

Commission for Aeronautical Meteorology

Abridged Final Report of the Sixteenth Session

Exeter

24–27 July 2018



WORLD
METEOROLOGICAL
ORGANIZATION

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Chairperson, Publications Board
World Meteorological Organization (WMO)
7 bis, avenue de la Paix
P.O. Box 2300
CH-1211 Geneva 2, Switzerland

Tel.: +41 (0) 22 730 84 03
Fax: +41 (0) 22 730 81 17
Email: publications@wmo.int

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This report contains the text as adopted by Plenary and has been issued without formal editing. Acronyms used in this report may be found in METEOTERM, the WMO terminology database, at <http://public.wmo.int/en/resources/meteoterm>.

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GENERAL SUMMARY OF THE WORK OF THE SESSION

1. The president of the Commission for Aeronautical Meteorology (CAeM), Mr Chi-ming Shun, opened the sixteenth session of the Commission on 24 July 2018 at 9.30 a.m. at the University of Exeter, Exeter, United Kingdom of Great Britain and Northern Ireland. The president thanked the United Kingdom for hosting the session, with a particular acknowledgement to the supporting staff of the Met Office and the University of Exeter. During his opening remarks, the president highlighted some of the many achievements of the Commission during his eight-year tenure as president, including the progress made in the implementation of the quality management system and the competency and qualification of aeronautical meteorological personnel, the significant progress in the Aviation Research and Development Project, advancement of volcanic ash science and support to the establishment of a global space weather service. A major achievement of the Commission, in partnership with the Commissions for Basic Systems and for Atmospheric Sciences, was the highly successful Aeronautical Meteorology Scientific Conference hosted by France in November 2017. This event addressed the significant pace of scientific and technological advancement that was demanding accelerated transition from research to operations and science to services in order to meet the evolving needs of aviation users. The impacts of climate change and variability on aviation operations were also highlighted as an emerging area that would demand an appropriate level of response from the aeronautical meteorology community. In concluding his remarks, Mr Shun said that his tenure as president had been a rewarding one, and that he hoped for healthy and fruitful discussions during the session and in the subsequent work of the Commission.

In his welcome address to the session on behalf of the Secretary-General, Dr Wenjian Zhang, Assistant Secretary-General of WMO, highlighted the crucial role that WMO and its Members play in the provision of meteorological services to aviation and in coordinating, cooperating and collaborating with the International Civil Aviation Organization and other relevant partners. Dr Zhang also referred to the decisions of the Executive Council at its seventieth session concerning the proposed reform of the WMO constituent bodies, which was a Members-driven process aimed at a more result-oriented and efficient Organization capable of meeting the new technological and societal challenges. He stressed that the planned consolidation of the technical bodies dealing with services and applications would ensure a holistic approach and consistency of the WMO normative work in these areas. Dr Zhang acknowledged that CAeM, in its long history, had always excelled and met the expectations of the community. Dr Zhang was confident that in the transition to the new structure the important work being undertaken by the Commission (or its successor) in supporting the delivery of the Aeronautical Meteorology Programme would be sustained, in full alignment with the strategic and operating plans of the Organization.

Mr Philip Evans, Chief Operating Officer of the Met Office and Permanent Representative of the United Kingdom with WMO, also addressed the opening of the session, warmly welcoming all delegates and wishing everyone a productive session.

2. The agenda of the session is provided in [Appendix 1](#).
3. The session adopted six resolutions given in [Appendix 2](#), six decisions given in [Appendix 3](#) and seven recommendations given in [Appendix 4](#).
4. The Commission elected Mr Ian Lisk (United Kingdom) as president and Ms Stéphanie Desbios (France) as vice-president.
5. The list of participants is given in [Appendix 5](#). Out of a total of 159 participants, 37 were women, that is, 23%.

6. The Commission, having noted the ongoing work on the WMO constituent bodies reform and the directions given by the Executive Council in the Recommendation 25 (EC-70) – WMO technical commissions and other bodies, and Resolution 36 (EC-70) – WMO Constituent Bodies Reform Transition Plan and Communication Strategy, agreed that the date and place of the next session of the Commission (or its successor) would be decided after the finalization of the reform proposal at the Eighteenth World Meteorological Congress in June 2019. The Commission requested the president, assisted by the Secretariat, to ensure a timely notification to Members of the planning for the next session/meeting.
7. The sixteenth session of CAeM closed at 11.52 a.m. on 27 July 2018.

APPENDIX 1. AGENDA

1. ORGANIZATION OF THE SESSION

- 1.1 Opening of the session
- 1.2 Consideration of the report on credentials
- 1.3 Approval of the agenda
- 1.4 Establishment of committees
- 1.5 Other organizational matters
- 1.6 Date and place of the next session
- 1.7 Closure of the session

2. REPORT BY THE PRESIDENT OF THE COMMISSION

3. REPORTS BY THE CHAIRPERSONS/CO-CHAIRPERSONS OF EXPERT TEAMS AND OTHER RELEVANT GROUPS

- 3.1 Expert team reports
- 3.2 Other relevant groups

4. CONSIDERATION OF THE WMO PROGRAMMES RELEVANT TO THE COMMISSION

5. COOPERATION WITH OTHER INTERNATIONAL ORGANIZATIONS RELEVANT TO THE COMMISSION

- 5.1 International Civil Aviation Organization
- 5.2 Other international organizations with which WMO has agreements or working arrangements

6. CONSIDERATION OF STRATEGIC PLANNING RELEVANT TO THE COMMISSION

- 6.1 WMO Strategic Plan and Operating Plan (2020–2023)
- 6.2 Report on the 2018 Technical Conference
- 6.3 Long-term plan for the Aeronautical Meteorology Programme

7. WMO REGULATORY AND GUIDANCE MATERIAL RELEVANT TO THE COMMISSION

8. WMO CONSTITUENT BODY REFORM AND ITS IMPLICATIONS FOR THE COMMISSION

- 8.1 WMO constituent body reform status and foreseen next steps
- 8.2 Working structure of the Commission, including establishment of subsidiary bodies

9. REVIEW OF PREVIOUS RESOLUTIONS AND RECOMMENDATIONS

- 9.1 Previous resolutions and recommendations of the Commission
- 9.2 Executive Council resolutions related to the Commission

10. ELECTION OF OFFICERS**11. ANY OTHER BUSINESS**

APPENDIX 2. RESOLUTIONS ADOPTED BY THE SESSION

Resolution 1 (CAeM-16)

Report by the president of the Commission for Aeronautical Meteorology

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Recalling:

- (1) Resolution 1 (CAeM-15) – Management Group of the Commission for Aeronautical Meteorology,
- (2) Resolution 2 (CAeM-15) – Establishment of subsidiary bodies of the Commission for Aeronautical Meteorology,

Noting Regulation 186 of the WMO General Regulations concerning the duties of the president of a commission,

Noting also the report of the president of the Commission for Aeronautical Meteorology (CAeM) (CAeM-16/INF. 2), which provides an overview of the progress of the work of the Commission since its fifteenth session,

Mindful of the current and foreseen issues facing aeronautical meteorological service provision, strategic and operational planning, as well as WMO reform considerations relevant to CAeM as highlighted in the president's report,

Appreciates the dedicated efforts of the president, vice-president, expert team co-chairpersons and core members with respect to their individual contributions and collective achievements, as manifested in the outputs of CAeM during the intersessional period;

Decides to endorse the report of the president as submitted to CAeM at its sixteenth session;

Requests the president of CAeM to ensure that the future outputs of CAeM, which are a fundamental contribution to the ability of National Meteorological and Hydrological Services to provide high-quality meteorological services for international air navigation, continue to be well documented and well communicated to WMO Members and aviation stakeholders;

Requests the Secretary-General to make available the necessary resources to support and sustain the future work of the Commission (or its successor).

Resolution 2 (CAeM-16)

Strategic planning considerations

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Noting:

- (1) Recommendation 20 (EC-70) – WMO Strategic Plan,
- (2) Recommendation 21 (EC-70) – Maximum expenditure for the eighteenth financial period (2020–2023),

Having been informed of the main components of the draft WMO Strategic Plan, draft Operating Plan and draft Results-based Budget for the next WMO financial period (2020–2023),

Taking note that the activities of the Organization in respect of aeronautical meteorological services are reflected in several long-term goals and strategic objectives of the WMO Strategic Plan, in particular:

- (1) Long-term goal 1 – Better serve societal needs: delivering authoritative, accessible, user-oriented and fit-for-purpose information and services,
- (2) Strategic objective 1.1 – Strengthen national multi-hazard early warning/alert systems and extend reach to better enable effective response to the associated risks,
- (3) Strategic objective 1.4 – Enhance the value and innovate the provision of decision-supporting weather information and services,

Mindful that, through Recommendation 6 (CAeM-16), it was agreed that the Commission for Aeronautical Meteorology (CAeM) (or its successor) should progress work in the context of a number of priority themes during the eighteenth financial period (2020–2023),

Agrees that the WMO Operating Plan 2020–2023 should reflect the expected outcomes and benefits for Members, use the agreed performance indicators, and detail outputs and milestones, activities, risks and mitigation measures. This should be done at a global level and cover any associated regional aspects. In addition, current programmes, working bodies and partners should be included;

Requests the president of CAeM to assist the Secretary-General in the strengthening and finalization of the WMO Operating Plan 2020–2023 in respect of aeronautical meteorological services related to all relevant strategic objectives, prior to its submission to the Eighteenth World Meteorological Congress in 2019.

Resolution 3 (CAeM-16)

2018 Technical Conference of the Commission for Aeronautical Meteorology

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Noting with satisfaction that a one-day Technical Conference (TECO-2018) was conducted with the theme “The future is now: Meteorology enabling aviation decision support” (University of Exeter, United Kingdom of Great Britain and Northern Ireland, 23 July) held immediately prior to the sixteenth session of the Commission for Aeronautical Meteorology (CAeM),

Appreciating the efforts of the organizing committee, chaired by the president of CAeM and assisted by members of the CAeM Management Group, in the preparation, conducting and reporting of TECO-2018,

Noting the blend of keynote and other oral presentations, panel discussions including interactive question/answer sessions with audience participation, and wrap-up summaries during TECO-2018 on topics that addressed past, present and future aeronautical meteorological service provision aligned with the evolving needs of aviation users, as well as an innovation showcase of examples of existing and emerging uses of aeronautical meteorology,

Welcoming the participation in TECO-2018 of National Meteorological and Hydrological Services of WMO Members; other aeronautical meteorological service providers, including from the private sector; representatives of international organizations, including the International Civil Aviation Organization; and other aviation industry users and stakeholders,

Endorses the outcomes of TECO-2018 as provided in the annex to the present resolution;

Invites the president of CAeM to consider the outcomes of TECO-2018 in the context of establishing the objectives and priorities of CAeM during the next intersessional period;

Requests the Secretary-General to assist the president of CAeM in the follow-up to the outcomes of TECO-2018, including by making available the necessary resources.

Annex to Resolution 3 (CAeM-16)

Outcomes of the 2018 Technical Conference of the Commission for Aeronautical Meteorology

The theme of the Technical Conference (TECO) was "The future is now: Meteorology enabling aviation decision support". It was divided into four sessions:

- (a) A history of aeronautical meteorological service provision;
- (b) Users' perspectives of aviation's current and future meteorological needs;
- (c) Innovation showcase - New and emerging technologies and capabilities in aeronautical meteorology;
- (d) The Future is now.... What next for CAeM?

Historical context and emerging issues

The President of CAeM, Chi-ming Shun, opened the TECO with a thought-provoking look at the history of aeronautical meteorological services. He highlighted the long-standing cooperation between ICAO and WMO and success stories (e.g. wind shear detection, electronic flight bag application) contributing to advancement of aeronautical meteorology. He also reflected on legacy issues such as turbulence prediction, SIGMET deficiencies and the challenges and opportunities presented by the ICAO Global Air Navigation Plan and its aviation system block upgrades (GANP/ASBU) methodology. He concluded by urging the group to consider the biggest change in aeronautical meteorology over the past few decades. The TECO agreed that the exponential increase in the amount of meteorological data has been one of the biggest changes. The TECO recommends that the Commission examine how data could be transformed into advanced decision-support services, and how data could be shared more openly and effectively for collaborative development.

Another significant change has been the link between climate change and aviation. The TECO highlighted several examples where climate change has begun to impact aviation operations, such as through the increased frequency of extreme weather events.

Service delivery

The TECO was pleased to hear that the importance of weather in aviation operations remains very high. Specific aspects raised by the user community included:

- (a) Traditional product set, such as TAF, may not be best suited to decision support;
- (b) Probability forecasts are valuable in support of ANSP business decisions;
- (c) Coordination of information on hazards among adjacent centres is critical;
- (d) Clients want better decision-support information not more data;

- (e) Need for equal attention on timely adjustments of forecasts for improving weather conditions, so that users can react quickly and make well-informed decisions;
- (f) Human interpretation of data and effective communication to users are very important. An example was provided to demonstrate positive impact of embedded human forecaster in ATM decisions; and
- (g) Collaborative decision-making efforts are very useful for clients and partners. Best practices could be shared to bring coherence to these local efforts.

The TECO was informed that the business rules used to develop and maintain aviation meteorological products and services date back to the 1950s. Given the huge advances in meteorological science and underpinning technologies that have evolved since then, it was agreed that these business rules need to evolve to better support the aviation industry's increasing needs for risk-based decision support. In this regard, the TECO heard how ensemble prediction systems have been utilized in meteorology for many years to both quantify forecast uncertainty and to provide probabilistic information. Delegates to the TECO suggested that the WMO will need to work with stakeholders, most notably ICAO, to propose new and innovative ways to translate scientific research into service and application, such as those emerging through the Aviation Research and Development Project (AvRDP).

Notwithstanding that there are already many examples of best practices of local, regional and even global coordination and collaboration, the TECO recognized the aviation community's need for a more seamless and consistent approach to providing hazardous weather and environmental hazards information.

The TECO also agreed that the validation and verification of forecasts and user services is becoming increasingly relevant if users are to trust and optimize the use of the meteorological information that they receive.

The TECO was informed of recent developments related to the public-private engagement (PPE) and the so-called Global Weather Enterprise (GWE). Such developments included a Policy Framework for Public-Private Engagement recently endorsed by EC-70. The TECO heard about several examples in aviation weather where such partnerships already exist. One example was presented to the TECO demonstrating existing public-private collaboration and service potential. Delegates heard that one private sector company ingests 400 terabytes of data daily and produces forecasts every 15 minutes for 2.2 billion locations globally.

As PPE and GWE are increasingly relevant to the field of aeronautical meteorological service, the TECO recognized that the analysis and assessment of their impact to the meteorological community from regulatory, economic and technological perspectives will help guide such discussions in the other disciplines of WMO.

Led by experts from all the WMO regions and user representatives, the TECO also identified other important issues for consideration by the Commission. These include quality management systems, IWXXM (ICAO Meteorological Information Exchange Model), system-wide information management (SWIM), cost recovery and competency requirements, and were consistent with the outcomes of the 2016/2017 CAeM global survey. The TECO recognized that these and other topics overlap with the CAeM priority themes proposed for the next intersessional period as well as priorities of the ICAO Meteorology Panel.

Resolution 4 (CAeM-16)**Management Group of the
Commission for Aeronautical Meteorology**

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Noting:

- (1) The positive experience of the Commission for Aeronautical Meteorology (CAeM) Management Group regarding its role of coordination and governance in the activities of CAeM during the intersessional period 2014–2018,
- (2) The report by the president of CAeM and the reports by the co-chairpersons of the CAeM expert teams detailing the accomplishments of the Commission since its fifteenth session,
- (3) The established working arrangements and responsibilities among the members of the Management Group and expert teams in implementing the work of CAeM in support of the Aeronautical Meteorology Programme,

Recognizing:

- (1) That the effectiveness of CAeM depends to a large extent on the effective management and coordination of its activities during the intersessional periods,
- (2) That a Management Group is required to ensure the integrity of all activities of CAeM and the alignment of its work programme with the priorities and expected results of the WMO Strategic and Operating Plans,
- (3) The need, in close coordination with the regional associations, for systematic monitoring and evaluation of the progress achieved by CAeM concerning 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,

Mindful of the outcomes of the seventieth session of the Executive Council regarding WMO constituent body reform that, subject to adoption by the Eighteenth World Meteorological Congress in 2019 and upon the completion of a transition period, would result in the disbanding of previous technical commissions, including CAeM, that have been active during the seventeenth financial period (2016–2019),

Convinced:

- (1) That Members and their experts will continue to play a crucial role in shaping and enacting WMO reform aspirations,
- (2) That the core values of strong scientific expertise, professionalism, close user engagement and partnership, agility, proactiveness and inclusiveness should guide CAeM (or its successor), thereby allowing aeronautical meteorological services worldwide to reach new heights,

Decides to re-establish a CAeM Management Group with the terms of reference as provided in the annex to the present resolution;

Encourages the CAeM Management Group to actively contribute to the implementation of the WMO Constituent Bodies Reform Transition Plan adopted through Resolution 36 (EC-70) – WMO

Constituant Bodies Reform Transition Plan and Communication Strategy, that will, subject to consideration by the Eighteenth World Meteorological Congress in 2019, result in a restructuring of the technical commissions, including CAeM;

Requests presidents of the regional associations to designate experts or to reconfirm the designation of experts to liaise with the CAeM Management Group on regional aspects of aeronautical meteorology;

Requests the presidents of other technical commissions to ensure coordination with CAeM regarding scientific and technological issues related to aeronautical meteorology and designate liaison experts to support the CAeM Management Group as appropriate;

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

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

Note: This resolution replaces Resolution 1 (CAeM-15) and Resolution 2 (CAeM-15), which are no longer in force.

Annex to Resolution 4 (CAeM-16)

Terms of reference of the Management Group of the Commission for Aeronautical Meteorology

- (1) The terms of reference of the Commission for Aeronautical Meteorology (CAeM) Management Group (MG) shall be as follows:
 - (a) To assist the president of the Commission in guiding and coordinating the activities of the Commission and its subsidiary bodies during the intersessional period immediately following the sixteenth session of the Commission (CAeM-16);
 - (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 and/or a community of expertise formed by experts nominated by Permanent Representatives of WMO Members (i.e. an aeronautical meteorology experts network or "AEMnet");
 - (c) To ensure that the activities of the Commission meet the needs of Members, especially those from 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, via the WMO website, newsletters and other means;
 - (e) To review requests for advice and assistance from regional associations on matters within the field of competence of the Commission and to ensure appropriately prompt follow-up actions;
 - (f) To ensure coordination and collaboration with other WMO constituent bodies on crosscutting issues, in particular with the Commission for Basic Systems (CBS), the

Commission for Atmospheric Sciences (CAS) and the Commission for Instruments and Methods of Observation (CIMO), in pursuit of effective incorporation of scientific and technological advancements into operational practice;

- (g) To ensure continued cooperation and collaboration with the International Civil Aviation Organization (ICAO), in particular with regards to the evolution and implementation of the Global Air Navigation Plan (GANP), associated aviation system block upgrades (ASBU) methodology and timeline;
 - (h) To ensure continued coordination with other users' organizations, as well as with other partner organizations at global and regional levels;
 - (i) To assist the president, when required, to make decisions on behalf of the Commission during the intersessional period on matters of priority, including the necessary establishment or dissolution of task-oriented CAeM subsidiary bodies, or the expansion or contraction of the AEMnet;
 - (j) To identify, define and prioritize the tasks to be accomplished and outputs to be delivered by the Commission in support of the Aeronautical Meteorology Programme (AeMP) and other relevant WMO programmes;
- (2) The CAeM MG shall comprise the following members:
- (a) President of the Commission (Chairperson);
 - (b) Vice-president of the Commission;
 - (c) Lead experts nominated by WMO Members in the following priority themes:
 - (i) Education, training and competency of aeronautical meteorological personnel (AMP);
 - (ii) Aeronautical meteorological information service and governance;
 - (iii) Aeronautical meteorological hazards prediction;
 - (iv) Impacts of climate change and variability on aviation;
 - (v) Communication and outreach; and
 - (d) Other focal points nominated by WMO Members contributing to the work of the Commission, as deemed necessary by the president of the Commission.

Resolution 5 (CAeM-16)

Review of previous resolutions and recommendations of the Commission for Aeronautical Meteorology

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Having been informed of the relevant resolutions and recommendations of the Commission (see [CAeM-16/INF. 9\(1\)](#)),

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

Decides:

- (1) To replace Resolution 5 (CAeM-XIII) – Participation of women in the work of the Commission, by Resolution 6 (CAeM-16) – Gender equality and empowerment of women;
- (2) Not to keep in force other resolutions and recommendations adopted prior to its sixteenth session.

Note: This resolution replaces Resolution 3 (CAeM-15), which is no longer in force.

Resolution 6 (CAeM-16)**Gender equality and empowerment of women**

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Recalling Resolution 5 (CAeM-XIII) – Participation of women in the work of the Commission,

Noting Resolution 59 (Cg-17) – Gender equality and empowerment of women, and the annex to Resolution 59 (Cg-17) – WMO Gender Equality Policy, and Decision 77 (EC-68) – WMO Gender Action Plan,

Recognizing the impacts of weather, water and climate on gender roles, especially in the event of disasters, and their implications for the provision of aeronautical meteorological services,

Having been informed of gender mainstreaming within WMO and the statistics on the participation of women and men in the activities of the Commission for Aeronautical Meteorology (CAeM) (see [CAeM-16/INF. 9\(1\)](#)),

Appreciating a keynote address entitled “Women in meteorology – a personal perspective” given during the sixteenth session of CAeM by Professor Ellie Highwood, Dean of Diversity and Inclusion and Professor of Climate Physics at the Department of Meteorology, University of Reading, United Kingdom of Great Britain and Northern Ireland,

Observing that women are underrepresented in the working structures of CAeM and that increased female participation is required, notably in order to meet the 30% target (minimum) set by the World Meteorological Congress at its seventeenth session in the WMO Gender Equality Policy,

Encourages CAeM members to ensure that women are nominated to participate in the activities of CAeM and its subsidiary bodies;

Requests the CAeM Management Group, in collaboration with the WMO gender focal point:

- (1) To devise strategies to increase the involvement of women in the work of CAeM, including:
 - (a) The establishment of a mentoring programme to strengthen the capacity of female aeronautical meteorologists to engage in the work of CAeM;
 - (b) The identification and addressing of barriers that hinder full and equal participation of female aeronautical meteorologists in the work of CAeM;
 - (c) Fostering a network of professional women in aeronautical meteorology by providing follow-on mentoring and guidance as well as organizing relevant workshops prior to CAeM-related meetings;

- (2) To undertake steps to implement the WMO Gender Action Plan by proposing mechanisms and partnerships that link relevant gender equality initiatives of WMO and major bilateral and multilateral donors and national governments to strengthen scientific investments that enhance the understanding of gender differences in access and use of aeronautical meteorological information and services that benefit end users;
- (3) To consider appointing a CAeM focal point for the empowerment of women in aeronautical meteorology who would be responsible for leading the foregoing activities.

Note: This resolution replaces Resolution 5 (CAeM-XIII), which is no longer in force.

APPENDIX 3. DECISIONS ADOPTED BY THE SESSION

Decision 1 (CAeM-16)

Organization of the session

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Having considered the provisional agenda proposed by the president of the Commission for Aeronautical Meteorology (CAeM),

Approves the provisional agenda;

Also approves the report of the representative of the Secretary-General on credentials in accordance with WMO General Regulations 21 to 24;

Adopts the establishment of committees for the duration of the session as:

(1) Coordination Committee:

Chairperson: Mr C.M. Shun (president)

Members: Mr I. Lisk (vice-president), Secretary-General's representative, Secretariat staff and representative of local organizing committee;

(2) Nomination Committee:

Chairperson: Ms X. Na (China)

Members: Mr J. Nuottokari (Finland) and Mr J-W. Lee (Republic of Korea);

(3) Selection Committee:

Chairperson: Mr I. Lisk (vice-president)

Members: Mr C.M. Shun (president), Ms S. Desbios (France), Mr K. Johnson (Canada) as co-rapporteur, Ms X. Na (China) as co-rapporteur, Mr Z. Zhang (China), Secretary-General's representative and Secretariat staff;

(4) TECO Outcomes Drafting Committee:

Chairperson: Mr C.M. Shun (president)

Members: Mr I. Lisk (vice-president), Ms S. Desbios (France), Mr K. Johnson (Canada) as co-rapporteur, Mr M. Strahan (United States of America) as co-rapporteur and Secretariat staff;

Agrees to the programme of work of the session:

(1) Working hours of the meetings: 9.30 a.m.–12.30 p.m. and 2.30 p.m.–5.30 p.m.;

(2) Arrangements and allocation of agenda items for the session;

Decides to suspend General Regulation 110 for the whole duration of the session to permit rapid processing of documents in accordance with General Regulation 3;

Also decides that in conformance with General Regulation 112, summarized minutes are not required for the session.

Decision 2 (CAeM-16)

Reports on Commission for Aeronautical Meteorology expert team activities

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Endorses the reports of the Commission for Aeronautical Meteorology (CAeM) expert teams as submitted to CAeM at its sixteenth session;

Requests the president of CAeM, in the context of the working structure of CAeM, to consider addressing any ongoing or incomplete activities of the CAeM expert teams arising from the last intersessional period as well as any new or emerging activities to be addressed during the next intersessional period.

Decision justification:

- (1) Resolution 2 (CAeM-15) – Establishment of subsidiary bodies of the Commission for Aeronautical Meteorology, established subsidiary bodies of CAeM;
- (2) Regulation 186 of the WMO General Regulations describes the duties of the president of a commission, which include to guide and coordinate the activities of the commission and its working groups between sessions of the commission;
- (3) The reports on the activities of the CAeM expert teams ([CAeM-16/INF. 3\(1\) to INF. 3\(5\) inclusive](#)) – namely the Expert Team on Aviation, Science and Climate, the Expert Team on Communication, Coordination and Partnership, the Expert Team on Education, Training and Competency, the Expert Team on Governance and the Expert Team on Information and Services for Aviation – highlighted the progress made during the last intersessional period, ongoing activities and considerations for future work.

Decision 3 (CAeM-16)

Reports on volcanic ash and space weather activities

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Noting the progress made since the fifteenth session of the Commission for Aeronautical Meteorology (CAeM) in the areas of:

- (1) Volcanic ash science and operations through the activities of Volcanic Ash Advisory Centre best practices workshops, the WMO and International Union of Geodesy and Geophysics Volcanic Ash Scientific Advisory Group and the International Workshops on Volcanic Ash,
- (2) Space weather information services through the activities of the Commission for Basic Systems (CBS) and CAeM Inter-programme Team on Space Weather Information, Systems and Services, and its predecessor the Inter-commission Team on Space Weather,

Requests the president of CAeM, in coordination with the presidents of CBS and the Commission for Atmospheric Science, as appropriate, to consider how volcanic ash and space weather issues in support of international civil aviation should be addressed during the next intersessional period.

Decision justification: A report on volcanic ash-related activities (see [CAeM-16/INF. 3\(6\)](#)) and a report on space weather-related activities (see [CAeM-16/INF. 3\(7\)](#)) highlight the progress made during the last intersessional period as well as ongoing activities.

Decision 4 (CAeM-16)

Reports on outcomes of Commission for Aeronautical Meteorology global survey and scientific conference

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Noting the outcomes of the:

- (1) Commission for Aeronautical Meteorology (CAeM) 2016/2017 global survey on aeronautical meteorological service provision,
- (2) WMO Aeronautical Meteorology Scientific Conference 2017,

Noting also Resolution 8 (EC-70) – Scientific research and development in aeronautical meteorology, and Resolution 9 (EC-70) – Global and regional landscape of aeronautical meteorological service provision,

Requests the president of CAeM, in the context of the future activities of CAeM, to consider how these outcomes should be addressed further during the next intersessional period.

Decision justification: The outcomes of the 2016/2017 CAeM global survey on aeronautical meteorological service provision are contained in [AeM SERIES No. 1](#) (see [CAeM-16/INF. 3\(8\)](#)) while the outcomes of the 2017 WMO Aeronautical Meteorology Scientific Conference are contained in [AeM SERIES No. 2](#) (see [CAeM-16/INF. 3\(9\)](#)).

Decision 5 (CAeM-16)

Obsolete World Meteorological Organization Guides

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Decides that the following WMO publications are now considered obsolete and should therefore be discontinued:

- (1) *Methods of Interpreting Numerical Weather Prediction Output for Aeronautical Meteorology* (WMO-No. 770);
- (2) *Guide to the Provision of Meteorological Service for International Helicopter Operations* (WMO-No. 842);
- (3) *Guide to the Quality Management System for the Provision of Meteorological Service for International Air Navigation* (WMO-No. 1001).

Decision justification:

- (1) The publication cited in (1) above: Last updated in 1992; contains outdated information; methods of interpreting numerical weather prediction output are sufficiently covered in other existing WMO publications such as "WMO Technical Progress Reports on the Global Data-processing and Forecasting System and Numerical Weather Prediction Research";
 - (2) The publication cited in (2) above: Last updated in 1996; all provisions relating to meteorological service to support international helicopter operations are already covered by International Civil Aviation Organization Annex 3 – Meteorological Service for International Air Navigation/*Technical Regulations* (WMO-No. 49), Volume II – Meteorological Service for International Air Navigation, and their associated guidance material;
 - (3) The publication cited in (3) above: Last updated 2014; obsolete in view of the 2017 major update of *Guide to the Implementation of a Quality Management System for National Meteorological and Hydrological Services* (WMO-No. 1100).
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Decision 6 (CAeM-16)**Composition of the Commission for Aeronautical Meteorology Management Group lead experts**

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Decides that the Commission for Aeronautical Meteorology (CAeM) Management Group, re-established under Resolution 4 (CAeM-16), shall comprise the following lead experts:

- (1) Ms Kathy-Ann Caesar (British Caribbean Territories) and Ms Gaborekwe Khambule (South Africa) for education, training and competency of aeronautical meteorological personnel;
- (2) Mr Michael Berechree (Australia) and Mr Jun Ryuzaki (Japan) for aeronautical meteorological information service and governance;
- (3) Ms Sharon Sum Yee Lau (Hong Kong, China) and Mr Matt Strahan (United States of America) for aeronautical meteorological hazards prediction;
- (4) Mr Lei Gu (China) for impacts of climate change and variability on aviation;
- (5) Ms Marina Petrova (Russian Federation) and Ms Claudia Ribero (Argentina) for communication and outreach.

Decision justification: This decision ensures that lead experts have been established by CAeM at its sixteenth session in respect of item (2) (c), sub-items (i)–(v) of the annex to Resolution 4 (CAeM-16). The following principles were applied by the Selection Committee in the determination of the experts:

- (1) The Management Group shall consist of a maximum of twelve members including the president and vice-president;
- (2) At least half of the members of the Management Group should be women;
- (3) The Management Group shall include representation from all WMO regional associations;

- (4) Each WMO regional association shall be represented by a maximum of three members on the Management Group;
 - (5) There shall not be more than one member of the Management Group from any one WMO Member;
 - (6) There should be some continuity of membership from one Management Group to the next.
-

APPENDIX 4. RECOMMENDATIONS ADOPTED BY THE SESSION

Recommendation 1 (CAeM-16)

Scientific and technological advancement in support of meteorological service for international air navigation

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Noting the relevance to the Commission for Aeronautical Meteorology (CAeM) and the wider aeronautical meteorology community of work undertaken by other WMO technical commissions and their subsidiary bodies through WMO programmes, including but not limited to the World Weather Watch (including the development of the International Civil Aviation Organization (ICAO) Meteorological Information Exchange Model (IWXXM) schema), the Global Atmosphere Watch, the World Weather Research Programme (including the Aviation Research and Development Project (AvRDP)), the Tropical Cyclone Programme and the Education and Training Programme,

Having been informed of recent, ongoing and upcoming developments within WMO programmes of relevance to CAeM (see [CAeM-16/INF. 4\(1\)](#) to [CAeM-16/INF. 4\(4\)](#)),

Being convinced that support from other WMO programmes is instrumental in the progression of the Aeronautical Meteorology Programme and the activities of CAeM in general and will ensure that WMO continues to provide authoritative scientific and technical advice on aeronautical meteorology matters to aviation stakeholders, including ICAO,

Recommends that collaboration be sustained and improved between technical commissions and programmes responsible for scientific and technological advancement and the education, training and competency of aeronautical meteorological personnel consistent with the evolving needs of aviation users;

Requests the Secretary-General:

- (1) To make the necessary resources available to foster the collaborative development of interdependent initiatives such as IWXXM and AvRDP in cooperation with the relevant WMO bodies;
- (2) To ensure that the evolving qualification requirements in the provision of aeronautical meteorological services are reflected when reviewing and updating the Basic Instruction Packages.

Recommendation 2 (CAeM-16)

Cooperation with the International Civil Aviation Organization

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Recalling Recommendation 4/1 – Review of the working arrangements between ICAO and WMO, of the International Civil Aviation Organization (ICAO) Meteorology Divisional Meeting held in Montreal, Canada in July 2014 conjointly with the fifteenth session of the Commission for Aeronautical Meteorology (CAeM), which tasked ICAO and WMO to undertake a review of the working arrangements to ensure that the organizations' respective roles and responsibilities, as well as their commitments, are appropriately aligned with the mandates of both organizations, taking into consideration evolving technological capabilities and aeronautical requirements,

Noting the working arrangements between ICAO and WMO, which record the understanding reached between the two organizations in terms of their respective primary responsibilities in the development of international standards, recommended practices and procedures governing meteorological service for international air navigation,

Noting with satisfaction the contribution, in an expert capacity, of the WMO Secretariat and members of CAeM where necessary to the activities of the ICAO Meteorology Panel and its working groups, and the need to ensure this contribution will be sustained,

Noting also the contribution, in an expert capacity, of the WMO Secretariat and members of CAeM where necessary to the activities of the ICAO Committee on Aviation Environmental Protection and its working groups, and the need to ensure this contribution will be continued,

Being convinced that efficient and effective cooperation between the two organizations is essential for supporting the needs of WMO Members, ICAO Member States and the wider community in ensuring safe, efficient, economic and environmentally responsible international civil aviation operations worldwide,

Having been informed of the outcomes of a bilateral meeting between the Secretary-General of WMO and the Secretary General of ICAO on 28 April 2017 that, inter alia, examined strengthening the cooperation between the two organizations in the field of aeronautical meteorology,

Encourages Members to foster enhanced coordination and collaboration between national aeronautical meteorological authorities and service providers, as well as respective civil aviation administrations, with a view to improving aeronautical meteorological service delivery;

Mindful of the growing demands placed on WMO Members responsible for the provision of aeronautical meteorological services associated with air transportation modernization over the next 15 years and beyond, as conveyed in the ICAO Global Air Navigation Plan and its aviation system block upgrades methodology,

Recommends that, consistent with Regulation 181 of the WMO General Regulations, WMO should seek opportunities to further improve the efficiency and effectiveness in its cooperation with ICAO, including the development of more effective working relationships and/or methods of cooperation for respective expert bodies and the elimination of any existing duplication or redundancy that may exist;

Requests the Secretary-General to make the necessary resources available to foster the recommended review and update of the working arrangements between WMO and ICAO.

Recommendation 3 (CAeM-16)

Cooperation with other international organizations of relevance to the Commission for Aeronautical Meteorology

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Noting with satisfaction the cooperation between WMO and other international organizations concerned with the provision of meteorological service for international air navigation, including the International Civil Aviation Organization (ICAO), the International Air Transport Association (IATA), the Agency for Aerial Navigation Safety in Africa and Madagascar (ASECNA), the International Union of Geodesy and Geophysics (IUGG), the International Atomic Energy Agency (IAEA) and the International Federation of Air Line Pilots' Associations (IFALPA),

Mindful of prevailing agreements or working arrangements between WMO and other international organizations, including ICAO, ASECNA, IUGG, IAEA and IFALPA, as contained in *Agreements and Working Arrangements with other International Organizations* (WMO-No. 60),

Noting also an emerging working arrangement between WMO and IATA concerning the operation and development of the aircraft meteorological data relay (AMDAR) system and that some National Meteorological and Hydrological Services of WMO Members already have existing arrangements with airlines for the collection and exchange of AMDAR data,

Recommends that WMO should seek opportunities to foster further cooperation with other international organizations relevant to the provision of meteorological service for international air navigation through new or improved agreements or other such working arrangements, as appropriate;

Requests the Secretary-General:

- (1) To make the necessary resources available to foster the recommended operation and development of the AMDAR system arising from the emerging working arrangement between WMO and IATA with due emphasis that the cost framework should be fair, equitable and transparent;
- (2) To continue coordination with ASECNA for joint support of the African Conference on Aeronautical Meteorology in Regional Association I (Africa), with a view to the conference being organized in 2019.

Recommendation 4 (CAeM-16)

Long-term plan for the Aeronautical Meteorology Programme

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Recalling that Resolution 3 (Cg-17) – Aeronautical Meteorology Programme, requested the application of a longer-term planning approach to the Aeronautical Meteorology Programme of WMO, consistent with the International Civil Aviation Organization (ICAO) Global Air Navigation Plan (GANP) and its aviation system block upgrades (ASBU) methodology and timeline, with special consideration on building capacity of sub-regions and Members with long-standing deficiencies in their service provision to civil aviation,

Recalling also that Resolution 66 (Cg-17) – WMO support to evolving aeronautical meteorological services, recognized that future developments at a global, regional and national level should be fully aligned with the ICAO GANP and its ASBU methodology,

Noting that Decision 43 (EC-68) – Action Plan – Meteorological services for aviation, requested the development of a draft long-term plan for the WMO Aeronautical Meteorology Programme (LTP-AeMP) aligned with the ICAO GANP and its ASBU methodology,

Noting also the relevance of LTP-AeMP with the WMO Strategic and Operating Plans as well as other long-term plans of WMO programmes,

Mindful of Decision 42 (EC-69) – Future of aeronautical meteorological services, which noted the development of a draft LTP-AeMP,

Having been informed that the Commission for Aeronautical Meteorology (CAeM) Management Group, at its January 2018 meeting, had called for a re-evaluation of the proposed structure of the draft LTP-AeMP as well as a strategy that would ensure its maintenance in the future,

Recognizing that the objective of an LTP-AeMP should be to provide a foundation for continuing the advancement of meteorological services for international air navigation over a rolling 15-year planning horizon that takes account of existing and foreseen scientific and technological advancement, operational capabilities of aeronautical meteorological service providers and the evolving needs and expectations of aviation users and stakeholders,

Observing that ICAO GANP and its ASBU methodology is continuously reviewed and periodically updated by ICAO (typically on a triennial basis), with the next update in 2019 covering the period through to 2033,

Agreeing that LTP-AeMP should be a living document that, once established, is kept under regular review and periodic update to ensure a high degree of alignment with, inter alia, the WMO Strategic Plan and ICAO GANP,

Having considered a "straw man" and strategy for the development and maintenance of LTP-AeMP (CAeM-16/INF. 6.3),

Requests the president of CAeM:

- (1) To establish a mechanism, in the context of the working structure of CAeM, that will ensure the development of a first-edition LTP-AeMP (covering a period consistent with the 15-year rolling planning horizon of ICAO GANP) for approval by the Eighteenth World Meteorological Congress;
- (2) To ensure that presidents of other technical commissions and presidents of regional associations are kept informed of and consulted on developments in this regard as necessary;
- (3) To establish mechanisms to support the future maintenance and development of subsequent editions of LTP-AeMP;

Requests the Secretary-General to make available the necessary resources to contribute to the development and maintenance of LTP-AeMP.

Recommendation 5 (CAeM-16)

World Meteorological Organization regulatory and guidance material addressing the provision of meteorological service for international air navigation

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Noting Resolution 1 (Cg-17) – Report of the fifteenth session of the Commission for Aeronautical Meteorology, including revised terms of reference of the Commission,

Noting also that the terms of reference of the Commission for Aeronautical Meteorology include contributing, in collaboration with the International Civil Aviation Organization (ICAO), to furthering the international standardization of meteorological service provision to international air navigation and providing assistance to Members to achieve compliance with those standards,

Having been informed of the outcomes of a bilateral meeting between the Secretary-General of WMO and the Secretary General of ICAO on 28 April 2017 during which were discussed, inter alia, measures to improve efficiency, including consideration that the publication of *Technical Regulations* (WMO-No. 49), Volume II – Meteorological Service for International Air Navigation, should be discontinued while maintaining ICAO Annex 3 – Meteorological Service

for International Air Navigation, as the main regulatory document for all users and providers, including civil aviation administrations and National Meteorological and Hydrological Services (NMHSs),

Mindful that ICAO is in the process of developing a new *Procedures for Air Navigation Services – Meteorology*, which will have major implications on the structure and content of ICAO Annex 3,

Having examined the suite of WMO regulatory and guidance material addressing the provision of meteorological service for international air navigation (see [CAeM-16/INF. 7](#)),

Observing that duplication or redundancy exists between key WMO and ICAO publications,

Noting further that *Technical Regulations* (WMO-No. 49), Volume II, Parts I and II are a duplication of ICAO Annex 3, Parts I and II, while Parts III and IV of the former publication are unique,

Noting in addition that some NMHSs of WMO Members face challenges in gaining access to ICAO regulatory and guidance material,

Convinced that the ongoing duplication or redundancy of key WMO and ICAO publications, including their disparate document controls, is not consistent with the principles of quality management and does not set a good example to international aeronautical meteorological service providers and the wider community,

Recommends that WMO, in coordination with ICAO, should:

- (1) Undertake steps necessary to discontinue *Technical Regulations* (WMO-No. 49), Volume II, while ensuring that any material of continuing relevance is reviewed before being transferred to other (new or existing) regulatory or guidance material of WMO or ICAO;
- (2) Ensure, during the accomplishment of (1), that:
 - (a) Any WMO or ICAO regulatory and/or guidance material that cross-references WMO *Technical Regulations* (WMO-No. 49), Volume II is appropriately amended;
 - (b) Members are kept fully informed of the relevance and availability of this material as well as other relevant ICAO provisions;

Requests the Secretary-General to keep ICAO informed of these developments and, in consultation with ICAO, to explore means to enable free access, preferably online, to relevant ICAO regulatory and guidance material by all WMO Members and their NMHSs providing meteorological service for international air navigation.

Recommendation 6 (CAeM-16)

Priority themes and continuity of World Meteorological Organization activities in aeronautical meteorology

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Noting:

- (1) The terms of reference of the Commission for Aeronautical Meteorology (CAeM) adopted through Resolution 1 (Cg-17) – Report of the fifteenth session of the Commission for Aeronautical Meteorology, including revised terms of reference for CAeM, and published

in *Basic Documents No. 1* (WMO-No. 15), 2015 edition, under General Regulations of the World Meteorological Organization Annex III – Structure and terms of reference of technical commissions,

- (2) *WMO Strategic Plan 2016–2019* (WMO-No. 1161),
- (3) Recommendation 20 (EC-70) – WMO Strategic Plan,

Noting also the outcomes of the seventieth session of the Executive Council in respect of WMO constituent body reform, in particular Recommendation 25 (EC-70) – WMO technical commissions and other bodies, concerning the establishment of a new WMO technical commission structure for the eighteenth financial period (2020–2023), which, subject to adoption by the Eighteenth World Meteorological Congress in 2019 and upon the completion of a transition period, would result in the disbanding of previous technical commissions, including CAeM, that have been active during the seventeenth financial period (2016–2019),

Mindful of the importance of the work of WMO in:

- (1) Assisting Members to fulfil, through the Aeronautical Meteorology Programme (AeMP), the strategic priorities and expected results of the Organization as conveyed in the WMO Strategic Plan,
- (2) Cooperating with the International Civil Aviation Organization (ICAO) in the field of aeronautical meteorology, particularly to support the implementation of a global interoperable, harmonized air traffic management system of the future as conveyed in the ICAO Global Air Navigation Plan and its aviation system block upgrade methodology,

Considering that the existing terms of reference of CAeM, as contained in General Regulations of the World Meteorological Organization Annex III, suitably reflect the responsibilities of CAeM in the intersessional period immediately following its sixteenth session,

Having agreed that CAeM (or its successor) should progress work in the context of the following priority themes during the eighteenth financial period (2020–2023):

- (1) Education, training and competency of aeronautical meteorological personnel,
- (2) Aeronautical meteorological information service and governance,
- (3) Aeronautical meteorological hazards prediction,
- (4) Impacts of climate change and variability on aviation,
- (5) Communication and outreach,

Requests Congress, in considering the establishment of a new WMO technical commission structure for the eighteenth financial period (2020–2023):

- (1) To ensure continuity of activities of AeMP corresponding to the foregoing priority themes;
- (2) To ensure continuity of cooperative arrangements with ICAO and other relevant aviation stakeholders with appropriate positioning of WMO in the international civil aviation community.

Note: This recommendation replaces Recommendation 1 (CAeM-15), which is no longer in force.

Recommendation 7 (CAeM-16)

Review of relevant resolutions and decisions of World Meteorological Organization governing bodies related to the Commission for Aeronautical Meteorology

THE COMMISSION FOR AERONAUTICAL METEOROLOGY,

Having been informed of the relevant resolutions and decisions of the World Meteorological Congress and Executive Council related to the Commission for Aeronautical Meteorology (CAeM) (see [CAeM-16/INF 9\(2\)](#)),

Noting with satisfaction the action taken by Congress and the Executive Council on the previous recommendations of CAeM,

Recommends that the following Congress and Executive Council resolutions be kept in force:

- (1) Resolution 3 (EC-65) – Steps to be undertaken to achieve compliance with the regulations of the World Meteorological Organization and the International Civil Aviation Organization;
- (2) Resolution 3 (Cg-17) – Aeronautical Meteorology Programme;
- (3) Resolution 44 (Cg-17) – Aviation Research and Development Project;
- (4) Resolution 66 (Cg-17) – WMO support to evolving aeronautical meteorological services;
- (5) Resolution 7 (EC-70) – Amendment to the *Technical Regulations* (WMO-No. 49), Volume II – Meteorological Service for International Air Navigation;
- (6) Resolution 8 (EC-70) – Scientific research and development in aeronautical meteorology;
- (7) Resolution 9 (EC-70) – Global and regional landscape of aeronautical meteorological service provision;

Recommends that the following Executive Council decisions be kept in force:

- (1) Decision 33 (EC-68) – Four-year plan for WMO activities related to space weather;
- (2) Decision 42 (EC-68) – Implementation of the WMO Strategy for Service Delivery;
- (3) Decision 43 (EC-68) – Action Plan – Meteorological services for aviation;
- (4) Decision 44 (EC-68) – Intercommission Aviation Research Project;
- (5) Decision 42 (EC-69) – Future of aeronautical meteorological services;
- (6) Decision 41 (EC-70) – Space weather linkage with WMO Strategic Plan;

Also recommends that the following Congress resolutions no longer be kept in force:

- (1) Resolution 1 (Cg-17) – Report of the fifteenth session of the Commission for Aeronautical Meteorology, including revised terms of reference of the Commission;
- (2) Resolution 8 (Cg-17) – Amendment of competency and qualification provisions in the *Technical Regulations* (WMO-No. 49), Volume I.

Note: This recommendation replaces Recommendation 3 (CAeM-15), which is no longer in force.

APPENDIX 5. LIST OF PARTICIPANTS

1. Officers of the session

Chi-ming SHUN	President of the Commission for Aeronautical Meteorology (CAeM)
Ian LISK	Vice-president of CAeM

2. WMO Members represented in the technical commission

Australia

Brett ANDERSON	Principal delegate
Michael BERECHREE	Alternate
Andrea HENDERSON (Ms)	Delegate
Alicia TUPPACK (Ms)	Delegate

Austria

Daniel FUCHS	Delegate
Herbert PÜMPEL	Delegate

Belgium

Jozef LETEN	Delegate
Bart NICOLAI	Delegate

Botswana

Sacrasta NCHENGWA	Principal delegate
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British Caribbean Territories

Glendell DE SOUZA	Principal delegate
Kathy-Ann CAESAR (Ms)	Delegate

Canada

Kent JOHNSON	Alternate
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Chile

Reinaldo GUTIERREZ	Principal delegate
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China

Ronghua JIN (Ms)	Principal delegate
Zhongfeng ZHANG	Alternate
Wengang GUO	Delegate
Xiaodan NA (Ms)	Delegate
Bujiu SHI	Delegate
Fengyun WANG	Delegate
Bo YANG	Delegate
Xiaoxin ZHANG	Delegate

Croatia

Alen SAJKO	Principal delegate
Igor KOS	Delegate

Cuba

Iván GONZALEZ VÁLDES	Delegate
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Democratic Republic of the Congo

Jean Pierre MPUNDU ELONGA	Delegate
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Denmark

Mads JESSEN	Alternate
Søren OLUFSEN	Delegate

Ecuador

Gabriela Veronica ROMAN BARRAGAN (Ms)	Principal delegate
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Egypt

Ibrahim ATTA	Principal delegate
Rabie ELBAHRAWY	Alternate

Finland

Jaakko NUOTOKARI	Principal delegate
Anu LANG (Ms)	Delegate
Kari OSTERBERG	Delegate

France

Stephanie DESBIOS (Ms)	Alternate
Fabien MASSON	Delegate

Gambia

Tijani BOJANG	Delegate
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Georgia

Badri JIJELAVA	Delegate
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Ghana

Joseph PORTUPHY	Principal delegate
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Honduras

Erick Bernardo MARTINEZ FLORES	Delegate
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Hong Kong, China

Chi-ming SHUN	Principal delegate
Sum-yee, Sharon LAU (Ms)	Alternate
Kai-kwong HON	Delegate
Chi-wai, Jeffrey LEE	Delegate

Hungary

Livia BERENYI (Ms)	Principal delegate
Szilard SARKOZI	Delegate

Iceland

Theodor Freyr HERVARSSON	Principal delegate
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India

Ajungla JAMIR (Ms)	Delegate
Nalini Mohan KANCHIBHATLA	Delegate

Ireland

Tony TIGHE	Principal delegate
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Israel

Evgeny BRAININ	Principal delegate
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Italy

Attilio DI DIODATO	Principal delegate
Angelo ROMITO	Delegate

Japan

Masashi KUNITSUGU	Principal delegate
Naoko KOMATSU (Ms)	Delegate
Jun RYUZAKI	Delegate

Latvia

Janis VEVERIS	Principal delegate
Alla KAJEVCENKO (Ms)	Delegate
Peteris ZACESTS	Delegate

Macao, China

Weng Kun Ivan LEONG	Principal delegate
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Malaysia

Azemi DAUD Delegate

Netherlands

Jan SONDIJ Principal delegate

New Zealand

Ramon OOSTERKAMP Principal delegate

Peter LECHNER Delegate

Nigeria

Taiwo ASANIYAN Principal delegate

Abdulrahman USMAN Alternate

Norway

Hans Henrik FREMMING Principal delegate

Paraguay

Raul Enrique RODAS FRANCO Principal delegate

Eduardo Jose MINGO VEGA Delegate

Poland

Tomasz SIEJEK Principal delegate

Anna KLOKOWSKA-SIEJEK (Ms) Alternate

Portugal

Carlos MATEUS Delegate

Qatar

Mohammed Jassim S A AL-KUWARI Delegate

Haya Fadul K F ALNAIMI (Ms) Delegate

Republic of Korea

Jaewon LEE Principal delegate

Kayoung BYEN (Ms) Delegate

Yeunsook CHOI (Ms) Delegate

Seungju LEE Delegate

Romania

Laurentiu BROJBOIU Principal delegate

Octavian Paul BUGEAC Delegate

Russian Federation

Marina PETROVA (Ms) Principal delegate

Larisa NIKITINA (Ms) Alternate

Anna IVANOVA (Ms) Delegate

Tatiana KULIK (Ms) Delegate

Olga PETROVA (Ms) Delegate

Konstantin TSYBULYA Delegate

Singapore

Chui Wah YAP (Ms) Principal delegate

Yap Fung THAM Alternate

South Africa

Gaborekwe KHAMBULE (Ms) Principal delegate

Albert MOLOTO Delegate

Spain

Angel ALCAZAR IZQUIERDO Principal delegate

Jesus MONTERO GARRIDO Alternate

Jose Pablo ORTIZ DE GALISTEO M. Delegate

Sweden

Maria LUNDBLAD (Ms)	Principal delegate
Josef RUNBACK	Alternate

Switzerland

Kaspar BUCHER-STUDER	Delegate
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Thailand

Phuwieng PRAKHAMMINTARA	Principal delegate
Kornawee SITTHICHIVAPAK (Ms)	Alternate

Ukraine

Iryna VITVITSKA (Ms)	Delegate
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United Kingdom of Great Britain and Northern Ireland

Phil EVANS	Principal delegate
Ian LISK	Alternate
Piers BUCHANAN	Delegate
Ian CAMERON	Delegate
Rory CLARKSON	Delegate
Jon DUTTON	Delegate
Teil HOWARD (Ms)	Delegate
Callum KNOX	Delegate
Aileen SEMPLE (Ms)	Delegate
Karen SHOREY (Ms)	Delegate
Jane WARDLE (Ms)	Delegate
Felicity WORSFOLD (Ms)	Delegate

United Republic of Tanzania

Agnes KIJAZI (Ms)	Principal delegate
Hamza KABELWA	Alternate
Geofrid Evarist CHIKOJO	Delegate
Ismail Mbwana KASSIM	Delegate

United States of America

Bruce ENTWISTLE	Principal delegate
Susan WEST (Ms)	Alternate
Michael MURPHY	Delegate
Mathew STRAHAN	Delegate
Clinton WALLACE	Delegate

3. WMO Members not represented in the technical commission**Lao People's Democratic Republic**

Vanhdy DOUANGMALA	Delegate
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Mozambique

Mussa MUSTAFA	Principal delegate
Claire Jacqueline SENDELA (Ms)	Delegate

4. Representatives of international organizations and other bodies**Association of Hydro-Meteorological Equipment Industry**

Sebastian KAUCZOK	Observer
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Association of Private Meteorological Services

Andrew ECCLESTON	Observer
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Comprehensive Nuclear-Test-Ban Treaty Organization

Jolanta KUSMIERCZYK-MICHULEC (Ms)	Observer
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European Organization for the Exploitation of Meteorological Satellites

Mounir LEKOUARA Observer

European Organization for the Safety of Air Navigation

Dennis HART Observer

Rosalind Jean LAPSLEY (Ms) Observer

International Civil Aviation Organization

Yong WANG Observer

International Federation of Airline Pilots' Associations

Klaus SIEVERS Observer

International Telecommunication Union

Vadim NOZDRIN Observer

For more information, please contact:

World Meteorological Organization

7 bis, avenue de la Paix – P.O. Box 2300 – CH 1211 Geneva 2 – Switzerland

Communication and Public Affairs Office

Tel.: +41 (0) 22 730 83 14/15 – Fax: +41 (0) 22 730 80 27

Email: cpa@wmo.int

public.wmo.int