IPT-SWeISS and its four task teams. For example, in the context of TT-AVI, other activities included providing assistance to ICAO in the development of space weather-related guidance material and other capacity development/outreach necessary to support implementation.

5.3.4.2 The MG noted that IPT-SWeISS was addressing other issues that included radio frequency coordination for space weather observations, space weather in the WIGOS Vision 2040 and the updating of a baseline Statement of Guidance for space weather observations.

5.3.4.3 The MG was informed that the second face-to-face meeting of IPT-SWeISS was scheduled for 21 to 23 May 2018 at the National Institute of Information and Communications Technology (NICT) in Tokyo, Japan where progress on these and other relevant topics would be addressed.

6. CAeM-16 SESSION (2018) AND FUTURE WORK PROGRAMME (Doc. 6 and Attachment 1)

6.1 Arrangements for the session

6.1.1 The MG noted that the sixteenth session of the CAeM (CAeM-16) was expected to take place during the week commencing 23 July 2018, including a one-day Technical Conference (TECO). The MG was informed by Mr Lisk that the Permanent Representative of the United Kingdom to WMO had recently notified the Secretary-General of an offer to host the session at the University of Exeter and that, if accepted, the Met Office would oversee all of the logistical arrangements for the session in coordination with the university and WMO.

6.1.2 The MG appreciated that there was a considerable amount of work required over the coming 6 months to prepare for the session and that, owing to the overdue determination of a host/venue, there was an urgent need to notify WMO Members and to finalize the agenda for the session and the theme/concept for the TECO (see 6.2 and 6.3 below).

6.1.3 In respect of the running order for the week, the MG recalled discussions at its last meeting in November 2016 where it was intended to arrange the CAeM-16 and TECO as follows:

Week commencing 23 July 2018							
	Sun	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**
Morning		TECO	CAeM-16	CAeM-16	CAeM-16	CAeM-16	
Afternoon		TECO	CAeM-16	CAeM-16	CAeM-16	CAeM-MG*	

* The convening of a CAeM Management Group meeting will likely take place on the Friday afternoon (subject to the conclusion of the CAeM-16 session on the Friday morning) *or* on the Saturday morning (subject to the conclusion of the CAeM-16 session on the Friday afternoon).

6.1.4 The MG recalled that in response to Action A12-2016 of the last meeting, an organizing committee (OC) comprising the MG members, Secretariat and others as necessary had been established to oversee and assist with all the necessary arrangements, including logistics and outreach, up to and including the conducting of the events. The MG noted that due to prevailing commitments it had so far only been possible to convene one teleconference of the OC (in March 2017). Notwithstanding, the MG acknowledged that the OC was still valid and that further teleconferences would be required in 2018.

6.1.5 The MG was informed that to comply with WMO-No. 15, Basic Documents No. 1, General Regulation 189 which required documents for a session to be dispatched as soon as possible and preferably not later than 45 days prior to the opening of the session, there was an expectation that all documents (except for information papers) should be available for translation 90 days prior. The MG undertook a review of key milestones in preparing for the session.

6.2 Provisional agenda for the session and expected outcomes

6.2.1 The MG was apprised that, in accordance with Regulation 191 of the General Regulations, the provisional agenda for an ordinary session of a commission was to be prepared by the president of the commission in consultation with the Secretary-General. In this connection, the MG reviewed a list of items normally included in an agenda for an ordinary session (Annex to Doc. 6), based on Regulation 191, and proposed that it be used as a baseline for the development of a draft provisional agenda for CAeM-16.

6.2.2 In considering the development of a draft provisional agenda for CAeM-16, the MG additionally considered the following relevant issues:

- How to handle the evolution of meteorological support to aviation in the context of the work of other technical commissions addressing integrated observing systems, seamless data-processing and forecasting systems, and information exchange systems;
- How to enable a review of technical regulations and other WMO publications addressing aeronautical meteorology, such as WMO-No. 49, Technical Regulations, Volume II, with a view to eliminating known duplications or inconsistencies;
- How to address collaborative arrangements with ICAO, IATA and others concerned;
- How to handle the development of a long-term plan for the AeMP in the context of WMO's strategic and operating plans as well as the evolution of ICAO's Global Air Navigation Plan (GANP);
- How to accommodate a report on the outcomes of the TECO as well as the outcomes of the 2016/17 CAeM global survey on aeronautical meteorological service provision; and
- How to address potential future changes in WMO constituent body structures.

6.2.3 Having concluded a discussion on the foregoing, the MG requested the Secretariat, in coordination with the president and vice-president of CAeM, to urgently prepare a draft provisional agenda for the CAeM-16 session for eventual approval by the president and inclusion in the invitation letter. See ACTION A08-2018 as shown at Annex 4 of this report. The MG appreciated that the CAeM-16/TECO organizing committee (OC) could be consulted in this regard if required.

6.2.4 In the context of potential invitees to the CAeM-16 session (other than WMO Members), the MG was informed that General Regulation 189 enables an invitation to attend as an observer to be extended to international organizations with which the Organization has concluded arrangements or agreements and, in conformity with the provisions of Regulations 19 and 20, to other persons. In the context of the upcoming discussion on the TECO (see 6.3 below), the MG appreciated that, owing to the TECO's non-intergovernmental status, there was, relative to the CAeM-16 session, more flexibility in terms of which organizations or other entities could be invited to attend and present.

6.3 Arrangements for the Technical Conference (TECO)

6.3.1 In addition to consideration of the provisional agenda for the CAeM-16 session (see 6.2 above), the MG acknowledged that there was also an urgent need to consider arrangements for the one-day TECO, in particular its theme and overall concept.

6.3.2 The MG recalled that the theme of the last TECO in July 2014, held back-to-back with CAeM-15 and the ICAO Meteorology Divisional Meeting, had been 'Building Blocks for the Future' as an acknowledgement of the introduction, by ICAO, of the ASBU methodology in the GANP and the key enabling role to be played by the aeronautical meteorology community in supporting the air transport modernization objectives described therein over the coming 15 years and beyond.

6.3.3 The MG discussed the expected outcomes of the 2018 TECO. In this regard and as with the last TECO held in 2014, the MG considered that the objective of the upcoming TECO was, in particular, to raise the overall level of awareness of WMO Members to a select (ideally small) number of critical issues already facing AMSPs or foreseen to arise over the coming years, to encourage information sharing on these issues, and to evoke (or even provoke) a reaction from the community heading in to the CAeM-16 session.

6.3.4 In respect of evocative (or even provocative) thematic ideas for the TECO, the MG considered the following suggestions (in no particular order):

- Progress with and implications of large-scale MET-ATM modernization programmes on traditional business models;
- The emergence of new use cases for meteorological information such as its integration into electronic flight bags (EFBs) and implications on service provision;
- Implementation of SWIM, IWXXM and web services;

- Expansion in availability and use of aircraft-based observations, and associated governance policies;
- Scientific developments and future direction, taking into account outcomes of AeroMetSci-2017;
- Climate change and variability impacts on aviation – recent developments and future path;
- Future role and responsibility of aeronautical meteorological forecasters (AMF) given trends towards automation, machine-to-machine service provision and other factors, and the adaptation that may be required of personnel competency frameworks; and
- Future service structures and service delivery mechanisms – centralization and regionalization, requirements for global and regional MET centres, enhanced public-private partnerships/engagement, regional/sub-regional cost recovery schemes, supplier-consumer (provider-user) interactions, scientific and technological advancement, etc..

6.3.5 The MG agreed that it would be desirable to attempt to address some of the foregoing thematic ideas within the following general construct:

- *Historical context* – outlining how far aeronautical meteorology has come over past years/decades, where it is 'today' and where it is foreseen to need to be 'tomorrow';
- *Users' perspective* – ensuring that users' current and foreseen capabilities, needs and expectations are conveyed to the aeronautical meteorology community, thereby encouraging provider-user/supplier-consumer awareness and alignment; and
- *Innovation showcase* – providing an outlet for public and private enterprise to showcase existing and emerging use-cases in aeronautical meteorology, thereby helping to inform the community of what is already possible and what may be possible in the future.

6.3.6 The MG appreciated that any of the thematic ideas indicated in 6.3.4 not forming part of the TECO could, alternatively/potentially, be addressed by way of side-events during the CAeM-16 session – e.g. lunchtime briefings – to help raise WMO Members' awareness on certain topics.

6.3.7 Having completed its consideration of the thematic ideas and general construct for the 2018 TECO, the MG requested Mr Johnson and Mr Strahan (ET-GOV and ET-ASC co-chairs respectively) to lead, with the assistance of the Secretariat and in coordination with the CAeM-16/TECO OC, the urgent development of a TECO concept note for eventual inclusion in the invitation letter. See ACTION A09-2018 as shown at Annex 4 of this report.

6.4 CAeM Operating Plan: 2016-2019 update and 2020-2023 preparation

6.4.1 The MG recalled that during its last meeting in November 2016 it had considered the development of a CAeM Operating Plan (OP) for 2016-2019 taking into account the work plans of the various CAeM Expert Teams (ETs). The MG had, at the time, proposed that ET-GOV should remain in charge of overall coordination of this effort across the ETs (Action A10-2016 of the last meeting refers). In this connection, the MG was informed that there had been no progress owing to prevailing commitments of the ETs, including ET-GOV, and prevailing uncertainty about the advancement of technical commission operating plans in general.

6.4.2 Despite the lack of progress in formulating a CAeM OP for 2016-2019, the MG noted that, since the last MG meeting, all of the CAeM ET work plans had been uploaded to the AeMP website – refer to ET-ASC, ET-CCP, ET-ETC, ET-GOV and ET-ISA (under 'Work Programme' tab on each webpage) – and that these were maintained by the Secretariat taking into account the outcomes of the periodic ET meetings. The MG felt that the availability of these up-to-date work plans, complemented by the availability of final reports of meetings/events (available here), was a clear demonstration of the work of the Commission.

6.4.3 In respect of the preparation of a CAeM OP for 2020-2023, the MG was informed that an Executive Council Working Group on Strategic and Operational Planning (EC WG-SOP) was still working on the construct of a new WMO Strategic Plan (SP) for 2020-2023 which would be

a starting point for the operational planning of all WMO constituent bodies, including the CAeM. The MG was apprised that it was expected that a mature draft of the WMO SP/OP would be submitted to the next meeting of the EC WG-SOP (11 to 13 April 2018) and, subsequently, to the EC-70 session (20 to 29 June 2018). The MG noted that the draft agreed by EC-70 would be further refined through inputs and feedback from WMO Members in order to have a final draft for the time of submission of the Cg-18 documents in Q1 2019.

6.4.4 Acknowledging that this was a 'work in progress', the MG was informed of the already agreed general structure of the WMO SP for 2020-2023 (Attachment 1 to Doc. 6 refers), where the Plan was structured around five Long-Term Goals (LTG) with several Strategic Objectives (SO) assigned to each LTG. The MG noted that the main sector-oriented service activities were included under LTG 1, Better serve societal needs ("*Delivering, authoritative, accessible, user-oriented and fit-for-purpose information and services"*) while the respective AEM-related strategic objective was SO 1.4, Weather-integrated decision-making (*"Enhance and innovate the provision of value-added decision-supporting information and services for weather- and climate-sensitive economic and social activities").*

6.4.5 The MG remarked that aeronautical meteorology/aeronautical meteorological service provision may also feature in or be directly influenced by activities under other LTGs and SOs within the already agreed general structure of the WMO SP for 2020-2023, such as LTG 3, Advance targeted research, and SO 3.2, Improve predictive capabilities ("*Enhance the science to service value chain ensuring scientific and technological advances improve predictive capabilities*").

6.4.6 The MG was informed that the WMO OP for 2020-2023 that would ensure the achievement of the LTGs and SOs was, much like the aforementioned SP, still an EC WG-SOP 'work in progress' in all its components in view of developing a fully integrated, organization-wide OP aligned with the SP. The MG appreciated that the CAeM-related inputs to the WMO OP for 2020-2023 – in terms of concrete priority tasks, related objectives and KPIs – would therefore only be possible once the final structures/content of the SP and OP were known. The MG therefore accepted that, at present, it was not possible to prepare the CAeM component of the next WMO OP (i.e. a CAeM OP for 2020-2023) but that inputs could be provided, through correspondence if necessary, once the final outcomes of the EC WG-SOP deliberations were known and communicated.

6.5 Long-term Plan for the AeMP (2019-2033) (INF. 1)

6.5.1 In addition to consideration of the CAeM Operating Plan (6.4 above), the MG further considered the development of a long-term plan for the Aeronautical Meteorology Programme (LTP-AeMP). The MG recalled that this matter had been discussed at the last MG meeting and was pleased to note that an introduction and template with basic content had been developed by the Secretariat as follow-up to Action A09-2016. (INF. 1) The MG appreciated however that in view of other significant prevailing commitments it had not been possible to make significant recent progress in terms of the maturation of a draft long-term plan. The MG considered practical ways in which a LTP-AeMP template could be matured taking into account the outcomes of the EC-69 Special Dialogue on the Future of Aeronautical Meteorological Services (see 4.1 above) and AeroMetSci-2017 (see 4.2 above).

6.5.2 Noting the LTP-AeMP introduction and template with basic content developed by the Secretariat, the MG was of the view that much effort was still required before LTP-AeMP would be sufficiently mature for consideration by CAeM, Executive Council and/or Congress in the 2018 to 2019 timeframe. Moreover, the MG questioned whether the current draft structure, which had taken inspiration from the GANP of ICAO in order to have a degree of consistency and continuity, was too extensive for CAeM/AeMP purposes. The MG proposed a re-evaluation of the entire proposed structure of the long-term plan as well as a strategy that would ensure its maintenance (owing to the fact that the LTP would be a 'living document', under constant review and periodic update). In addition, the MG recognized that the WMO SP and OP for 2020-2023 (6.4 above refers) as well as a foreseen major update to the ICAO GANP (2019-2033), both of which were currently a 'work in progress', would be significant influencing

factors on the scope and content of the LTP-AeMP for the 2019 to 2033 period. The MG also remarked that the LTP-AeMP should not only address prospective advances in meteorological science over the coming 15 years and beyond but also technological advances.

6.5.3 To progress, the MG requested the Secretariat, in coordination with the MG, to urgently prepare a 'strawman' (initial draft for discussion) and a strategy for the development and maintenance respectively of the LTP-AeMP for 2019-2033. See ACTION A10-2018 as shown at Annex 4 of this report. The MG recalled from 6.2.2 that the handling of the long-term plan should be a consideration of the CAeM-16 session in July 2018.

6.6 Restructuring of technical commissions – status of discussions

6.6.1 The MG was reminded that the Seventeenth World Meteorological Congress (Cg-17) in 2015 had requested the Executive Council to:

- Provide recommendations to the Eighteenth Congress on constituent body constructs, as appropriate, including possible new structures for technical commissions, regional associations and the Executive Council;
- To provide recommendations on rules, procedures, processes, working mechanisms, and duties of constituent bodies, WMO Officers (President and Vice-Presidents) and the relationship between them and the WMO Secretariat; and
- To enhance the efficiency and effectiveness of the Organization and of good governance.

6.6.2 In this connection, the MG was informed that the Executive Council had followed the directions of Cg-17 and tasked an EC Working Group on Strategic and Operational Planning (EC WG-SOP) "*to prepare separate recommendations pertaining to each of the structures: the Executive Council, the technical commissions and the regional associations, including terms of reference of proposed bodies, step-by-step transition schedules and other relevant details explaining in particular inter-relations between various bodies in a holistic manner*" (Decision 68 (EC-69) refers).

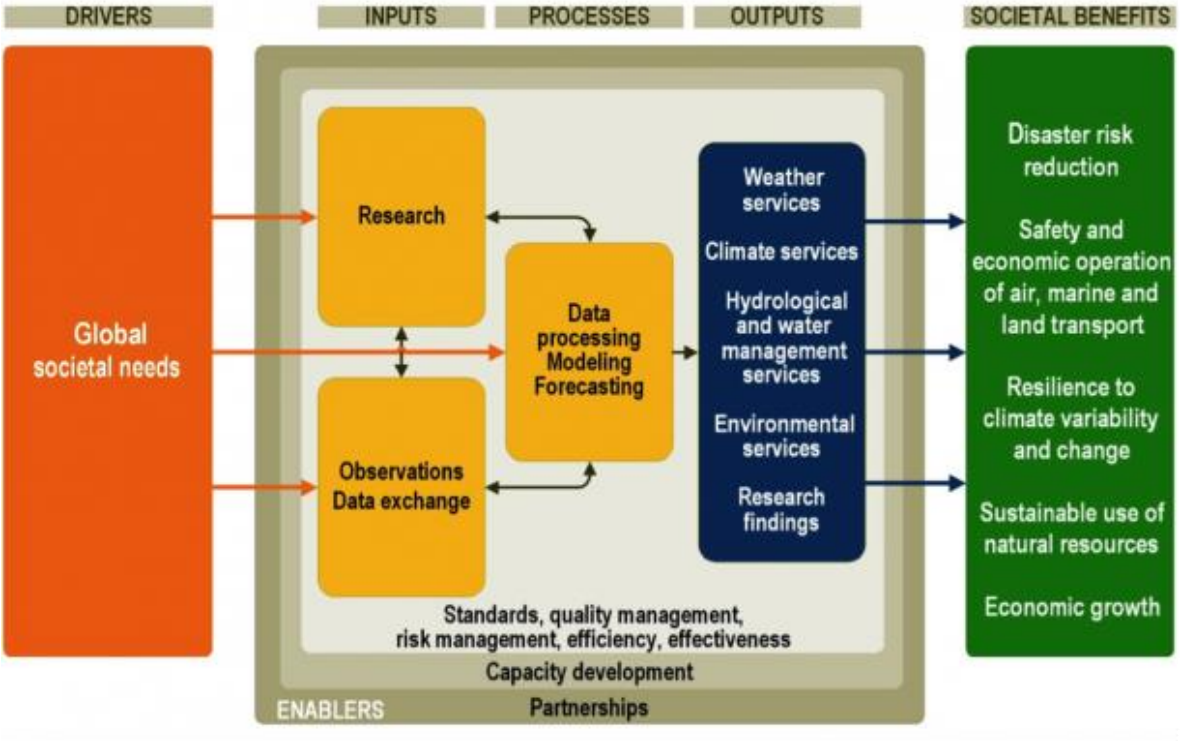
6.6.3 The MG noted that EC WG-SOP had met twice in 2017 and the constituent body reform was one of the main agenda item of both meetings. The rationale of the reform and the related process was provided in detail in document EC-69/INF. 16.3. The PRA/PTC-2018 meeting held from 17 to 19 January 2018 had continued this discussion. The MG appreciated the active participation of the president of CAeM in this discussion process.

6.6.4 The MG was informed that the next steps in the reform process included an EC WG-SOP meeting in April 2018 and, finally, the EC-70 session (20-29 June 2018), where a mature reform proposal should be endorsed for submission to Cg-18 in June 2019.

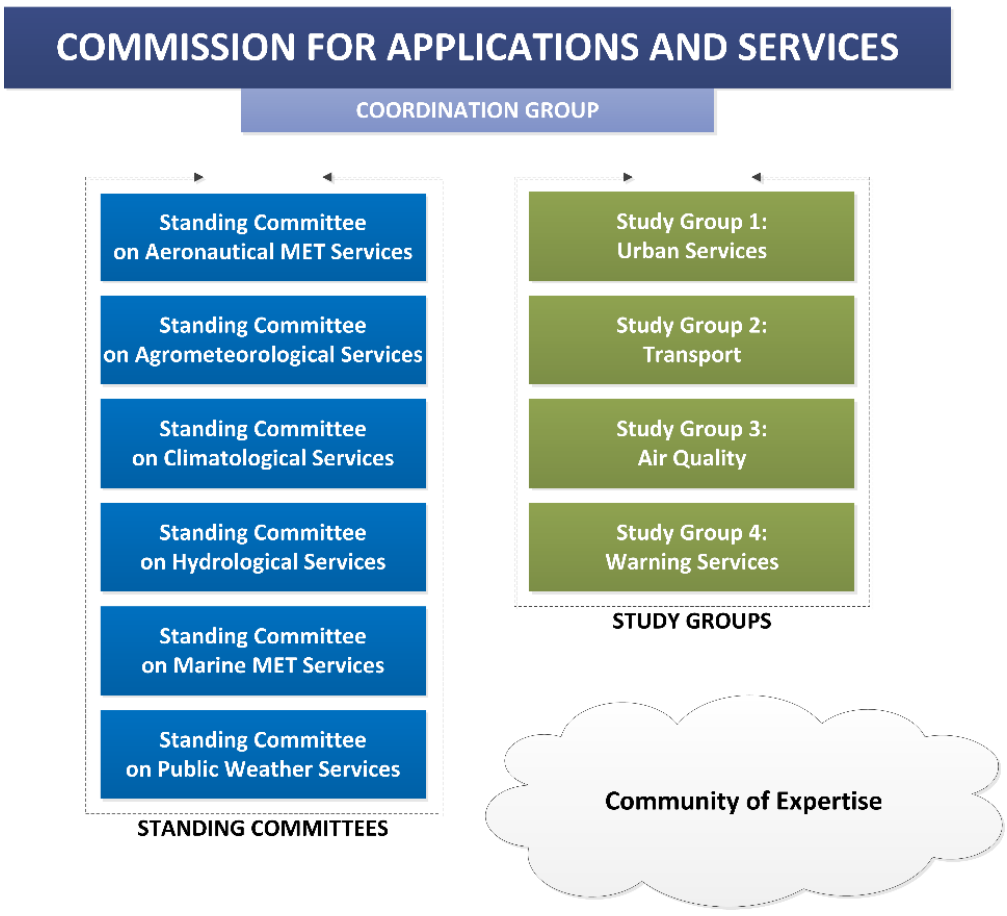
6.6.5 The MG noted that, currently, there was a general agreement in the technical commission (TC) part of the reform discussion about the need for consolidation of some of the existing TCs to streamline processes and gain efficiency, and that there were converging views for establishing two main TCs, as follows (working titles):

- Commission for Infrastructure and Information Management (CIIM); and
- Commission for Applications and Services (CAS).

The MG was apprised that this proposal was based on a so-called 'value chain' workflow as follows:



6.6.6 The MG was informed that it was currently envisaged that the new CIIM would incorporate the terms of reference (TORs) of the existing CBS and CIMO while the new CAS would incorporate the TORs of the CAeM, CAgM and all service-related tasks of other commissions – for example, public weather services (from CBS), hydrological services (from CHy), marine meteorological services (from JCOMM), climatological services (from CCl). An initial proposal for the structure of the new CAS was illustrated as follows:



6.6.7 The MG was informed that the following structure elements of the TCs were being considered:

- ***Standing Committee (SC)*** – a quasi-permanent expert body reporting to a TC with limited scope (normally, service sector specific) and TORs defined by the parent TC; SCs will be formed for areas where a WMO regulatory framework has been established and needs to be further developed and maintained;
- ***Joint Standing Committee (JSC)*** – a SC established jointly by and reporting to more than on TC;
- ***Inter-Agency Standing Committee (IASC)*** – a SC established jointly with another international organization with which WMO has working arrangements (e.g., ICAO);
- ***Study Group (SG)*** – an expert group established by a TC with a concrete task and timeframe for concluding its work; SGs (or ETs) will be established for areas where WMO has not yet established regulatory framework, but there are plans in place for establishment of international standard and/or recommended practices.

6.6.8 While realizing that there are still some uncertainties about the exact shape of the future TC structure, the MG noted that it was highly likely that the aeronautical meteorological programme (AeMP) would continue to be handled as one of the application programmes of WMO and, as such, be in the scope of the future Commission of Applications and Services. Thus, the expectation was for the establishment of a Standing Committee on Aeronautical Meteorology (SC-AeM). The MG noted at this stage the prevailing opinion was that the SCs should not be regarded as intergovernmental bodies (although the membership would be through nominations by Permanent Representatives of WMO Members or by relevant partner organizations such as ICAO).

6.6.9 The MG noted that the internal structure of the SC-AeM was yet to be established, but it would be based on a CAeM structure to be discussed at and agreed by the CAeM-16 session in July 2018. The MG appreciated that it would be consulted in the formation process. EC-70 (2018) was expected to review, along with the proposed new structure of the TC, a transition plan which would specify how and when the existing structures would be replaced by the new bodies established by Cg-18 in 2019.

6.6.10 The MG discussed these WMO reform matters at length, particularly in view of their direct bearing both on the continuance and evolution of CAeM as one of the constituent bodies of WMO, on the AeMP as a mature programme area of the Organization, as well as on the structures and composition of the Secretariat. A range of views were expressed by the MG, some addressing the challenges that would likely be faced by such reform, others addressing the opportunities that may arise as a result of the reform:

- The *challenges* included the proposed transitioning from an intergovernmental arrangement (CAeM) to a non-intergovernmental arrangement (SC-AeM), and how to continue to ensure commitment from Members, a sufficient 'community of expertise' to support the programme, and balanced representation (i.e. between the developed world *and* the developing world, and between the regions).
- The *opportunities* included the potential to further improve how WMO coordinates and collaborates with ICAO. For example, there may be opportunities for WMO to have an agile community of expertise in aeronautical meteorology (and other supporting scientific and technical areas) that would more readily, more efficiently and more effectively be able to provide advice into the ICAO regulatory process rather than via the traditional expert teams and other such groups that exist today. In addition, there may be opportunities, where needed and feasible on both sides, for WMO and ICAO to have joint working and/or management group structures.

6.6.11 In concluding its consideration of the issues raised, the MG was reminded that, as per 6.6.4 above, the coming several months would be critical in terms of determining the strategy, scope and timing of WMO reform. The MG considered that regardless of whether the WMO reform would happen in the near-term or far-term, a transition plan from the existing structure to any new structure would be of paramount importance to ensure continuity in activities.

6.7 Future CAeM Expert Team needs and structures

6.7.1 Following on from the preceding discussions, particularly agenda items 6.4 to 6.6, the MG recognized that the establishment of the future structure of CAeM subsidiary bodies would be guided by two main contributing factors: 1) the need to deliver the AEM-related objectives of the WMO SP for 2020-2023; and 2) the final decision on the restructuring of WMO constituent bodies including the technical commissions. Since, at the time of the MG meeting, both factors were not yet concluded, the MG accepted that it would have to deal with some uncertainties and assumptions. In view of this, it was agreed that this work would continue until the CAeM-16 session, which would be better informed by the EC-70 decisions on both aforementioned factors.

6.7.2 The MG also accepted that another key influencing factor to be considered in the planning process was related to the longer-term tasks stemming from the evolution of the ICAO GANP and its ASBU methodology, of which ICAO's next GANP would be endorsed in 2019 to cover the period until 2033. The MG recognized the need for WMO to support the evolution of the ICAO and WMO regulatory frameworks, and that this should stay as a foundation pillar of the AeMP.

6.7.3 Despite the prevailing uncertainty about the various plans and structures, and the assumptions that may or may not have to be made in this regard, the MG felt strongly that it should take a strong leadership role in effecting a positive change within the Commission and any future arrangements. The MG appreciated that the expected general reconstituting of the CAeM from an intergovernmental technical commission to a non-intergovernmental standing committee (e.g. SC-AeM), as highlighted at 6.6.8 above, should be considered in the planning of future expert teams/groups.

6.7.4 The MG was of the opinion also that the current CAeM composition of a management group and five expert teams, plus other working structures such as VAAC BP and VASAG, may not be an entirely satisfactory or sustainable arrangement going forwards, not least in view of the fact that many of the WMO (PR-nominated) experts involved in the CAeM MG, ETs and other groups were also serving as ICAO (State-nominated) members or advisors on the ICAO METP and/or its working groups. From a WMO perspective, the MG felt very strongly that such 'dual-use' of experts was not entirely satisfactory or sustainable and that a more agile arrangement should be found – both on the WMO side and the ICAO side – that would still ensure that WMO would continue to provide expert scientific and technical advice to ICAO but without the constraints often caused by the existence of experts teams and other groups on one side that bear strong resemblance and overlap with those established on the other side (for example, ET-ISA and WG-MISD as well as ET-GOV and WG-MCRGG).

6.7.5 In this connection, the MG recalled remarks made earlier (5.1.5.7 and 6.6.10) concerning the potential establishment of a WMO 'community of expertise'. The MG felt that such a community could retain a required level of expertise while also enabling a more efficient and more effective use of the resource than is perhaps the case today. The MG also felt that for certain issues wholly under the responsibility of WMO – notably the competency and qualification, education and training of aeronautical meteorological personnel – there would be merit in retaining such a WMO expert team arrangement.

6.7.6 After further thorough debate, the MG agreed that, as a basic principle, any future working structures of WMO in support of the AeMP should suitably take account of:

- Education, training and competency;
- Normative work – i.e. standards development and maintenance;
- Innovative applications – i.e. research to operations; and
- Emerging issues – e.g. climate change and variability impact on aviation.

6.7.7 The MG consequently requested the president and vice-president of the Commission, in coordination with the MG, to lead the development of a future WMO/CAeM working structures proposal for consideration at the CAeM-16 session in July 2018 and to make sure that a call for

nomination of experts by Members for the next intersession period of CAeM will be disseminated in time. See ACTION A11-2018 as shown at Annex 4 of this report.

6.8 WMO publications under CAeM responsibility

6.8.1 Further to discussions at the last MG meeting, the MG recalled that the CAeM had lead or supporting responsibility in the development or maintenance of the following WMO guides/guidance material (most recent year of publication in [brackets]):

WMO-No.	Title	Most recent year of publication
Lead responsibility		
731	*Guide to meteorological observing and information distribution systems for aviation weather services*	2014
732	*Guide to practices for meteorological offices serving aviation*	2003
770	*Methods of interpreting numerical weather prediction output for aeronautical meteorology*	1999
904	*Guide to aeronautical meteorological services cost recovery: principles and guidance*	2007
1001	*Guide to the quality management system for the provision of meteorological service for international air navigation*	2014
Supporting responsibility		
782	*Aerodrome reports and forecasts*	2014
842	*Guide to the provision of meteorological service for international helicopter operations*	1996
958	*AMDAR Reference Manual: Aircraft Meteorological Data Relay*	2003
1038	*Weather forecasting for soaring flight*	2009
1083	*Guide to the implementation of education and training standards in meteorology and hydrology, Volume I – Meteorology*	2015
1100	*Guide to the implementation of the quality management systems for national meteorological and hydrological services and other relevant service providers*	2017
TD 1390	*Aviation Hazards*	2007
####	*WMO Guide on Competency*	(2018)

6.8.2 The MG considered the status of the foregoing, where it was noted or recalled that:

a) ET-GOV is continuing to review and consolidate WMO-Nos. 731 and 732;
b) WMO-No. 770 should be made obsolete in view of the MG remarks at 2.1.3 a) above;
c) WMO-No. 1001 (and corresponding ICAO Doc 9873) should be made obsolete in view of the MG remarks at 2.1.3 b) above, with cross-references in ICAO Annex 3/WMO-No. 49, Volume II, for example, replaced by cross-references to WMO-No. 1100;
d) WMO-No. 842 should be made obsolete in view of the MG remarks at 2.1.3 c) above; and
e) The WMO Guide on Competency is expected to be published imminently by WMO.

6.8.3 As an aside, the attention of the MG was also drawn to a new WMO publication titled 'Status of Human Resources in National Meteorological and Hydrological Services' which appeared to share the same WMO publication identifier (ETR-20) as WMO-TD No. 1390 (Aviation Hazards) referenced in the table above. The MG was informed that this would be immediately brought to the attention of the ETR Office for resolution.

7. COOPERATION WITH OTHER WMO BODIES AND INTERNATIONAL ORGANIZATIONS (Doc. 7, INF. 4 and INF. 5)

7.1 ICAO

7.1.1 The MG was informed that there had been no meetings of ICAO's METP since November 2016 but that, as alluded to at 4.3 above, there had been a series of METP WG meetings. In addition, there had been periodic meetings of the METP Management Group.

7.1.2 In the context of the METP WG meetings held, the MG recalled some of the highlights of recent work stream progress under agenda item 4.3 (and INF. 2).

7.1.3 The MG noted that METP WG meetings as well as a 3rd Meeting of the METP (METP/3) were expected to be held before the end of 2018 as follows:

Upcoming meeting	Date
WG-MOG (SADIS) and WG-MOG (WAFS)	10-13 April 2018, Frankfurt
METP Ext. (SWx) [*Unconfirmed*]	26-27 April 2018, Montreal
WG-MIE	1-4 May 2018, Boulder
WG-MISD (SWx, RRM and RHWAC), WG-MRI and WG-MCRGG	7-11 May 2018, Washington DC
METP/3	10-14 September 2018, Montreal
WG-MOG (IAVW) and WG-MISD (VASD) [*Unconfirmed*]	12-14 November 2018, Wellington

7.1.4 In addition, the MG appreciated that several regional ICAO meetings addressing meteorology were to be expected in 2018, including the Asia-Pacific Meteorology Subgroup from 18 to 21 June 2018 in Bangkok and the European/North Atlantic Meteorology Group from 18 to 21 September 2018 in Paris.

7.1.5 In considering the current substantial work programme of the METP and its working groups, the many face-to-face meetings and virtual meetings (teleconferences), appreciating the correspondingly high level of support offered by WMO Members to this work (notably the CAeM and CBS communities), and recalling the closely-related discussions under agenda item 6.7, the MG again questioned the sustainability of separate ICAO and WMO working groups/expert teams.

7.1.6 In this connection, Mr Wang (ICAO) indicated that there may be a general 'slowing-down' of the standards-development on the ICAO side in order to dedicate greater attention (and resources) on the implementation of existing standards, however nothing had yet been confirmed in this respect. Mr Wang also indicated there were ongoing discussions within ICAO, at the level of the Air Navigation Commission, concerning the frequency of Panel meetings and working group meetings as well as Panel objectives, deliverables and priorities. Mr Wang suggested that the current exceptionally high workload of the METP/WGs may ease once the substantial changes brought about by Amendments 79 (2020) and 80 (2022) of ICAO Annex 3/WMO-No. 49, Technical Regulations, Volume II had been introduced.

7.1.7 Lastly, in the context of WMO's involvement in the ICAO Committee on Aviation Environmental Protection (CAEP), the MG was informed by the WMO Secretariat that WMO's membership of CAEP was currently uncertain and that recent requests for advice submitted to the ICAO Secretariat (Air Transport Bureau) had, thus far, met with a null response. Mr Wang indicated that he would consult with ATB to help find a resolution. See ACTION A12-2018 as shown at Annex 4 of this report.

7.2 IATA

7.2.1 The MG was apprised that the WMO Secretariat continued to liaise with IATA on aeronautical meteorological matters, including through participation in periodic meetings of the

IATA Flight Operations Support Task Force (FOSTF) typically held once or twice per year. The FOSTF offers airline representatives, air navigation service providers and others concerned the opportunity to discuss a range of meteorology-specific matters, particularly those being addressed by the ICAO METP and WG mechanism, and enables IATA to formulate position statements.

7.2.2 The MG was pleased to note that WMO involvement in a March 2017 meeting of the FOSTF had given the opportunity to brief IATA on the latest developments within the CAeM/AeMP, including (at the time) early highlights of the 2016/17 CAeM global survey on aeronautical meteorological service provision as well as promotion of AeroMetSci-2017. In addition, the MG was pleased to note that Sharon Lau of Hong Kong Observatory (HKO) had given an informative presentation to the FOSTF on HKO's MET-ATM collaboration with Cathay Pacific.

7.2.3 The MG was further apprised that the WMO Secretariat had recently initiated dialogue with IATA's Accident Classification Technical Group (ACTG). The ACTG was the IATA group charged with reviewing and analysing accidents, identifying contributing factors, determining trends and areas of concern relating to operational safety, and developing prevention strategies. The MG informed that safety reports issued by IATA on an annual basis (Safety Report 2016, 53rd Edition issued in April 2017 available here) demonstrated that meteorology/weather conditions continue to be a significant threat and factor in aviation incidents and accidents, on the ground and in the air. For example, weather is a key contributing factor to loss of control in-flight (LOC-I) accidents, with more than one-third of LOC-I accidents occurring during degraded meteorological conditions, in most cases involving thunderstorms and icing. Improved WMO dialogue with IATA in this regard, through involvement in the ACTG, was therefore intended to better quantify these threats and factors with a view to further improving aeronautical meteorological service provision. The ACTG convenes typically once or twice per year and that WMO Secretariat was now a member of the group.

7.2.4 In the context of aircraft-derived meteorological observations and WMO partnership with IATA, the MG was pleased to note that in July 2017 the two organizations had entered into a new working arrangement relating to the operation of the global AMDAR (aircraft meteorological data relay) system, administered under WMO's AMDAR Programme. While the AMDAR observing system was mature, having existed for 30 years or so and today involving more than 40 airlines, 4,000 aircraft and 700,000 daily observations, as a critical component of the WMO Global Observing System (GOS) there was recognition of the mutual benefits to be gained from expanding the AMDAR network – in terms of the number of airlines involved, the number of suitably equipped aircraft and the number of daily observations. The MG was pleased to note that further information on this new WMO-IATA partnership was available here.

7.2.5 Furthermore, the MG was pleased to receive an extensive briefing (INF. 4 refers) by Mr Dean Lockett, Scientific Officer, Aircraft and Remotely-sensed Observations, WMO, on AMDAR and the ongoing WMO-IATA collaboration, including the establishment (by IATA) of a global turbulence database comprising real-time turbulence data transmission to airlines in flight. In these respects, the MG remarked that while such developments were a tremendous opportunity to expand the coverage and capabilities of the AMDAR network and to improve numerical weather prediction model capabilities that would ultimately lead to more accurate forecasts (that would benefit aviation and other sectors), there were also some areas of concern for WMO Members, such as the proposed commercialization of the data (i.e. its onward sale to third parties) and data access by third parties. The MG appreciated that such issues were known to both organizations and were being actively pursued. As regards the cost implication to NMHSs currently participating in the AMDAR programme, Mr Lockett reassured that it would be no less favourable under the WMO-IATA collaboration.

7.3 Other WMO technical commissions

7.3.1 The MG appreciated that the Commission for Basic Systems (CBS) continued to support the CAeM and the AeMP in a number of key areas including the continued development of the

IWXXM (ICAO Meteorological Information Exchange Model) schema, the maintenance of existing aeronautical code forms and data representations, the further improvement in the observation and prediction of volcanic ash clouds and gases, and the establishment of a global space weather information service to serve international air navigation.

7.3.2 In addition, the MG was pleased to note that the governance and evolution of the WMO Information System (WIS) was a key area for CBS and that other technical commissions, including CAeM, would be tasked to provide input into the operation and development of the WIS through an Inter-Commission Task Team on WIS (ITT-WIS) established through CBS-16 (2016) and EC-69 (2017). The terms of reference of ITT-WIS were available here with a first meeting of the team expected in February or March 2018.

7.3.3 Further to the foregoing, the MG was updated on progress as part of WMO's Rolling Review of Requirements (RRR) and Observing Systems Capability Analysis and Review tool (OSCAR) to further improve a Statement of Guidance on Observations for Aeronautical Meteorology (SoG-Aero). The MG was pleased to note that co-chairs from ET-ASC and ET-ETC had recently provided input to an update to the SoG-Aero which would be next reviewed at an upcoming meeting of a CBS IPET-OSDE (Inter-Programme Expert Team on Observing System Design and Evolution).

7.3.4 Furthermore, the MG was pleased to receive an extensive briefing (INF. 5 refers) by Mr Etienne Charpentier, Chief, Observing and Information Systems Department, WMO, which addressed, inter alia, the status of the RRR and OSCAR, observing systems contributing to the WMO Integrated Global Observing System (WIGOS), the transition from a GOS Vision 2025 to a WIGOS Vision 2040, and the status and next steps for the SoG-Aero.

7.3.5 The MG was pleased to note that representatives of the Commission for Atmospheric Sciences (CAS) had been directly involved in assisting AeroMetSci-2017 and, additionally, that there continued to be support from the atmospheric research community in progressing volcanic ash issues, including through support to the WMO-IUGG Volcanic Ash Scientific Advisory Group (VASAG) referenced at 5.2 above.

7.3.6 In the context of the Commission for Instruments and Methods of Observation (CIMO), and akin to remarks made during the last MG meeting, the MG considered that there would be benefit of improved coordination and collaboration between CAeM and CIMO. This would ensure, for example, that guidance on meteorological observations at aerodromes and (increasingly) in the terminal area could be improved or developed and that there was a means in which to direct periodic aviation-specific enquiries on instruments and methods of observation.

7.3.7 In the context of the Commission for Climatology (CCl), the MG appreciated that, with the exception of some limited engagement in support of AeroMetSci-2017, there was currently little or no interaction between CCl and the CAeM at this time. It was appreciated however that if/when the climate change and variability impacts on aviation issue garners more attention amongst both the aviation user community and the service provider community there may be a need to increased interaction across the two technical commissions (or future WMO structures dealing with such matters). It was remarked, for example, that a changing climate and increased incidence and severity of extreme weather events was likely to be of relevance to airport planners in view of the often long lead-times and significant costs attributable to infrastructure changes (e.g. new buildings, runways/taxiways, drainage systems, etc.). Making use of historical climatological records (e.g. the past 30-years) to support planning for future infrastructure changes may not be appropriate given the expected changes (warming) in the global climate and the consequential weather regimes at a local, national and regional level.

7.4 WMO regional activities

7.4.1 The MG noted with appreciation that the report of ET-CCP (5.1.2 above and Doc 5.1(2) refers) had provided a comprehensive outline of many recent WMO regional activities in the context of aeronautical meteorology.

7.4.2 Recalling discussions under agenda item 6.2 and 6.3 concerning the planning for CAeM-16 session and TECO, the MG suggested that some of the regional developments, such as SIGMET coordination pilot projects and other collaborative arrangements between AMSPs (e.g. NAMCON referenced at 5.1.4.4 above), may offer inspiration for side-events during the session.

8. ANY OTHER BUSINESS

8.1 In response to a query by Mr Shun concerning the status of the update of the working arrangements between ICAO and WMO, Mr Ivanov and Mr Wang advised that while there had been progress since the last MG meeting such that a draft update was about 90% complete, the progress had slowed over recent months principally due to the significant workload commitments of both secretariats. Mr Brock added that the 'final 10%' was perhaps the most challenging part to address since it was getting to the heart of the working arrangements, the governance structures, the due processes for coordination, collaboration and communication, etc. These were not insignificant issues to reconcile. It was also highlighted that ongoing discussions concerning WMO reform were an added distraction or opportunity depending on one's viewpoint. Furthermore, there were separate but highly-relevant ongoing discussions with legal representatives, particularly but not only on the WMO side, concerning working arrangements with organizations/entities in general which may (or will) have a bearing on how the update of the existing ICAO and WMO working arrangement is progressed through to approval.

8.2 On other matters, recognizing this would be the last MG meeting with Mr Shun as president of the Commission, Mr Lisk, on behalf of the MG and the wider CAeM community, expressed his sincere thanks to Mr Shun for his leadership over the past 8 years.

8.3 Recalling remarks made at the opening of the meeting concerning his imminent reassignment within the WMO Secretariat (1.1.4 refers), Mr Ivanov informed the MG that Mr Brock would soon be appointed as Acting Chief of the AEM Division. Mr Ivanov also expressed that he had enjoyed tremendously supporting the work of the Commission over recent years. The president of CAeM and the MG expressed heartfelt appreciation to Mr Ivanov for his dedication and contributions to the work of the CAeM and AeMP in the past years, but in view of all the changes within the AEM Division in terms of the available Secretariat support (see also 1.1.4 above), the MG re-iterated the critical need for the WMO Secretariat to safeguard the preparation of the CAeM-16 session and to prioritize the existing and future tasks of the AEM Division accordingly.

9. CLOSURE OF THE MEETING

9.1 During the closing ceremony the meeting was addressed by Mr Shun, president of the CAeM, and Dr Wenjian Zhang, Assistant Secretary-General of WMO. Dr Xu Tang, Director of the WDS Department of WMO, was also in attendance.

9.1.1 In Mr Shun's closing remarks he provided a summary of progress. He highlighted that the meeting had successfully addressed, inter alia, the outcomes of the 2016/17 CAeM global survey on aeronautical meteorological service provision and the EC-69 special dialogue on the future of aeronautical meteorological services, the outcomes of AeroMetSci-2017 and future scientific direction, the imminent availability of a new WMO Guide on Competency, the development of a long-term plan for the AeMP, preparations for the CAeM-16 session and TECO, WMO reform and its implications on the CAeM and other constituent bodies, and lastly collaboration between WMO, ICAO and IATA.

9.1.2 In Dr Zhang's closing remarks he highlighted the need for the CAeM to pay close attention to the development of the new WMO Strategic Plan for 2020-2023 and the CAeM community's contribution to 1) minimising disaster impact on socio-economic developments

and 2) maximizing support to socio-economic development. Dr Zhang expressed that aviation would continue as a priority in the new plan, recognizing the economic benefit of aeronautical meteorological service provision as a core business area of many WMO Members. He appreciated the key role that Mr Shun was playing in the ongoing discussions on WMO reform, and he expressed that WMO reform should be viewed as an opportunity to make WMO and its Members more efficient and more effective. Dr Zhang also confirmed an expectation that WMO reform proposals would be addressed at EC-70 (June 2018) and Cg-18 (2019). Dr Zhang acknowledged that the CAeM-MG was a strong leadership group, both at the operational level and the technical level. He indicated that the 'climate change impacts on aviation' issue discussed at AeroMetSci-2017 may offer a further opportunity for WMO to show leadership. Dr Zhang acknowledged the work performed by the CAeM/ETs on quality management systems and meteorological personnel competency and qualification which would be of benefit for the AEM and wider WMO community. Dr Zhang concluded by reiterating that he was confident that WMO reform would lead to greater efficiency and effectiveness, and that future working structures should be more agile compared with the situation today. He also encouraged the CAeM to update its strategies (work plans) in support of the AeMP based on recent events such as AeroMetSci-2017.

9.2 After the customary exchange of courtesies, the meeting closed at 15:00 hours on Wednesday 24 January 2018.

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WEATHER CLIMATE WATER
TEMPS CLIMAT EAU

CAeM MANAGEMENT GROUP 2018

GENEVA, SWITZERLAND

22-24 JANUARY 2018

AGENDA

1. ORGANIZATION OF THE SESSION

1.1 Opening of the session
1.2 Adoption of the agenda
1.3 Working arrangements

2. REVIEW OF THE ACTION LIST

3. REPORT OF THE PRESIDENT OF CAeM

4. OUTCOMES OF RECENT MEETINGS/EVENTS

4.1 EC-69 Special Dialogue on the Future of Aeronautical Meteorological Services
4.2 Aeronautical Meteorology Scientific Conference (AeroMetSci-2017)
4.3 ICAO meetings/events

5. REVIEW OF THE WORK PROGRAMME IMPLEMENTATION

5.1 Expert Team reports and coordination of tasks
5.2 Volcanic ash-related activities
5.3 Space weather-related activities

6. CAeM-16 SESSION (2018) AND FUTURE WORK PROGRAMME

6.1 Arrangements for the session (date, location, etc.)
6.2 Provisional agenda for the session and expected outcomes
6.3 Arrangements for the Technical Conference (TECO) (concept, theme, etc.)
6.4 CAeM Operating Plan: 2016-2019 update and 2020-2023 preparation
6.5 Long-Term Plan for the AeMP (2019-2033)
6.6 Restructuring of technical commissions – status of discussions
6.7 Future CAeM Expert Team needs and structures
6.8 WMO publications under CAeM responsibility

7. COOPERATION WITH OTHER WMO BODIES AND INTERNATIONAL ORGANIZATIONS

7.1 ICAO
7.2 IATA
7.3 Other WMO technical commissions
7.4 WMO regional activities

8. ANY OTHER BUSINESS

9. CLOSURE OF THE MEETING

CAeM MANAGEMENT GROUP 2018

GENEVA, SWITZERLAND

22-24 JANUARY 2018

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* Agenda item 9
** Agenda items 1-3 and 9
*** Agenda item 7

Action List

Status of follow-up key:

Not started	On hold	On-going	Completed	Deferred	Cancelled
Work on the task has not begun and is not underway.	*Work on the task has begun but is not finished and is not being actively worked on.*	*Work on the task has begun and is actively underway.*	*Work on the task has been completed.*	*Work on starting or completing the task has been deferred to a later date.*	*Work on the task has stopped without being started or completed and is no longer required.*

Action identifier key:

A[nn]-[yyyy]	For actions arising from CAeM Management Group meetings, where A[nn] denotes the action number and [yyyy] denotes the year
Example: A01-2016	*Action 01 arising from the CAeM Management Group meeting in 2016*

Actions agreed by the CAeM Management Group meeting in November 2016
(CAeM-MG-2016)
(as updated by CAeM-MG-2018)

ID No.	Ag. Item	Action	Responsibility	Deliverables	Deadline	Status at 24 Jan 18	Note
A01-2016	2	To prepare and coordinate a schedule for 2017 CAeM-MG teleconferences	Secretariat	Teleconference schedule	16 Dec 2016	Complete	
A02-2016	2	To maintain the CAeM-MG Action List on the WMO extranet AeMP website	Secretariat	Action List on WMO extranet	16 Dec 2016	Complete	
A03-2016	3	To determine the need and feasibility of reinstating aircraft-based observations in the work programme of the CAeM	Secretariat	Report/feedback to MG	31 Mar 2017 (or Telecon #1 of 2017)	Complete	See CAeM-MG-2018 report, §3.4
A04-2016	4.1.1	To provide ET-GOV with feedback on the proposed straw man of revised WMO-No. 732	All ET chair/co-chairs	Feedback on proposed WMO-732 revision	16 Dec 2016	Complete	
A05-2016	4.1.3	To monitor developments insofar as current ET-ETC co-chair (United States) is concerned and to identify and establish a new ET-ETC co-chair if necessary	P/CAeM in coordination with MG	New ET-ETC co-chair if necessary	31 Jan 2017	Complete	
A06-2016	4.1.4	To identify and establish a co-chair for ET-ASC	P/CAeM in coordination with MG	New ET-ASC co-chair	16 Dec 2016	Complete	
A07-2016	4.1.4	To add work programme item to ET-ASC on climatological tables and aerodrome reference temperatures with a view to preparing a study note for consideration by ICAO	ET-ASC chair	Study note (or similar) to ICAO	30 Sep 2017	Complete	Linked with ET-ASC Task C3 arising from May 2017 meeting

ID No.	Ag. Item	Action	Responsibility	Deliverables	Deadline	Status at 24 Jan 18	Note
A08-2016	4.1.5	To clarify the role and responsibility of CAeM/ET-ISA in respect of IWXXM developments given the activities of other related bodies/groups such as CBS (TT-AvXML) and ICAO	ET-ISA co-chairs	Update to TORs and/or work programme, as necessary	31 Mar 2017 (or Telecon #1 of 2017)	Complete	
A09-2016	6.1	To: a) develop a draft introduction and template for an AeMP long-term plan; and b) circulate to P/CAeM and VP/CAeM for comments	Secretariat	Draft AeMP long-term plan introduction and template	16 Dec 2016	Complete	
A10-2016	6.2	To: a) undertake a review and, as necessary, revision of the CAeM Operating Plan priorities; and b) to populate with high-level deliverables, activities, KPTs and KPIs	Coordinated by ET-GOV with inputs from all ET chair/co-chairs	Draft CAeM Operating Plan (2016-2019)	a) 30 Nov 2016 b) 16 Dec 2016	Deferred	See Annex 5 of CAeM-MG-2016 report See CAeM-MG-2018 report, §6.4 Supersedes A07-2015 and connected with A06-2015 and A09-2015
A11-2016	6.2	To periodically review and, as necessary, update the CAeM Operating Plan	MG	Up-to-date CAeM Operating Plan	Each CAeM-MG meeting	Deferred	Recurrent activity See CAeM-MG-2018 report, §6.4

ID No.	Ag. Item	Action	Responsibility	Deliverables	Deadline	Status at 24 Jan 18	Note
A12-2016	6.3	To: a) activate an Organizing Committee (OC) for the planning and preparation of the CAeM-16 session and TECO in 2018; and b) initiate OC coordination not later than 31 March 2017	Secretariat in coordination with MG and others concerned	OC-CAeM for CAeM-16 and TECO	a) 16 Dec 2016 b) 31 Mar 2017	Complete	
A13-2016	6.4	To consult with the DPFS Division, WWR Division and others concerned to determine if other existing WMO publications could sufficiently accommodate the aeronautical meteorology components alluded to in WMO-No. 770	Secretariat	Report/feedback to MG	31 Mar 2017 (or Telecon #1 of 2017)	Complete	Joint WMO Technical Progress Reports on the GDPFS and NWP research activities are issued annually (see latest here). Components of WMO-No. 770 accommodated in some of the reports (e.g. Hong Kong, China and Germany).

ID No.	Ag. Item	Action	Responsibility	Deliverables	Deadline	Status at 24 Jan 18	Note
A14-2016	6.4	To consider the impact that a discontinuation (or distillation) of WMO-No. 1001 would have on ICAO Doc 9873	ICAO	Report/feedback to MG	31 Dec 2017 (or CAeM-MG-2017)	Complete	Would be an impact. In view of new (2017) edition of WMO-No. 1100 need to consider making both WMO-No. 1001 and ICAO Doc 9873 obsolete and to update references in the Note to Annex 3, 2.2.2.
A15-2016	6.4	To determine whether, in the context of WMO-No. 842, there is a (continuing) requirement to provide specific guidance on meteorological service for international helicopter operations	ICAO	Report/feedback to MG	31 Dec 2017 (or CAeM-MG-2017)	Complete	No longer a continuing requirement since all provisions covered by ICAO Annex 3.
A16-2016	6.4	To: a) undertake a review of the content of WMO-No. 1390 to ensure continued relevance; and b) determine the feasibility to transfer ownership of WMO-No. 1390 from ETR to AeMP	a) ET-ETC b) Secretariat	Review of WMO-No. 1390 and (potential) transfer of ownership	a) 30 Jun 2017 b) 31 Mar 2017	a) Complete	a) Proposed update passed by ET-ETC and UK Met Office to WMO Secretariat in Dec. 2017 for processing.

ID No.	Ag. Item	Action	Responsibility	Deliverables	Deadline	Status at 24 Jan 18	Note
						b) Complete (no transfer of ownership)	b) ETR Prog. to retain ownership. AeMP to continue to provide technical input to 1390.
A17-2016	6.4	To undertake a review and, as necessary, update of existing online ETC resources to ensure alignment with the (prospective new) WMO competency guide	ET-ETC	Review and, as necessary, update of online ETC resources	30 Sep 2017	On-going	See CAeM-MG-2018 report, §5.1.3.4
A18-2016	7.1	To develop a discussion paper (or equivalent) on key topics and principles of the technical commissions "reform" from CAeM perspective for consideration at PTC-2017	P/CAeM and VP/CAeM with Secretariat assistance	Discussion paper (or equivalent)	16 Dec 2016	Complete	
A19-2016	7.1	To identify experts willing to review and suggest improvement to the prevailing Statement of Guidance for Aeronautical Meteorology	Secretariat based on inputs from MG	Grouping of experts to serve as reviewers of the SOG	16 Dec 2016	Complete	
A20-2016	7.1	To review ICAO Annex 3/WMO-No. 49, Volume II with a view to improving its consistency with WMO-No. 49, Volume I concerning WIGOS and the specific requirements thereof as defined in the Rolling Review of Requirements	Secretariat based on inputs from MG	Evaluation of consistency between WMO-No. 49, Volumes I and II	30 Sep 2017	On hold	

ID No.	Ag. Item	Action	Responsibility	Deliverables	Deadline	Status at 24 Jan 18	Note
A21-2016	7.1	To further consultation between CAeM and CIMO on methods of observation, in particular automation issues, at the aerodrome and (increasingly) in the terminal area	P/CAeM and VP/CAeM	Consultation with CIMO	31 Mar 2017	On-going	See CAeM-MG-2018 report, §3.2 k)
A22-2016	7.1	To consider efforts to improve the standardization and quality of air-reports received at the ICAO world area forecast centres (WAFCs) and to further disseminate the air-reports as basic meteorological data to the wider meteorological community normally on the WMO GTS	ICAO	Report/feedback to MG	31 Dec 2017 (or CAeM-MG-2017)	On-going	
A23-2016	7.3	To: a) finalize the draft Concept Note for the WMO Scientific Event 2017; and b) use the Concept Note during the subsequent planning and preparations	a) Secretariat based on input from MG b) Organizing Committee	Finalized Concept Note	a) 16 Dec 2016 b) 31 Jan 2017	a) Complete b) Complete	Connected with A24-2016
A24-2016	7.3	To: a) activate an Organizing Committee (OC) for WMO Scientific Event 2017; and b) initiate OC coordination not later than 31 January 2017	Secretariat in coordination with MG and others concerned	OC-SCI for WMO Scientific Event 2017	a) 16 Dec 2016 b) 31 Jan 2017	a) Complete b) Complete	Connected with A23-2016
A25-2016	8.1	To seek an extension to the review period established by the ICAO METP/2 for the AG-MCRGG White Paper on Future Aviation Meteorology Information Delivery	Secretariat	Extension to the White Paper review period and report/feedback to MG	30 Nov 2016	Complete	Connected with A26-2016

ID No.	Ag. Item	Action	Responsibility	Deliverables	Deadline	Status at 24 Jan 18	Note
A26-2016	8.1	To provide specific comments as well as general remarks on the ICAO METP AG-MCRGG White Paper on Future Aviation Meteorology Information Delivery	MG	Feedback to Secretariat for consolidation and forwarding to METP AG-MCRGG	To be determined	Complete	Connected with A25-2016

Actions agreed by the CAeM Management Group meeting in January 2018
(CAeM-MG-2018)

ID No.	Ag. Item	Action	Responsibility	Deliverables	Deadline	Status	Note
A01-2018	2.1 and 6.8	Undertake action to retire WMO-Nos. 770 and 842 and, where applicable, address any associated consequential amendments to WMO or other publications	WMO Secretariat (in coordination with ICAO Secretariat if required)	a) Obsolete WMO-Nos. 770 and 842; and b) Where applicable, amendment/removal of cross-references in WMO or other publications	31 Dec. 2018		Check if cross-referenced in any ICAO publications
A02-2018	2.1 and 6.8	Undertake action to retire WMO-No. 1001 and ICAO Doc 9873 and address associated consequential amendments to WMO and ICAO publications (including ICAO Annex 3/WMO-No. 49, Volume II). Replace all references to 1001/9873 with WMO-No. 1100	WMO Secretariat in coordination with ICAO Secretariat	a) Study Note for METP/3; b) Obsolete WMO-No. 1001 and Doc. 9873; and c) Amendment of ICAO Annex 3/WMO-No. 49, Volume II and other publications (reference to WMO-No. 1100 instead)	a) 10 Sept. 2018 b) and c) Nov. 2020		Amendment 79 (2020)
A03-2018	5.1.1	Investigate with WWRP the possibilities for a formal report on AvRDP Phase I implementation and the strategy for Phase II	Herbert Puempel	(Possible) AvRDP report for CAeM-16	24 April 2018*		

ID No.	Ag. Item	Action	Responsibility	Deliverables	Deadline	Status	Note
A04-2018	5.1.2	a) Check feasibility of gathering satisfaction survey feedback from newsletter recipients using MailChimp or other platform (e.g. SurveyMonkey); and b) If feasible, conduct satisfaction survey with newsletter recipients	a) Secretariat; b) ET-CCP	Satisfaction survey	a) 28 February 2018; b) 31 March 2018		
A05-2018	5.1.3	Review the ICAO USOAP CMA Protocol Questions (PQs) to determine whether they adequately address competency and qualification, education and training requirements	ICAO	Review of PQs	31 Dec. 2018		Ref: ICAO Annex 3/WMO-No. 49, Vol. II, §2.1.5
A06-2018	5.1.4	Develop a communication strategy and supporting materials on the global and region-specific outcomes of the CAeM global survey for use at CAeM-16, WMO and ICAO meetings or other events	ET-GOV in coordination with ET-CCP	Communications strategy and supporting materials	31 May 2018		E.g. reports, presentations, graphics
A07-2018	5.1.4	Develop an overview of the methodologies and techniques used to communicate and collect feedback on the survey that led to such a high response rate (92%) for future use by the MG or other interested parties	ET-GOV in coordination with ET-CCP	Overview of the methodologies and techniques	31 March 2018		
A08-2018	6.2	Develop a draft provisional agenda for the CAeM-16 session	WMO Secretariat in coordination with president and vice-president of CAeM	Draft provisional agenda for CAeM-16	7 February 2018		Incorporate agenda item 6.2 proposals

ID No.	Ag. Item	Action	Responsibility	Deliverables	Deadline	Status	Note
A09-2018	6.3	Develop a draft concept note for the 2018 TECO	Kent Johnson and Matt Strahan (as lead) assisted by WMO Secretariat and in coordination with CAeM-16/TECO OC	Concept note for TECO 2018	7 February 2018		Incorporate agenda item 6.3 proposals
A10-2018	6.5	Develop a strawman and a strategy for the development and maintenance respectively of the LTP-AeMP for 2019-2033	Secretariat in coordination with the MG	Strawman and strategy proposal for CAeM-16	24 April 2018*		
A11-2018	6.7	Develop a proposal for the future working structures of WMO/CAeM in support of the AeMP	President and vice-president of CAeM in coordination with the MG	Working structure proposal for CAeM-16	24 April 2018*		
A12-2018	7.1	Consult with ATB (ICAO) to assist in establishing the status of WMO's membership of the Committee on Aviation Environmental Protection (CAEP)	ICAO Secretariat (Yong Wang)	Clarity on WMO membership of ICAO CAEP	30 Sept. 2018		

* Expected submission deadline of working documentation for the CAeM-16 session.

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