

# Commission for Aeronautical Meteorology

Fifteenth session

Montreal

15–16 July 2014

Abridged final report with resolutions and recommendations



**World  
Meteorological  
Organization**

Weather · Climate · Water

WMO-No. 1139



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# GENERAL SUMMARY OF THE WORK OF THE SESSION

## 1. OPENING OF THE SESSION (agenda item 1)

1.1 The fifteenth session of the Commission for Aeronautical Meteorology (CAeM) was opened by Mr C.M. Shun (Hong Kong, China), president of the Commission, at 09:30 a.m., on Tuesday 15 July 2014, in the ICAO Headquarters in Montréal, Canada.

1.2 Mr Shun emphasized the importance of the session by noting that it was held conjointly with the ICAO Meteorology Division Meeting, the last one of which was held 12 years ago. He thanked ICAO for hosting this session of the CAeM. The president recalled that the upgrade plan of aeronautical meteorology for the next 15 years or more had been agreed at the Conjoint ICAO Meteorology Division Meeting and the meteorological community would need to respond. He highlighted that effective governance and cost recovery, increased efficiency and competent aeronautical meteorological personnel would remain the underlying foundations to ensure service delivery in compliance with the stated requirements. Furthermore, the Commission should ascertain how the human forecasters and observers would add value in the system-wide information management environment, how the meteorological information could be integrated into the decision-making systems of the users and how research efforts could be put into operational applications. Mr Shun added that strengthening partnership with aviation users, more effective communication with Members and Regional Associations, capacity-building, sharing of best practices and provision of guidance material would also be key to success of aeronautical meteorological services in the future environment. He encouraged participants to note the position on issues related to the Conjoint Meeting and CAeM-15 stated by the WMO Executive Council in its session held just a couple of weeks ago in Geneva in considering the new terms of reference and working structure of the CAeM.

1.3 The president of the ICAO Air Navigation Commission, Mr Farid Zizi, welcomed all participants to ICAO headquarters for the 15th Session of the Commission for Aeronautical Meteorology. The convening of the Commission session in Montreal coincident with the MET Divisional Meeting was an illustration of the strong relationship, the strong bond that exists between ICAO and WMO in the area of aeronautical meteorology. The establishment of aeronautical requirements for meteorological service and the fulfilment of these requirements through specified technical methods and practices is central to the ICAO-WMO working arrangements that have existed for the past 60 years. On this basis, the mutual coordination and collaboration will remain essential as international civil aviation transitions to a global interoperable air traffic management system intended to make the aviation system (a “system of systems”) more efficient, more sustainable and less environmentally damaging without compromising ICAO’s number one priority: safety. Through this Commission session and taking account of the developments that are already taking place or that are envisaged, there is the opportunity for the Members of the Commission to address the implications of these developments on WMO and its Members.

1.4 Mr Jerry Lengoasa, WMO Deputy Secretary-General welcomed participants and thanked ICAO for hosting the session. He emphasized the importance of timely and accurate meteorological information in case of major disruptions caused by weather and events like volcanic ash and radioactive release in the atmosphere to support critical decisions by aviation users — airlines, air traffic management and civil aviation authorities. There are opportunities to further develop adequate emergency services for aviation hazards — natural and human-made. A major role of WMO in this regard is to organize and support research activities that would enable improved operational services. He pointed further that the WMO Strategic Plan for 2011–2015 recognizes Aeronautical Meteorology as one of the five key priorities for WMO due to the urgent need to assist Members to achieve compliance with the ICAO and WMO standards on Quality Management, including ISO 9001 certification. The other emerging implementation area concerned the new WMO standards on the competency for aeronautical meteorological personnel.

1.5 Mr Lengoasa outlined the emerging challenges related to the implementation of the ICAO Global Air Navigation Plan (GANP) through its Aviation System Block Upgrades (ASBU),

such as the transition to a fully digital exchange of aeronautical meteorological information as part of the System-Wide Information Management concept. This will be a major task for all WMO Members in the coming years and the Commission should play an important role by providing the necessary guidance and capacity development.

1.6 The Deputy Secretary-General emphasized that regardless of the various national arrangements and service delivery models, the NMHSs have played and will continue playing a major role in this area: their ability to adapt to the foreseen changes in the Global ATM system is of vital importance. Therefore, one of the major roles of the Commission for the next intersession period will be systematically raising awareness among WMO Members of the forthcoming changes stemming from the GANP and ASBU and assisting Members in developing their national plans and strategies for aeronautical meteorology. The tendencies towards further globalization and regionalization of service provision are well understood; however, the global system will be strongly dependent on the ability of individual Members to provide the requisite basic and specialized data and information. In this regard, it will be of vital importance to review and adjust the existing financing and cost-recovery mechanisms, to ensure fair and equitable allocation of resources to sustain and improve the services at all levels.

1.7 A complete list of participants is given in the [appendix to the present report](#).

## **2. ORGANIZATION OF THE SESSION** (agenda item 2)

### **2.1 Consideration of the report on credentials** (agenda item 2.1)

The representative of the Secretary-General of WMO presented a brief report on delegations whose credentials had been found valid. In accordance with General Regulations 21 to 24, the Commission approved this report and decided not to set up a Credentials Committee.

### **2.2 Adoption of the agenda** (agenda item 2.2)

The Commission adopted the proposed annotated agenda, as contained in CAeM-15/Doc. 2.2.

### **2.3 Establishment of committees** (agenda item 2.3)

2.3.1 The session established a Nomination Committee to review nominations received for the president and vice president of the Commission. The Nomination Committee was composed of the principle delegates of Zambia, Mr Jakob Nkomoki (chairperson); Australia, Mr Alasdair Hainsworth; Chile, Mr Reinaldo Gutierrez Cisterna; and Romania, Mr Dorinel Visoiu.

2.3.2 The session established also a Coordination Committee composed of the president and the vice-president of the Commission, the representative of the Secretary-General, the secretaries of the plenary sessions and a representative of the hosting institution ICAO.

2.3.3 The Commission agreed to conduct its business in plenary sessions only. Dr Xu Tang, Director of the WMO Weather and Disaster Risk Reduction Services (WDS) Department and Mr Dimitar Ivanov, Chief of the Aeronautical Meteorology Division acted as Secretaries to the plenaries.

### **2.4 Organizational matters** (agenda item 2.4)

Under this item, the Commission decided on its working hours for the duration of the session. It was agreed that, in accordance with Regulation 113 of the WMO General Regulations, no minutes of the session would be prepared, but that statements by delegations might be reproduced and distributed as and when requested.



### 3. REPORT OF THE PRESIDENT (agenda item 3)

#### *Overview by the president*

3.1 The Commission noted with appreciation the significant progress made since CAeM-XIV in 2010 through the effective leadership and efforts of the president, vice-president, Management Group (MG), Expert Teams (ETs) and the Secretariat. A positive factor was the recognition of Aeronautical Meteorology as one of the five strategic priorities of the WMO Strategic Plan for the sixteenth financial period 2012–2015 which helped to improve some of the long-standing resource difficulties faced by the Commission.

3.2 The Commission was informed that at the beginning of the intersessional period the MG had laid down an Operating Plan for 2011–2015 with clear deliverables, Key Performance Indicators (KPIs), Key Performance Targets (KPTs) and Key Outcomes (KOs) for 5 top level strategic priorities. These had been considered in view of the upcoming CAeM-15 session to be held conjointly with the ICAO Meteorology Divisional Meeting in 2014 (the 'Conjoint Meeting'). The Commission was pleased to note the following significant results achieved in respect of these strategic priorities:

- (a) Development of proposals for Meteorological Services to Air Traffic Management (MSTA) – KPT considered achieved with inputs provided to the relevant ICAO roadmap document to be considered at the Conjoint Meeting;
- (b) Development of AMP Competency Assessment Toolkit (CAT) and provision of support to Members in implementation – the CAT was completed within the first 18 months and training workshops for Members had been organized for five regions. The December 2013 KPT of 100 Members compliant with the Competency Standard had been realized to a significant extent (further updates to be expected from Members);
- (c) Provision of support to Members in implementation of Quality Management System (QMS) – a generic Guide for the Implementation of a QMS for NMHSs had been published in all WMO official languages and expert advice had been provided to other WMO Programmes pursuing establishment of QMS for their programme areas. The number of Members per Region which had achieved ISO 9000 certification was: Region I – about 25%; Region II – about 35%; Region III – about 30%; Region IV – about 20%; Region V – about 50%; and Region VI – about 90%. For the other Members, QMS implementation had been progressing well except for 18 Members where no implementation activities had been reported. The December 2013 KPT of 100 Members with QMS implemented was nearly reached (further updates to be expected from Members). Further updates of the QMS implementation status, including those Members who had already implemented QMS but not yet received certification, will be provided to the 17th WMO Congress;
- (d) Improvement of SIGMET provision and resolution of long-standing deficiencies – while there have been some improvements in a couple of regions in the availability of SIGMETs, deficiencies still remain in certain regions. Inputs, in particular long-term improvement proposals, including the proposed establishment of Regional Hazardous Weather Advisory Centres considering the positive results from a regional SIGMET advisory trial, had been provided to the relevant ICAO concept of operations to be considered at the Conjoint Meeting; and
- (e) Development of proposals for emergency responses including volcanic ash (VA), nuclear emergencies and space weather - KPT achieved with inputs provided to the relevant ICAO roadmaps and concepts of operations to be considered at the Conjoint Meeting. An Inter-programme Coordination Team on Space Weather (ICTSW) was also established jointly with the CBS.

The Commission agreed with the president that further discussion on the ToR and working structure of the Commission for the next intersessional period would be required.

3.3 The Commission was also pleased to note that the MG had pioneered innovative steps to effectively manage the operation of the Commission in the past four years, including: strategic planning with defined measures of success, adoption of concise and action-oriented documents and reports for meetings, making extensive use of teleconference and Internet for MG and ET meetings, reducing the lengths and overheads for Commission sessions, which helped that progress was sustained within the budget constraints. This would not have been possible without Members contributing experts and other in-kind contributions, including hosting numerous meetings, training workshops, websites, translation of documents, etc., that ensured work progress of the CAeM. The Commission and the president expressed appreciation to all contributing Members and their experts for their commitment and support.

3.4 The Commission noted further that these useful experiences had been shared with the Executive Council Task Team on Continuous Improvement with a view to further improve the efficiency and effectiveness of the Organization. The Commission agreed with the president that in the long run, there would be a need for a more fundamental performance review of the constituent bodies of the Organization, and thus future options optimal for the Commission should be proactively considered by the incoming Management Group and exchanged through the regular meetings of the presidents of the technical commissions (PTC mechanism).

3.5 The Commission concurred with the president that Aeronautical Meteorology was entering into an era of rapid and fundamental changes, in response to the fast growth of aviation transport and the need of new concepts for Air Traffic Management (ATM). The new 2013 version of the ICAO Global Air Navigation Plan (GANP) introduced a consensus-driven Aviation System Block Upgrades (ASBU) methodology which included upgrade modules for Aeronautical Meteorology, in 5-year blocks out to the timeframe of 2028. These changes could pose significant challenges to WMO Members, as well as provide new opportunities. Concerns had been expressed that changing business and service delivery modalities discussed, including a wider regionalization and more open competition for provision of services to aviation users, could put the financial and organizational viability of NMHSs in many parts of the world at stake. Therefore, the Commission was expected to cooperate closely with ICAO, aviation stakeholders and partners, reflecting the views and needs of WMO Members, to determine the most suitable models including cost recovery mechanisms for future local, sub-regional, regional and global aviation weather services delivery. This would require further work on the relevant regulatory and governance framework, roadmaps and concepts of operations, supporting procedures, guidance, sharing of best practices and capacity development, and to conduct a range of activities to increase the awareness of WMO Members of the forthcoming changes. In view of these high-impact developments, the Commission agreed with the president of the need to keep Aeronautical Meteorology among the strategic priorities of the Organization during the seventeenth financial period (2016–2019) and requested the president to convey this message to the next Congress.

3.6 The Commission also recognized that the future viability and sustainable development of NMHSs as aeronautical meteorological service providers would be underpinned by Members' implementation and maintenance of QMS and compliance with AMP competency and qualifications standards. Recognizing that the related regulatory framework would need to be updated to reflect the latest ISO Standards and expected changes in aeronautical meteorological services provision, the Commission urged the MG to sustain its continual efforts, in cooperation with the Education and Training Programme, in providing the necessary assistance, in particular to least developed and developing Members, including training, developing guidance material, and facilitating twinning/mentoring arrangements for Members in need.

3.7 The Commission agreed with the president that effective communication, coordination and partnership with Members, regional associations, technical commissions and other relevant WMO bodies, as well as with partner organizations would become even more important in the successful development and implementation of the forthcoming changes in the aeronautical

meteorological services provision and in assessing feedback and responding to Members' request for advice, guidance and assistance.

3.8 The Commission noted that while the new concepts for Air Traffic Management (ATM) were expected to pose significant challenges to WMO Members, deployment of NWP, nowcasting, probabilistic forecasts and other advanced technologies needed to enable near-term and immediate services (< 20 min) to aviation users under the ASBUs would also provide many opportunities for service enhancements to be realized in close cooperation with the scientific and research communities. In this connection, the Commission welcomed the opportunity to partner with the Commission for Atmospheric Sciences (CAS) to develop a joint Aviation Research Demonstration Project (AvRDP) with a view to demonstrate the capability of nowcasting and mesoscale modelling techniques in support of Trajectory Based Operations under the ASBUs. The Commission also agreed that issues related to impacts of climate change and variability on aviation would need to be dealt with in coordination with the relevant WMO and ICAO bodies and programmes such as the Global Framework for Climate Services (GFCS) and the ICAO Committee on Aviation Environmental Protection (CAEP).

3.9 The Commission recognized that after nearly 60 years, it was time to review the Working Arrangements between ICAO and WMO and align them with the forthcoming changes in aeronautical meteorological service provision, in which each of the two Organizations would have a role to play according to their mandates. The Commission recommended that the revised working arrangements should be based on the same exemplary spirit of cooperation and should ensure efficiency and effectiveness of the individual and conjoint activities by clear definition of the roles and responsibilities of the two organizations and their relevant bodies. The Commission noted that the ICAO and WMO Secretariats would work together on a draft for the changes to the Working Arrangements for approval by the respective executive bodies of the two Organizations, and requested the MG to provide the necessary assistance and support in this important process.

3.10 The Commission noted that, related to the implementation of QMS and competency requirements, a number of developing Members were still in need of assistance in establishing adequate cost-recovery mechanism for the provision of meteorological service to aviation. It was noted that lack of or inadequate cost-recovery was affecting mostly NMHSs providing meteorological service for aviation but poorly connected with the national aviation stakeholders due to administrative reasons (i.e., NMHS not under the ministry of transport). The Commission acknowledged that several VCP-funded projects were on-going in Region I and Region II in an attempt to promote the best practices in cost-recovery and establish the needed national agreement between the stakeholders that would enable the NMHS to start recovering costs following the relevant ICAO and WMO guidance. It was expected that more requests for such projects would be coming from Members in the near future. Development of an appropriate cost-recovery mechanism for those Members with low traffic volumes (i.e., the small island States), with due consideration of the specifics of the flight operations, should also be considered.

3.11 The Commission would include an activity in its future operating plan to conduct a study to ascertain the challenges faced by Members who are unable to meet the QMS requirements, and to develop further actions to address these challenges, including the improved use of VCP funds to assist Members in need.

3.12 The Commission was aware that the cost-recovery issue was not unique for the developing countries. It was noted that some developed and developing country Members, whose NMHS's budget was highly dependent on revenue from aviation sector, were also concerned with the ability to sustain those revenues in view of the expected changes in the business model for service provision including the trend for regionalization or even globalization of services. Therefore, the Commission requested the MG and relevant ETs, supported by the Secretariat, to accord high priority to the issue of cost-recovery in its future work programme and expand the existing guidance on the subject building on best practice of Members and risk analysis of changing service provision modalities.

### **Volcanic ash**

3.13 The Commission recognized that, soon after the last session, widespread and prolonged disruption to international air navigation caused by the eruptions of volcanoes in Iceland, Chile and Indonesia had resulted in significant pressure placed by the aviation industry on the aviation meteorology community and particularly on the nine Volcanic Ash Advisory Centres (VAACs) to provide enhanced levels of volcanic ash service delivery. Inconsistency of VAACs forecast process and output, whilst previously existing, had been widely exposed and global variations in capacity for geophysical and meteorological monitoring of volcanoes, volcanic ash and volcanic gases had been further highlighted.

3.14 The Commission noted that the WMO/International Union of Geodesy and Geophysics (IUGG) Volcanic Ash Scientific Advisory Group (VASAG) was established following the WMO Volcanic Ash Workshop that took place in Santiago, Chile just before the eruption of Eyjafjallajökull in April 2010. The Commission appreciated the active CAeM representation on VASAG including its vice-president and the effectively support by VASAG to the International Volcanic Ash Task Force (IVATF) Science sub-group. It presented a very efficient and effective route for responding to the evolving meteorological, geophysical and volcanological science requirements of the IVATF and IAVWOPSG.

3.15 The Commission was pleased to note that the VASAG had made very good progress in establishing best practice models, including a best practice statement, implementation of both QMS and Competency Standards for staff of the VAACs, and in providing recommendations on dispersion modelling science priorities. The VASAG also contributed to the important issue of differentiation between “visible” ash, as seen by the human eye, and “discernible” ash detected by agreed sensing techniques, based also on ground-based sensing techniques beyond satellite-based methods. The Commission further noted that the IAVWOPSG had endorsed the additional provisions in Annex 3 to include the consideration of relevant ground-based and airborne data to detect the existence and extent of volcanic ash in the atmosphere, where previously only satellite derived information had been explicitly included. Updated definitions of volcanic ash had also been developed for inclusion in the ICAO Manual on Volcanic Ash, Radioactive Material and Toxic Chemical Cloud (Doc. 9691). Supported by the VASAG, WMO had provided inputs to the ICAO Roadmap for IAVW in Support of International Air Navigation for consideration by the Conjoint Meeting.

3.16 The Commission expressed appreciation to Members providing experts to the WMO/IUGG VASAG, who had not only provided excellent scientific inputs into the ICAO processes, but were so far practically unfunded by WMO. Given the evolving nature of volcanic ash science pulled through into operations, the need for continuation of VASAG work had been supported and a review and update of its terms of reference is envisaged for consideration by the WMO Executive Council in 2015.

3.17 The Commission also noted with interest that, in Europe, the WEZARD (WEather hazARDS for Aviation) project (funded by 2011-13 European Commission Coordination and Support Action) had conducted a cross-industry volcanic ash capability and gap analysis. The EUMETNET (network of 29 European National Meteorological Services) led Work Package 3 of the project focusing on geophysical monitoring, observations, dispersion modelling and data exchange. A major outcome of this work was the agreement by CBS, CAS, CIMO and CAeM working in close collaboration with EUMETNET and EARLINET (the European Aerosol Research Lidar Network) to initiate a ceilometer backscatter and lidar observations demonstration project in RA VI (Europe) building on the work already done by the German Meteorological Service (DWD) and the WMO Global Atmospheric Watch (GAW) programme (see <http://www.dwd.de/ceilomap>).

### **Space weather**

3.18 The Commission noted that the science of the space weather hazards had continued to benefit from an increased services application focus although the overall vulnerability of aviation to space weather hazards remained relatively poorly understood. It was pleased with the

establishment of the Inter-programme Coordination Team on Space Weather (ICTSW) by CBS in cooperation with CAeM in May 2010, with a mandate to support space weather observations, data exchange, product and services delivery, and operational applications. ICTSW had two co-chairpersons nominated respectively by CBS and CAeM, and involved experts from 21 different countries and 7 international organizations. The need for a coordinated effort by WMO Members to address the observing and service requirements to protect the society against the global hazards of space weather was acknowledged by the Sixteenth Congress. Based on the work done by the ICTSW, WMO had provided inputs to the draft ICAO Concept of Operations for Space Weather Information Services to be considered as information for the Conjoint Meeting.

### ***Nuclear emergencies***

3.19 The Commission noted that the Fukushima nuclear accident dating back to March 2011 continued to focus the minds of the international aviation community. Provision of SIGMET for radioactive clouds and operational access to near real-time at-source monitoring information through the International Atomic Energy Agency (IAEA) and near-source atmospheric data, in particular wind information, with which to initialize the dispersion models remained high priority issues. WMO had provided inputs to the draft ICAO Concept of Operations for Radioactive Material Information Services to be considered as information for the Conjoint Meeting.

### ***Expert team on Education, Training and Competencies (ET-ETC)***

3.20 The Commission recalled that CAeM-XIV established the Task Team on the Competency Assessment Toolkit (TT-CAT) as well as the Expert Team on Education and Training (ET-ET). The Commission was informed that TT-CAT, within its original remit, accomplished most of its objectives during the first half of the intersessional period and was dissolved. In order to try to sustain the established momentum, the members of the TT-CAT and the ET-ET were named to a newly established Expert Team on Education, Training and Competencies (ET-ETC). In the following paragraphs, the term ET-ETC is used to refer to the ET-ET and the TT-CAT as well as the amalgamated ET-ETC.

3.21 The Commission noted with appreciation that the ET-ETC had made considerable progress over the past four years. A sufficient set of tools and related training material had been provided in order to assist Members to meet the AMP competence requirements of the WMO Technical Regulations (WMO-No. 49). Even though the KPT of 100 Members in compliance with the competency requirements by 1 December 2013 was not fully met, significant progress had been made by almost all Members. The Commission further noted that for the competency part of ETC, there was still work to do, most notably in Regions III and V and was pleased to note the plans for an RA III Competency Assessment Workshop in Buenos Aires in late November 2014.

3.22 The Commission appreciated the implementation of the training database and the mapping tool as another major accomplishment of the ET-ETC. This tool (available on the CAeM website, <http://www.caem.wmo.int/moodle/>) allows users to search a vast international database of training resources and map them to the specific competency to be developed. The Commission recognized and thanked Hong Kong, China for leading this development.

3.23 The Commission noted further the following major activities and achievements of the ET-ETC:

- (a) Finalization and publication of Implementation Guidance for Aeronautical Meteorological Forecaster and Observer Competency Standards;
- (b) Development of Competency Assessment Toolkit;
- (c) Training workshops on implementation of competency assessment held in all regional associations except RA III (training workshop for RA III being scheduled for late 2014);

- (d) Establishment of a discussion forum on the CAeM website for knowledge sharing;
- (e) Development and implementation of “mapping database” connecting specific competencies to available training material.

3.24 The Commission recognized that that competency assessment had been a primary focus over the past four years and agreed that the education and training activities would gradually return to the forefront.

3.25 The Commission recalled that the qualification requirements for AMF in the WMO Technical Regulations will become a standard practice on 1 December 2016. It emphasized that the preparation for compliance with those requirements should be initiated in due time to avoid a big lag between the date of coming into force and the actual implementation by Members. Therefore, the Commission requested the MG and ET-ETC, supported by Secretariat, to provide clear guidance on the necessary steps to be undertaken by Members and relevant training institutions in order to facilitate national implementation actions and resource planning.

### ***Expert Team on Meteorological Services to ATM & Meteorological Information Exchange (ET-M&M)***

#### *Meteorological services to ATM*

3.26 The Commission recalled that, after having appreciated the work done by the previous Expert Team on New Terminal Weather Forecast (ET-NTF), the CAeM-XIV established the Expert Team on Meteorological Services in the Terminal Area (ET-MSTA). The ET-MSTA aimed to continue working in close cooperation with the relevant bodies of ICAO, on proposals for expanded forecast services addressing the wider approach and departure area around aerodromes. The Commission also requested to strengthen the consultation with representatives of the user groups, considering the evolving user requirements being expressed in regional ATM modernization projects such as NextGen and SESAR. To support this activity, the CAeM also established a new Task Team on MSTA User Needs (TT-UN) working in close coordination with the ET-MSTA.

3.27 The Commission was informed that during the first half of the intersessional period, ET-MSTA had worked in close cooperation with an ad hoc group of the ICAO Aerodrome Meteorological Observation and Forecast Study Group (AMOFSG), with the aim of having Aviation Meteorology considered at a higher level by the ICAO Air Traffic Management Requirements and Performance Panel (ATMRPP). However, it transpired that the ATMRPP was initially not yet ready to enter into an in-depth discussion on MET-ATM requirements. In parallel, the MSTA initiative was presented at a number of national and international MET-ATM events which allowed the TT-UN to gather interesting users’ feedback, in particular: the need to address operational impact to aviation due to significant weather, and the need to address verification from a user perspective. The ET recognized that a scenario-based approach would be beneficial in these processes.

3.28 The Commission was further informed that, in response to ICAO’s establishment of the new Project Team on Meteorological Aeronautical Requirements and Meteorological Information Exchange (MARIE-PT), as a successor of the AMOFSG ad hoc group, the MG took the decision in October 2011 to merge the activities of the CAeM focal point on OPMET data exchange, ET-MSTA and TT-UN into an Expert Team on Meteorological Services for ATM and Meteorological Information Exchange (ET-M&M), with expanded focus to overall ATM requirements but a continued priority on dense terminal areas and airspace. ET-M&M’s major task was to provide the MARIE-PT with an overview of the current and foreseen MET capabilities in support to ATM, associated with comprehensive information on verification techniques and results that could help understand the current skill in forecasting high-impact weather.

3.29 The Commission was pleased to note, that despite a rather long lapse of dialogue, the breakthrough came in late 2012 when ET-M&M managed to meet ATMRPP in October 2012 to sound out the urgent need for a closer MET-ATM interaction. This initiative was reaffirmed at the ICAO 12<sup>th</sup> Air Navigation Conference in November 2012, highlighting the future need of integrating

MET information into ATM. Consequently, ET-M&M contributed to the MET Information Integration for Trajectory Based Operations (TBO) Concept and Roadmap to be considered by the Conjoint Meeting. ET-M&M provided further details on the current and foreseen MET capabilities in support to ATM, with their benefits to ATM and key performance areas highlighted with a view to achieve a further update of this Roadmap. It is envisaged that the Roadmap would provide a firm basis for further development of the MSTA under the ASBUs and would be supplemented by generic examples of the MET capabilities based on the prototypes and best practice examples developed over the past 4 years by the MSTA teams.

#### *MET information exchange*

3.30 The Commission was informed that the CAeM Focal Point for OPMET Data Exchange (FPODE), also co-chairperson of ET-M&M, represented CAeM in the CBS OPAG-ISS Task Team on Aviation XML (TT-AvXML), established in the fall of 2011. TT-AvXML had developed a number of logical models and related physical data exchange schemes (residing in both WMO and ICAO domains) allowing for the exchange of METAR/SPECI, TAF and SIGMET in XML/GML format. Two release candidates were delivered respectively in December 2012 and April 2013 for review and preliminary testing by TT-AvXML members and other interested parties. This had led to the milestone release of version 1 of the models and exchange schemes in October 2013 as the version to be used for testing bilateral exchanges, as foreseen in Amendment 76 to ICAO Annex 3.

3.31 The Commission noted that the ToRs of the TT-AVXML foresaw activities up to 2016, in particular, evaluation of feedback on the released version as well as updating it in order to have a new release for implementation in November 2016 (Amendment 77 to ICAO Annex 3). This activity, as well as expanding the models to include other ICAO products (envisaged in Amendment 77 to Annex 3), would require advice from ICAO in the light of the outcomes from the Conjoint Meeting. Since it was unclear at this stage if the TT-AvXML would be continued or a new dedicated TT set-up for this purpose, the Commission tasked the Management Group to coordinate an effective solution with the CBS and other stakeholders concerned.

3.32 The Commission was advised that the governance of the different data exchange models should be a distributed responsibility between WMO and ICAO, and this would be one of the specific areas to be properly addressed in the forthcoming review and amendment of the Working Arrangements between WMO and ICAO. It is expected that the results of this review will not be available until 2016. Therefore WMO should continue to be responsible for the development and maintenance of aeronautical meteorological codes and by implication data models in the meantime.

#### ***Expert Team on Governance and Partnership (ET-GP)***

3.33 The Commission recalled that the Expert Team on Governance and Partnership (ET-GP) was established by CAeM-XIV to assist Members with the provision of aeronautical meteorological services to meet both current and emerging needs. To accomplish this goal, the ET focused on the following in the past four years: improved communication, provision of SIGMETs and feasibility of Regional SIGMET Advisory Centers, “twinning” as a method of addressing the challenges associated with the implementation of QMS, governance and cost recovery. Additionally, the ET tracked progress of regional air navigation service providers (ANSP) initiatives and reviewed and commented on pertinent documentation.

3.34 In respect of improved communication, the Commission noted that many CAeM members might not be fully aware of the current and future developments in aeronautical meteorology. Outcomes from numerous ICAO groups and meetings with partner organizations like IATA were not directly communicated to the CAeM members. To improve communication with Members with a view to provide the relevant information to a broader audience, ET-GP embarked on compiling a CAeM membership e-mail addresses database based on WMO-No. 5. After the first communication was distributed, ET-GP tracked the returned e-mail addresses and found that many of the members which could benefit from this type of information either did not have e-mail addresses or they were incorrect in the WMO listing. The Commission strongly urged its members

to update the CAeM membership information with the WMO Secretariat for more effective communication in the future. The Commission noted with appreciation that ET-GP had provided notification of the CAeM-15 session not only to the PRs but also to the members of the Commission as nominated by the PRs. Noting that this method of notification could lead to a greater participation by members, contributing to the decision-making process of this CAeM session, such a practice should also be considered by other technical commissions.

3.35 The Commission noted with concern that the provision of SIGMETs was a critical function of Members' meteorological watch offices (MWO) but that there were regions where SIGMET deficiencies persisted, despite some improvements made in a couple of other regions. Members of the ET were significantly involved in the ICAO Meteorological Warnings Study Group (METWSG) tests of the Regional SIGMET Advisory Centre concept and in the development of the draft ICAO Concept of Operations for Advisory Services for Hazardous Meteorological Conditions which had been included as information for the Conjoint Meeting.

3.36 As regards ET-GP's role in assisting Members with governance and cost recovery issues, the Commission was informed that the ET recognized the continued challenges faced by Members especially in countries with internal governance issues between the Civil Aviation Authority (CAA) and the aeronautical meteorological service provider where inadequate resources and support were provided for the meteorological services. ET-GP discussed the potential for using twinning arrangement between well-established meteorological service providers and those providers which needed additional assistance. This methodology proved successful for QMS implementation and competency assessment. Guidance material on twinning arrangement is available on the CAeM website.

3.37 The Commission also noted that ET-GP members continued to track the activities and the impact on aeronautical meteorological service providers as a result of regional ATM initiatives including SESAR in Europe, NextGen in the United States of America, and CARATS in Japan. These initiatives, along with ICAO ASBUs, would be driving changes in the provision of weather information in support of ATM and require integration of weather information and a move from text-based information to digital information. ET-GP had also undertaken a review of the WMO Technical Regulations and related guidance material that is to be maintained and updated under the CAeM. The Commission noted that further work would need to be carried out in updating some of the documents during the next intersessional period.

### ***Task Team on Quality Management Systems (TT-QMS)***

3.38 The Commission noted that the Task Team on Quality Management Systems (TT-QMS) was formed under CAeM by the WMO Executive Council at EC-LXIII in 2011 following a strong endorsement of the prioritization of the implementation of Quality Management Systems (QMS) throughout WMO, but with an initial emphasis on aeronautical meteorological services provided by Members in response to an ICAO requirement. The importance accorded by the Organization to this TT is reflected by the participation of Professor Mieczyslaw S. Ostojki, Second Vice-President of WMO as its member. The updated terms of reference of TT-QMS is available in Appendix 4 to the Report of the Second Meeting of WMO TT-QMS held in Marrakesh, Morocco, 29 February–2 March 2012, available at: [http://www.wmo.int/pages/prog/amp/aemp/training-info2\\_en.html](http://www.wmo.int/pages/prog/amp/aemp/training-info2_en.html).

3.39 The Commission noted with appreciation that TT-QMS worked with the WMO Secretariat to develop a useful survey tool for continuous monitoring of the current status of the WMO Members in terms of their compliance with the QM requirements for the delivery of aeronautical meteorological services, i.e., the status of WMO Members in terms of meeting ICAO Annex 3 requirements (Standard 2.2.2 and Recommendation 2.2.3).

3.40 The Commission expressed appreciation to the TT and the Australian Bureau of Meteorology for developing and hosting the WMO Quality Management website ([http://www.bom.gov.au/wmo/quality\\_management.shtml](http://www.bom.gov.au/wmo/quality_management.shtml)). The website provided significant resources to assist Members in the development and implementation of QMS. Currently, the



website has four key areas: QM Resources, QM Templates & Procedures, QM Publications and QM Forum. In particular, the QM Forum provided the opportunity for Members to seek advice from members of the WMO QM community on all aspects of developing and implementing QMS. The Forum had in excess of 190 members with a core group always prepared to offer assistance in the form of advice and QM tools, templates etc. Access to the Forum could be gained by following the simple instructions on the WMO QM website: [http://www.bom.gov.au/wmo/quality\\_management/docs/Yammer\\_Instructions.pdf](http://www.bom.gov.au/wmo/quality_management/docs/Yammer_Instructions.pdf).

3.41 The Commission also noted with appreciation that a “Guide to the Implementation of a Quality Management System for National Meteorological and Hydrological Services” (WMO-No. 1100), a generic step-by-step guide to the development and implementation of QMS for the delivery of all weather and ocean services, had been published in all WMO official languages and had been made available on the WMO website: [http://library.wmo.int/opac/index.php?lvl=notice\\_display&id=15574#.U4HUPfmSw2A](http://library.wmo.int/opac/index.php?lvl=notice_display&id=15574#.U4HUPfmSw2A).

3.42 The Commission was informed that the ToR of TT-QMS required the development of twinning/mentoring arrangements between Members with a well-developed QMS and other Members embarking on QMS e.g. building on examples set by Nigeria, Kenya and the United Republic of Tanzania. All of the TT members had been involved in providing mentorship roles with other WMO Members, providing practical knowledge, skills and a degree of confidence as Members took their first steps along the QM path. The twinning/mentoring arrangements had proved to have significant value and thus should be further promoted.

3.43 The Commission noted that a risk analysis conducted by TT-QMS focusing on the risks to the Member country, the aeronautical meteorological service provider and WMO if a QM approach was not adopted. To enable greater distribution of the risk analysis, it had been translated into Russian and Spanish and published on the WMO QM website ([http://www.bom.gov.au/wmo/quality\\_management/qm\\_resources.shtml](http://www.bom.gov.au/wmo/quality_management/qm_resources.shtml)).

3.44 The Commission noted further that, while the initial focus of TT-QMS had been the adoption of QM approach to the delivery of aeronautical meteorological services, the TT had been approached by other WMO Programmes seeking guidance and clarification on the adoption of a QM approach to the delivery of their services. The Commission recognized that further work would need to be done by the TT as the current WMO-No. 49 Volume IV, Quality Management would need to be updated in due course to provide a more generic approach in terms of its use from the broader WMO perspective and to accommodate the introduction of ISO 9001:2015.

### ***Implementation Coordination Team (ICT)***

3.45 The Commission recalled that the Implementation Coordination Team (ICT) was tasked to serve as the bridge between the WMO Regional Associations and CAeM, strengthening coordination and cooperation at the regional/subregional level on aeronautical meteorology. Ensuring systematic collection, analysis and sharing of best practices between Members, the ICT contributed to a clearer evaluation of the processes in AMP competence assessment, QMS implementation, SIGMET issuance, VA issues and cost recovery.

3.46 The Commission further noted that to evaluate Members' implementation status and to provide targeted assistance, ICT had coordinated the following activities: (a) implementation status analysis; (b) liaison with regional aviation task teams/subgroups; (c) monitoring regional AeM activities; (d) sharing best practices; and (e) consultation and advice with aviation experts. Better understanding of regional needs became possible through the WMO questionnaires and surveys carried out or facilitated by the team. The Commission appreciated the strong engagement of the ICT in compliance monitoring, especially the efforts made by the team in the CAeM Benchmarking Survey 2012, but learned of sometimes very deficient information flow from Members in some Regions, clearly supporting that further enhancement of cooperation, coordination and communication between the Commission and the regional associations would be required.

3.47 The Commission also noted with appreciation a number of successful training and implementation events for QMS, TAF verification, and competence assessments carried out under the guidance of ICT, and supported the notion that subregional cooperation agreements based on culturally, linguistic and historically homogenous regions appeared efficient and successful and could be further encouraged as complementary to the formal regional structures.

#### 4. FUTURE WORK PROGRAMME AND STRUCTURE OF THE COMMISSION (agenda item 4)

##### ***CAEM structure – establishment of subsidiary bodies***

4.1 The Commission expressed its gratitude for the work done by CAeM under its current structure, and noted that responsibilities were shared among Management Group members so that each member had a role to play in implementing the work programme.

4.2 The Commission discussed the most efficient way to organize its working structure, without increasing the cost, and in view of:

- (a) The Commission's terms of reference;
- (b) The priorities and expected results set by the WMO Strategic Plan (2012–2015) and the draft WMO Strategic and Operating Plan (2016–2019);
- (c) The challenges related to aeronautical meteorology identified by the regional associations and the need for the Commission to provide advice and guidance to Members to respond to those challenges;
- (d) The expected outcomes from the Conjoint MET Divisional Meeting related to the meteorological components of the ICAO Global Air Navigation Plan (GANP) and the Aviation System Block Upgrades (ASBU), and the need for regional and national planning of respective service improvements and institutional changes;
- (e) Available resources in terms of number of experts engaged in the work of the Commission's subsidiary bodies and the WMO regular budget allocated to support the work of the Commission.

4.3 The Commission decided to continue with a streamlined structure, focused on the essential role that the Commission must play and being more in line with the available resources in terms of expert participation and funding. The Commission stressed the important role of the CAeM Management Group in assessing, guiding and coordinating the work of the Expert Teams in making necessary adjustments during the intersessional period and in advising the president on relevant issues. The Commission therefore decided to re-establish the CAeM Management Group by adopting [Resolution 1 \(CAeM-15\) – Management Group of the Commission for Aeronautical Meteorology](#).

4.4 The Commission decided that its new structure of subsidiary bodies for the intersessional period 2014–2018 will comprise five small and focused Expert Teams covering specific implementation and coordination areas, as follows:

- (a) Expert Team on Communication, Coordination and Partnership (ET-CCP);
- (b) Expert Team on Aviation, Science and Climate (ET-ASC);
- (c) Expert Team on Education, Training and Competency (ET-ETC);
- (d) Expert Team on Governance (ET-GOV); and,
- (e) Expert Team on Information and Services for Aviation (ET-ISA).

The Commission established the new structure by adopting [Resolution 2 \(CAeM-15\) – Establishment of subsidiary bodies of the Commission for Aeronautical Meteorology](#).

4.5 The Commission noted that the Executive Council at its sixty-sixth session (June 2014) commended the work of the CAeM Task Team on QMS which had delivered a set of highly useful resources and tools to minimize the cost of establishing a QMS by Members. The Council noted that other WMO Programmes have approached the team for support, and have benefited from many of the resources developed for aviation. It was recalled that the WMO Strategy for Service Delivery referred to the QMS as a vital approach to all service areas and steps have been undertaken to promote QMS in the provision of services having important safety implications, such as, marine, hydrology, DRR, etc. Noting that the quality management was becoming a requisite function and managerial practice to be promoted through different service delivery areas, the Council requested the president of CAeM to ensure that the current TT-QMS would continue working until the end of the current financial period and support the transition to a new QMF structure to be decided by Cg-17.

4.6 The Commission reaffirmed its commitment to the main long-term objectives of the Aeronautical Meteorology Programme to ensure the worldwide, reliable provision of high quality, timely, cost-effective and responsive meteorological service to users throughout the world in support of safe, regular and efficient aviation operations. The Commission further recognized the fundamental importance of the work of the individual experts within the proposed structure to the accomplishment of the goals of the CAeM work programme. It therefore requested Members to ensure to the extent possible that their appointed experts were given support by their respective management and the opportunity to complete the tasks allocated by the Commission, and to provide resources to carry out the related activities.

4.7 Noting the need for outreach of the activities of the CAeM subsidiary bodies, the Commission encouraged its president and the WMO Secretariat to keep members of the Commission informed of progress in the work by all appropriate means, including the WMO website.

4.8 The Commission noted the inter-dependence of many activities between CBS, CIMO and CAS and the CAeM, and therefore requested the CAeM president to coordinate with CBS, CIMO and CAS on the appropriate joint working mechanisms to carry out cross-cutting activities. The Commission recommended to submit to the upcoming CBS Extraordinary Session (2014) relevant outcomes of the Conjoint MET Divisional Meeting (2014) as well as CAeM-15 with a request to CBS to consider their implications on future work programmes for WIS, WIGOS, DRR and service delivery programmes.

4.9 The Commission was informed that the Executive Council recently noted that space weather activities are becoming more closely aligned with the service programmes of WMO including aeronautical meteorology programme. Therefore, the Commission agreed to continue its coordination with the CBS on the space weather issues through the ICTSW, taking into consideration the outcome of the Conjoint MET Divisional Meeting (2014) while ensuring the right level of operational expertise on the ICTSW necessary to support the development of the provisions for space weather services in support of international air navigation.

### ***Review of CAeM terms of reference and operating plan***

#### ***CAeM Terms of Reference***

4.10 The Commission recalled that its current Terms of Reference (ToRs) had been decided by CAeM-XIV (2010) and aligned with the strategic thrusts and expected results of the then valid WMO Strategic Plan (2008–2011). In view of the continuing strategic planning process, including the current WMO Strategic Plan (2012–2015) and the draft Strategic and Operating Plan (2016–2019) endorsed by EC-66, the Commission felt that further alignments of the ToRs should be made to ensure more adequate representation of the role and responsibility of the Commission in the WMO integrated planning and implementation process.

4.11 The Commission noted the EC-66 decision to maintain aviation as a priority area under the proposed 2016–2019 Strategic and Operating Plan. The Commission further noted the EC-66 decision to undertake a review and prepare proposals relating to the work, interactions and content of the technical commissions, the working structures of the Executive Council and WMO Programmes delivering Expected Results (ER) 1, 2, 4 and 5. Given the above, the Commission recognized that its work contributes to and is influenced by several other key WMO priority areas such as WIS, WIGOS and Disaster Risk Reduction; therefore needs to further align its work programme towards ERs.

4.12 The Commission also considered the outcomes of the CAeM TECO (2014) (see the [annex to the present report](#)) and the Conjoint ICAO/WMO MET Divisional Meeting (2014) discussions and how these outcomes would impact on WMO strategic planning considerations well beyond the current 2015–2019 strategic and operational planning period. The Commission recognized that reducing societies' vulnerability to natural hazards, the transition to data-centric System Wide Information Management (SWIM) and associated governance principles coupled with increasingly regionalized models of quality and cost-effective aviation service delivery will inevitably pose significant challenges to all Members.

4.13 The Commission recalled further that the terms of reference of the technical commissions are composed by the general ToRs for all Commissions augmented by specific ToRs for each Commission which are all included in the WMO General Regulations, Annex III (WMO-No. 15). In reviewing its specific ToRs, the Commission agreed that they should reflect its assigned responsibilities, in many areas shared with ICAO and other relevant stakeholders, on matters relating to:

- (a) Furthering standardization of meteorological service provision to international air navigation and providing assistance to Members to achieve compliance with those standards;
- (b) Sharing of implementation experience, exchange of technology and research uptake;
- (c) Development of enhanced aeronautical meteorological services in support of the future Air Traffic Management system;
- (d) Education and training for aeronautical meteorological personnel;
- (e) Regional and national capacity development activities aimed at enhancing the delivery of quality aeronautical meteorological services;
- (f) Promote efficiency, effectiveness and develop governance guidance, including on data sharing, cost recovery for regional and sub-regional services;
- (g) Furthering the partnerships with relevant aviation user and stakeholder organizations.

4.14 The Commission adopted [Recommendation 1 \(CAeM-15\) – Terms of reference of the Commission for Aeronautical Meteorology](#); and [Recommendation 2 \(CAeM-15\) – Long-term planning to support aeronautical meteorology as a WMO strategic priority](#), requesting the Secretary-General to bring these recommendations to the attention of the forthcoming Cg-17 and EC-67 in 2015.

#### *CAeM Operating Plan*

4.15 The Commission noted the development of the new WMO Strategic and Operating Plan (2016–2019), to be considered by Cg-17 in May 2015, and acknowledged that aeronautical meteorology will continue to be amongst the key priorities for the Organization during the intersessional period as part of the overarching priority on enhanced Service Delivery. The Commission was informed that the new Operating Plan will be organization-wide and each technical commission is expected to develop its part of the Operating Plan including specific key

outcomes (KOs) and key performance indicators (KPIs) supplementing the global KOs and KPIs. In addition, to facilitate the monitoring and evaluation process, all plans should be synchronized and cover the same period.

4.16 The Commission agreed that the CAeM Operating Plan (2016–2019) should be developed by the Management Group based on the identified priorities and using the outcomes of the Technical Conference (2014) and the Conjoint MET Divisional Meeting. The Commission also agreed that the Operating Plan should essentially include the tasks and deliverables incorporated in the work plans of the Expert Teams in coordination with regional associations and should be aligned with the timeline of the Aviation System Block Upgrades.

*Internal matters, effectiveness and efficiency*

4.17 The Commission agreed on the need to continue to prioritize its tasks and deliverables in view of the limited resources available to the AEM programme. It requested the president to ensure, and the Secretariat to facilitate, effective and efficient working mechanisms and to look for further improvements that allow continuity of the activities. The Commission also requested the Management Group to work with the regional associations, Members and the Secretariat to monitor and evaluate the implementation of the work programme against the established KOs and KPTs.

4.18 The Commission appreciated the better use of the information technology in the work of subsidiary bodies, including the WMO CAeM website and online resources, supported by several Members maintaining specific portions of the web content. The Commission requested the president, assisted by the Secretariat, to develop and promote further the use of the website, online resources and virtual meetings by its subsidiary bodies.

4.19 The Commission requested the Secretary-General to ensure support, within available resources, for the activities of its subsidiary bodies at an adequate level to support the planned meetings of the Management Group and of the Expert Teams. At the same time, the Commission encouraged the developed Member countries providing experts to the subsidiary bodies, to continue supporting their participation in the necessary meetings as much as possible from their own resources, which would help allocate the AEM programme budget to support less developed Members.

4.20 The Commission requested all its members to be proactive during the intersessional period and participate in the different consultation activities. In particular, members were requested to facilitate the gathering of monitoring information through surveys conducted by Expert Teams and to provide timely updates to the WMO Country Profile Data Base and other relevant publications on matters related to aeronautical meteorology.

**5. ELECTION OF OFFICERS** (agenda item 5)

5.1 Mr C.M. SHUN (Hong Kong, China) was elected as president of the Commission.

5.2 Mr Ian LISK (United Kingdom of Great Britain and Northern Ireland) was elected as vice-president of the Commission.

**6. REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS** (agenda item 6)

6.1 In accordance with the WMO General Regulation 191, the Commission examined those resolutions and recommendations adopted by CAeM prior to its fifteenth session, which were still in force. The Commission also noted that action on most of the previous recommendations had already been taken and completed, or their substance incorporated into the WMO Technical Regulations, as

appropriate. The Commission therefore adopted [Resolution 3 \(CAeM-15\) – Review of previous resolutions and recommendations of the Commission for Aeronautical Meteorology](#).

6.2 The Commission examined resolutions of the Executive Council within the field of the activities of CAeM and adopted [Recommendation 3 \(CAeM-15\) – Review of relevant resolutions of the Executive Council based on previous recommendations of the Commission for Aeronautical Meteorology](#).

**7. ANY OTHER BUSINESS** (agenda item 7)

There was no other business.

**8. DATE AND PLACE OF THE SIXTEENTH SESSION** (agenda item 8)

In accordance with Regulations 188 and 189 of the WMO General Regulations, the president of the Commission should determine the date and place of the sixteenth session in agreement with the President of the World Meteorological Organization and after consultation with the Secretary-General, during the intersessional period.

**9. CLOSURE OF THE SESSION** (agenda item 9)

The fifteenth session of the Commission for Aeronautical Meteorology closed at 12:36 p.m. on 16 July 2014.

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# RESOLUTIONS ADOPTED BY THE SESSION

## Resolution 1 (CAeM-15)

### MANAGEMENT GROUP OF THE COMMISSION FOR AERONAUTICAL METEOROLOGY

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

#### Noting:

- (1) The positive experience of the CAeM Management Group regarding its coordination and governance role during the intersessional period 2010–2014,
- (2) The report of the president of the Commission to the Commission at its fifteenth session outlining the role of the Management Group in the successful conduct of the Commission's tasks and activities,
- (3) The established working arrangements and responsibilities among the Management Group members in implementing the Commission's work programme,

#### Recognizing:

- (1) That the effectiveness of the Commission depends to a large extent on the effective management and coordination of its activities during the intersessional periods,
- (2) That the Management Group is required to ensure the integrity of all activities of the Commission and the alignment of its work programme with the priorities and expected results of the WMO Strategic and Operating Plans,
- (3) The need for systematic monitoring and evaluation of the progress achieved with the implementation of the established work programme and appropriate adjustments during the intersessional period,
- (4) The need to respond promptly to matters of urgency including crisis situations affecting air transport and service provision by Members,

#### Decides:

- (1) To re-establish the CAeM Management Group with the following terms of reference:
  - (a) To assist the president in guiding and coordinating the activities of the Commission and its subsidiary bodies during the intersessional period 2014–2018;
  - (b) To ensure that the Commission effectively contributes to achieving the strategic objectives and expected results of the WMO Strategic and Operating Plans directly and through the activities of its subsidiary bodies;
  - (c) To ensure that the activities of the Commission meet the needs of developing and least developed countries, in particular for training in aeronautical meteorology, as well as for implementing quality management systems, cost recovery, and competency and qualification standards for aeronautical meteorological personnel;
  - (d) To keep Members abreast of the activities of the Commission and the results achieved by its subsidiary bodies, through the websites of the Commission and the Aeronautical Meteorology Programme and via other means;

- (e) To review requests for advice and assistance from regional associations on matters within the field of competence of the Commission and ensure prompt follow-up actions, as necessary;
  - (f) To ensure coordination and collaboration with other WMO constituent bodies on cross-cutting issues, in particular with the Commission for Basic Systems, the Commission for Atmospheric Sciences and the Commission for Instruments and Methods of Observation, in pursuit of effective incorporation of science and technology advancements into the operational practice;
  - (g) To ensure continued cooperation and collaboration with partners, in particular with the International Civil Aviation Organization and users' organizations, as well as with other partner organizations at global and regional levels;
  - (h) To assist the president, as required, to make decisions on behalf of the Commission during the intersessional period on matters of urgency;
- (2) That the composition of the CAeM Management Group shall be as follows:
- (a) The president of the Commission (Chairperson);
  - (b) The vice-president of the Commission;
  - (c) The chairpersons of:
    - (i) The Expert Team on Communication, Coordination and Partnership;
    - (ii) The Expert Team on Aviation, Science and Climate;
    - (iii) The Expert Team on Education, Training and Competency;
    - (iv) The Expert Team on Governance;
    - (v) The Expert Team on Information and Services for Aviation;

**Requests** the presidents of regional associations to designate experts to liaise with the Management Group on regional aspects of aeronautical meteorology;

**Requests** the presidents of technical commissions to ensure coordination with the Commission with regard to science and technology issues related to aeronautical meteorology and designate liaison experts to support the Management Group as appropriate;

**Requests** the Secretary-General to invite the International Civil Aviation Organization and, as necessary, other appropriate international organizations, by agreement with the president, to participate in the work of the Management Group as observers;

**Authorizes** the president to invite such additional experts as are necessary, resources permitting, to participate in the work of the Management Group.

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**Note:** This resolution replaces Resolution 1 (CAeM-XIV), which is no longer in force.

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**Resolution 2 (CAeM-15)****ESTABLISHMENT OF SUBSIDIARY BODIES OF THE COMMISSION FOR AERONAUTICAL METEOROLOGY**

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

**Noting:**

- (1) The need for providing advice and guidance to Members in order to enhance their compliance with the standards and recommended practices of the International Civil Aviation Organization (ICAO) and the World Meteorological Organization (WMO) for the provision of aeronautical meteorological services,
- (2) The expected changes in the service delivery models and respective governance of aeronautical meteorological services related to the implementation of the ICAO Global Air Navigation Plan and the Aviation System Block Upgrades methodology, and the urgent need to raise awareness and change planning in this regard,
- (3) The need to provide continued guidance and assistance to Members regarding the implementation of quality management, cost recovery, and competency and qualification requirements, as mandated by WMO and ICAO,
- (4) The need to address the impacts of climate change and variability on aviation transport by raising awareness and contributing to potential mitigation measures,

**Considering:**

- (1) The leading role of the WMO Aeronautical Meteorology Programme in the development of new and improved services to aviation to support the planned air traffic management improvements in the Global Air Navigation Plan and the Aviation System Block Upgrades,
- (2) The need for guidance and assistance to ensure full compliance with the quality management system and competency and qualification requirements in a sustainable manner by all Members,
- (3) The important role of aeronautical meteorological service in contributing to the vitality and relevance of many National Meteorological and Hydrological Services,
- (4) The need for Members to adapt operational and management practices to the foreseen regulatory changes, including the trend towards regionalization of the services,

**Decides**, in accordance with General Regulation 33 of the WMO General Regulations, to establish the following CAeM subsidiary bodies:

- (1) The Expert Team on Communication, Coordination and Partnership, with the following terms of reference:
  - (a) To ensure effective two-way communication with Members and partner organizations, such as the International Civil Aviation Organization and the International Air Transport Association, on issues of concern of the WMO Aeronautical Meteorology Programme;
  - (b) To promote effective communication with the regional associations and coordinate appropriate response to their requests for advice and guidance concerning gaps and challenges in aeronautical meteorological service provision in their respective Regions;

- (c) To establish an effective mechanism for the monitoring and evaluation of the CAeM work programme as an integral part of the WMO monitoring and evaluation system;
  - (d) To provide support to the Secretariat in developing and updating relevant databases with regard to Aeronautical Meteorology Programme entries;
  - (e) To report regularly on progress to the president of the Commission;
- (2) The Expert Team on Aviation, Science and Climate, with the following terms of reference:
- (a) To deal with issues of research and development related to road maps and concepts of operations for, inter alia, the World Area Forecast System, the International Airways Volcano Watch, and space weather, in close collaboration with the Inter-programme Coordination Team on Space Weather and the WMO-IUGG Volcanic Ash Scientific Advisory Group;
  - (b) To coordinate research and development activities in the area of nowcasting and very short-range forecasting in collaboration with the Commission for Atmospheric Sciences;
  - (c) To address issues related to the impacts of climate change and variability on aviation, including seasonal and interannual changes, in coordination with relevant bodies and programmes such as the Global Framework for Climate Services, the Global Data-processing and Forecasting System and the ICAO Committee on Aviation Environmental Protection;
  - (d) To coordinate research and development activities related to observing systems, including the detection and quantification of volcanic ash, lightning, wind shear and wake vortex conditions, in collaboration with relevant subsidiary bodies of the Commission for Instruments and Methods of Observation and the Commission for Basic Systems;
  - (e) To report regularly on progress to the president of the Commission;
- (3) The Expert Team on Education, Training and Competency, with the following terms of reference:
- (a) To provide guidance on the implementation of WMO standards and recommended practices related to the competency and qualifications of aeronautical meteorological personnel;
  - (b) To facilitate efficient methods of education and training in aeronautical meteorology by making education and training resources available online;
  - (c) To encourage the sharing of education and training resources as well as best practices;
  - (d) To look for cost-effective training opportunities and seek in kind contributions to make these available in the WMO official languages;
  - (e) To coordinate with the Executive Council Panel of Experts on Education and Training in developing and updating WMO provisions on the competency and qualifications of aeronautical meteorological personnel for inclusion in the WMO Technical Regulations and related guides;
  - (f) To address aeronautical users' needs for training in aeronautical meteorology by developing appropriate guidelines and other relevant material;

- (g) To address emerging training and education needs for enhanced meteorological services stemming from the Global Air Navigation Plan and the Aviation System Block Upgrades;
  - (h) To report regularly on progress to the president of the Commission;
- (4) The Expert Team on Governance, with the following terms of reference:
- (a) To monitor implementation of the quality management system requirements and provide advice to Members on implementing these requirements in a sustainable manner, with such a task being undertaken by the Task Team on Quality Management Systems until the Seventeenth World Meteorological Congress;
  - (b) To address governance issues related to service improvements and institutional changes stemming from the Global Air Navigation Plan and the Aviation System Block Upgrades, including but not limited to cost recovery and the regionalization of aeronautical meteorological services;
  - (c) To contribute to a sustainable and effective relationship between WMO and ICAO, including providing advice on the revision of the working arrangements between the two organizations and proposing WMO representation, where applicable, on relevant ICAO expert groups;
  - (d) To share best practices and assist Members in establishing optimal governance at national level with regard to meteorological authorities and meteorological service providers and their roles and responsibility;
  - (e) To address social justice issues, including gender and equality, in accordance with relevant WMO policies;
  - (f) To report regularly on progress to the president of the Commission;
- (5) The Expert Team on Information and Services for Aviation, with the following terms of reference:
- (a) To work closely with ICAO and other partners in developing relevant background material, methodologies and implementation guidance on the meteorological components of the Aviation System Block Upgrades, based on identified user requirements;
  - (b) To develop relevant performance metrics and verification methodologies;
  - (c) To contribute to the development of aeronautical meteorological services that underpin collaborative decision-making and common situational awareness, in close collaboration with ICAO;
  - (d) To address the service-related components of the road maps and concepts of operations, including the development of meteorological information services, in collaboration with ICAO;
  - (e) To cooperate with relevant subsidiary bodies of WMO and ICAO on exchange models for aeronautical meteorological data and information;
  - (f) To report regularly on progress to the president of the Commission;

**Further decides** to select, in accordance with General Regulation 33 of the WMO General Regulations:

- (1) Marina Petrova (Russian Federation) and Gaborekwe Khambule (South Africa) as co-Chairpersons of the Expert Team on Communication, Coordination and Partnership;
- (2) Herbert Puempel (Austria) as Chairperson of the Expert Team on Aviation, Science and Climate;
- (3) Cyndie Abelman (United States) and Chris Webster (New Zealand) as co-Chairpersons of the Expert Team on Education, Training and Competency;
- (4) Jan Sondij (Netherlands) and Kent Johnson (Canada) as co-Chairpersons of the Expert Team on Governance;
- (5) Stéphanie Desbios (France) and Jun Ryuzaki (Japan) as co-Chairpersons of the Expert Team on Information and Services for Aviation;

**Requests** the chairpersons and co-chairpersons of the expert teams to submit to the Management Group within 60 days their proposals for the work programme and core experts (not more than five for each expert team) in order to finalize the composition of the expert teams;

**Requests** Members to provide full support to their experts appointed to such teams in conducting all the tasks assigned by the Commission;

**Requests** the Secretary-General to invite ICAO and, as appropriate, other international organizations, by agreement with the president, to participate in the work of the CAeM subsidiary bodies.

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**Note:** This resolution replaces Resolution 2 (CAeM-XIV), which is no longer in force.

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### **Resolution 3 (CAeM-15)**

#### **REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS OF THE COMMISSION FOR AERONAUTICAL METEOROLOGY**

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

**Noting** the actions taken on the resolutions and recommendations adopted by the Commission prior to its fifteenth session,

**Decides:**

- (1) To keep in force Resolution 5 (CAeM-XIII) – Participation of women in the work of the Commission;
- (2) Not to keep in force other resolutions and recommendations adopted before its fifteenth session.

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**Note:** This resolution replaces Resolution 3 (CAeM-XIV), which is no longer in force.

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# RECOMMENDATIONS ADOPTED BY THE SESSION

## Recommendation 1 (CAeM-15)

### TERMS OF REFERENCE OF THE COMMISSION FOR AERONAUTICAL METEOROLOGY

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

**Noting:**

- (1) The *WMO Strategic Plan 2012–2015* (WMO-No. 1069),
- (2) The draft WMO Strategic and Operating Plans (2016–2019) endorsed by the Executive Council at its sixty-sixth session,
- (3) The tasks of the Commission for Aeronautical Meteorology stemming from the Global Air Navigation Plan of the International Civil Aviation Organization, and its Aviation System Block Upgrades methodology,

**Recognizing** that the terms of reference of the Commission have to be aligned with the forthcoming implementation of the Global Air Navigation Plan and relevant Aviation System Block Upgrades related to aeronautical meteorology,

**Recognizing further** the responsibility of the Commission in fulfilling the strategic priorities and expected results of the draft WMO Strategic and Operating Plans (2016–2019),

**Recommends** that the terms of reference of the Commission be amended as given in the annex to the present recommendation;

**Requests** the Secretary-General to bring the present recommendation to the attention of the Seventeenth World Meteorological Congress in 2015 to consider respective amendment to the WMO General Regulations, Annex III – Structure and terms of reference of technical commissions, as published in *Basic Documents No. 1* (WMO-No. 15).

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## Annex to Recommendation 1 (CAeM-15)

### TERMS OF REFERENCE OF THE COMMISSION FOR AERONAUTICAL METEOROLOGY

#### Commission for Aeronautical Meteorology (CAeM)

The terms of reference of the Commission for Aeronautical Meteorology shall be:

- (a) To contribute, in close collaboration with ICAO, to furthering the international standardization of meteorological service provision to international air navigation and provide assistance to Members to achieve compliance with those standards;
- (b) To promote and facilitate, in collaboration with relevant WMO bodies, the international sharing of implementation experience, exchange of technology and research uptake, including appropriate pilot projects, to meet evolving user requirements for aeronautical meteorological information and services;

- (c) To participate, in close collaboration with ICAO and other relevant stakeholders, in the development of enhanced aeronautical meteorological services in support of the future Air Traffic Management system;
- (d) To coordinate development of guidance, training material and learning opportunities in collaboration with other WMO bodies and ICAO, to ensure Members' compliance with the competency and qualification requirements for aeronautical meteorological personnel;
- (e) To review and respond to Members' aeronautical meteorology prioritized needs and support capacity development activities, in cooperation with regional associations, aimed at enhancing the delivery of quality aeronautical meteorological services, especially by developing and least developed Members;
- (f) To promote good governance and efficiency, in cooperation with ICAO, regional bodies and Members, including enhanced regional and sub-regional cooperation in aeronautical meteorological service delivery and development of related cost-recovery mechanisms;
- (g) To maintain existing and develop further partnerships with relevant aviation user and stakeholder organizations and collaborate on issues related to aeronautical meteorology.

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### **Recommendation 2 (CAeM-15)**

#### **LONG-TERM PLANNING TO SUPPORT AERONAUTICAL METEOROLOGY AS A WMO STRATEGIC PRIORITY**

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

**Noting:**

- (1) The *WMO Strategic Plan 2012–2015* (WMO-No. 1069),
- (2) The draft WMO Strategic and Operating Plans (2016–2019) endorsed by the Executive Council at its sixty-sixth session,
- (3) The meteorology component of the International Civil Aviation Organization (ICAO) Global Air Navigation Plan and its Aviation System Block Upgrades methodology,
- (4) The outcomes of the CAeM Technical Conference (TECO-2014),

**Recognizing** the responsibility of the Commission in fulfilling the strategic priorities and expected results of the draft WMO Strategic and Operating Plans (2016–2019),

**Recognizing further** the long-term planning envisaged in the Global Air Navigation Plan and the Aviation System Block Upgrades with a time horizon of 2028 and beyond, the related impacts on Members and the need for the Commission to ensure synchronized planning of related WMO activities,

**Recommends:**

- (1) That aeronautical meteorology continue to be given high priority in the WMO strategic planning;
- (2) That a longer-term planning approach be applied to the Aeronautical Meteorology Programme consistent with the Aviation System Block Upgrades methodology and timeline;

- (3) That special attention be given to the governance issues related to changing service delivery models, including the regionalization and globalization of services;
- (4) That a coherent approach be applied to the information management being developed by WMO and ICAO (that is, the WMO Information System and the System-wide Information Management) to ensure full interoperability;
- (5) That relevant capacity development programmes be designed to assist Members in adapting to the changes in aeronautical meteorological service provision;

**Requests** the Secretary-General to bring the present recommendation to the attention of the Seventeenth World Meteorological Congress in 2015 and other relevant bodies engaged in the WMO strategic planning process.

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### **Recommendation 3 (CAeM-15)**

#### **REVIEW OF RELEVANT RESOLUTIONS OF THE EXECUTIVE COUNCIL BASED ON PREVIOUS RECOMMENDATIONS OF THE COMMISSION FOR AERONAUTICAL METEOROLOGY**

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

**Noting** with satisfaction the action taken by the Executive Council on the previous recommendations of the Commission for Aeronautical Meteorology or concerning the Commission,

**Recommends:**

- (1) That resolutions 6 (EC-LXII), 16 (EC-LXII), 17 (EC-LXII) and 3 (EC-65) be no longer considered necessary;
- (2) That Resolution 6 (EC-64) be kept in force.

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**Note:** This recommendation replaces Recommendation 4 (CAeM-XIV), which is no longer in force.

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# ANNEX

## ANNEX

### Annex to [paragraph 4.12](#) of the general summary

#### AVIATION METEOROLOGY: BUILDING BLOCKS FOR THE FUTURE (TECO-2014)

##### Outcome of discussions on challenges and opportunities

1. The CAeM Technical Conference “Aviation Meteorology – Building Blocks for the Future” was held in Montreal, Canada on 7 and 8 July 2014. Topics selected for the Conference reflected issues that were in the focus of the conjoint ICAO/WMO Divisional Meeting, including: the planned evolution of the global ATM system according to the ICAO Global Air Navigation Plan (GANP) through the Aviation System Blocks Upgrade (ASBU) approach and related impacts on meteorological service provision; the future of existing meteorological services, such as WAFS and IAVW, as well as emerging services, like “Space Weather”; and possible impacts of climate change on aviation. The Conference was presented as a series of keynotes from leading subject matter experts, followed by facilitated discussions in five regional breakout groups to ensure the maximum engagement of participants.
2. The TECO was informed about the position statement by EC-66 on the Conjoint Meteorology Division Meeting and identified a number of common challenges and priorities for all regions, as well as some issues which were region-specific. The following is a summary of the challenges and issues presented by the rapporteurs of the breakout groups:

***Session 1: Evolution of ATM (Global Air Navigation Plan (GANP), Aviation System Block Upgrades (ASBU), System-Wide Information management (SWIM); regional and national developments; users' perspective) – Challenges and Opportunities***

- There is an urgent need to raise the awareness amongst WMO Members of the GANP and ASBU, the resultant changes in the MET service provision and the respective impact on NMHSs and Aviation Meteorological Service Providers (AMSPs). It was recognized that WMO will have a key role in helping Members to address the challenges associated with the implementation of the GANP, especially with regards to the sustainable upkeep and development of underpinning observing infrastructure and networks. The proposed regionalized modes of service delivery will have significant implications on the sovereign rights of States to determine national modes of service delivery. This needs to be properly addressed for the proposed changes to be successful.
- Strong concerns were raised that many Members would not be able to keep up with the pace of change - it should after all be remembered that many Members in the developing world are still struggling to implement the QMS and personnel competency requirements. The successful implementation of the GANP will require additional human, technological and financial resources. It was agreed that scalable solutions with inclusiveness principle engaging all Members, driven by realistic implementation targets and supported by effective and sustainable cost recovery will therefore be required.
- The new information management systems required to implement SWIM will pose major challenges. More clarity is needed regarding SWIM infrastructure and data governance requirements as well as the links and synergies with existing WMO programmes such as the WMO Information System (WIS). It was also recognized that implementation of SWIM will require greater interoperability and harmonization of data provision, while the accuracy, credibility and fit-for-purpose of the data to be shared have to be ensured.
- The development of business models to support sub-regionally based service provision, are recognized as an opportunity for enhanced cooperation with the development of the partnerships with users and stakeholders could result in cost efficiencies and the sharing of



best practice. Development of supporting governance principles, including effective cost-recovery mechanisms would be of paramount importance.

- Further work is needed to better understand the user requirements. This will require improved interaction, coordination and mutual understanding with all user groups in order to underline the relevance and importance of meteorological information in the aviation service delivery 'value chain'.

**Session 2: *Meteorological service provision in the context of evolving global air navigation planning (Aviation MET Service provision road maps and ConOps (WAFS, IAVW, Space Weather), trajectory-based operations (TBO); governance, QMS, cost-recovery – regional examples)***

- Paradigm shift “product-centric to data-centric” needs to be explained and understood in order to facilitate its practical implementation.
- Strong Air Traffic Management (ATM) drivers for improved accuracy, resolution, update frequency and cost effectiveness need to be addressed within the timeline of ASBU.
- Consolidation and regionalization as evidenced by the roll-out of Regional Hazardous Weather Advisory Centers (RHWAC) seem to be inevitable and necessary and can be seen as an opportunity to resolve long-standing deficiencies, especially with regards to SIGMET provision.
- The multi-national AMSP best practices demonstrated by ASECNA and some European Nordic countries should be promoted although it is recognized that work is necessary to further develop the associated governance and cost-recovery principles.
- GANP and ASBU will require improved performance in risk- and impact-based services and this will again require the pull through of new science and technologies into operations.
- Competition with private/commercial sector service providers remains a serious issue for most NMHSs but should also be seen as an incentive for NMHS to demonstrate quality, compliance and resultant cost-effectiveness.
- The roadmaps for future regional and global service models (e.g., IAVW, WAFS) need to be continuously developed and assessed in the planning for the later stages of ASBU (e.g., 2028+).

**Session 3: *Emerging services – Space weather***

- TECO welcomed the presentations on the current status of space weather science and the impact of space weather on aviation. TECO also appreciated the information from the WMO Inter-programme Coordination Team on Space Weather (ICTSW) that advises WMO and ICAO on the status and development of the science and observational capabilities necessary to support operational space weather services for international air navigation.

**Session 4: *Climate change impacts on aviation***

- TECO noted the interest expressed by partner organizations in studying the possible impacts of climate change on air transport operations. Impact studies are at a very early stage although TECO was informed of the potential high impacts associated with changing weather patterns in terms of airport operations, en route weather and the likely changes in routes caused by climate change induced impacts on global trade, tourism, industry and migration routes.
  - TECO was pleased to hear that the Commission will include the subject of climate change impacts in its future work programme.
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# APPENDIX

## LIST OF PARTICIPANTS

### 1. Officers of the session

C.M. SHUN (Hong Kong, China)	President
Ian Lisk (United Kingdom)	Vice-President

### 2. Representatives of Members of CAeM

#### Antigua and Barbuda

Orvin PAIGE	Delegate
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#### Argentina

Claudia Marcela CAMPETELLA (Ms)	Principal Delegate
Jorge Oscar LEGUIZAMÓN	Alternate

#### Australia

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Susan O'ROURKE (Ms)	Alternate
Michael BERECHREE	Delegate
Jennifer BIRDSALL (Ms)	Delegate
Gordon JACKSON	Delegate

#### Austria

Herbert PUEMPEL	Principal Delegate
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#### Belgium

Bart NICOLAI	Principal Delegate
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#### Botswana

Othata MMOLOTSI	Principal Delegate
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#### Brazil

Flavio Santos de CERQUEIRA	Principal Delegate
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#### British Caribbean Territories

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Margarette MAYERS (Ms)	Delegate

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Gergana Tsancheva KOZINAROVA (Ms)	Delegate

#### Burkina Faso

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Kent JOHNSON	Delegate
Eric DUPUIS	Adviser

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Zhongfeng ZHANG	Alternate

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Dongyan MAO (Ms)	Delegate
Jun YU	Delegate
Juan ZOU (Ms)	Delegate
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Alen Sajko	Delegate
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Søren E. OLUFSEN	Delegate
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**Portugal**

Carlos Barão MATEUS	Principal Delegate
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Paul BUGEAC	Adviser

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Tatiana K. KULIK (Ms)	Delegate
Juliya N.NARYSHKINA (Ms)	Delegate
Olga G. PETROVA (Ms)	Delegate

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<b>Turkmenistan</b> Satlykbibi ATLIEVA (Ms) Akmurat SAIDOV	Delegate Delegate
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<b>Ukraine</b> Tetiana ANTONENKO (Ms)	Principal Delegate
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Micah NAMUKOLO	Delegate

**Zimbabwe**

Gilbert Diwah TAVONGA	Delegate
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**3. Representatives of non-Members of CAeM****Bahrain**

Anwar Yusuf AL-MULLA	Principal Delegate
Ahmed Ali Ismail AL-SAYED	Delegate

**4. Representatives of international organizations****Agency for Air Navigation Safety in Africa and Madagascar (ASECNA)**

Aimée Claire ANDRIAMALAZA (Ms)	Observer
Goama ILBOUDO	Observer
Charles Kouadio KANGA	Observer

**European Organization for the Safety of Air Navigation (EUROCONTROL)**

Dennis HART	Observer
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**International Civil Aviation Organization (ICAO)**

Greg BROCK	Observer
Neil HALSEY	Observer
Raul ROMERO	Observer

**International Federation of Airline Pilots' Associations (IFALPA)**

Carole COUCHMAN (Ms)	Observer
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**5. Invited expert/lecturer**

Paul JOE	Environment Canada
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