

*International Civil Aviation Organization*



ICAO

**INFORMATION PAPER (IP/04)**

**ICAO Asia and Pacific (APAC)**  
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(MET SG/28)

Bangkok, Thailand, 8 to 12 July 2024

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**Agenda Item 6: Research, development, and other initiatives**

**WMO ACTIVITIES OF RELEVANCE TO ICAO**

(Presented by the World Meteorological Organization, WMO)

**SUMMARY**

This information paper provides an overview of some of the recent activities of the World Meteorological Organization (WMO) of relevance to ICAO, particularly in the context of engagement with ICAO and other agencies at the global and regional levels, recent and upcoming events, and other noteworthy information, including links to WMO resources.

Action by the meeting is in paragraph 3.

**1. INTRODUCTION**

1.1 ICAO and the World Meteorological Organization (WMO) coordinate, collaborate and cooperate on international standards for aeronautical meteorological service provision, as contained in ICAO Annex 3/WMO Technical Regulations (WMO-No. 49), Volume II, Meteorological Service for International Air Navigation and supporting ICAO and WMO guidance material. Where resources allow, WMO continues to play an active role in supporting its Members and partners, including ICAO, in the establishment, maintenance and implementation of these international standards.

1.2 This information paper provides an overview of some of the recent activities of WMO of relevance to ICAO, particularly in the context of WMO's latest organization structures, engagement with ICAO and other agencies at the global and regional levels, recent and upcoming events, and other noteworthy information, including links to WMO resources.

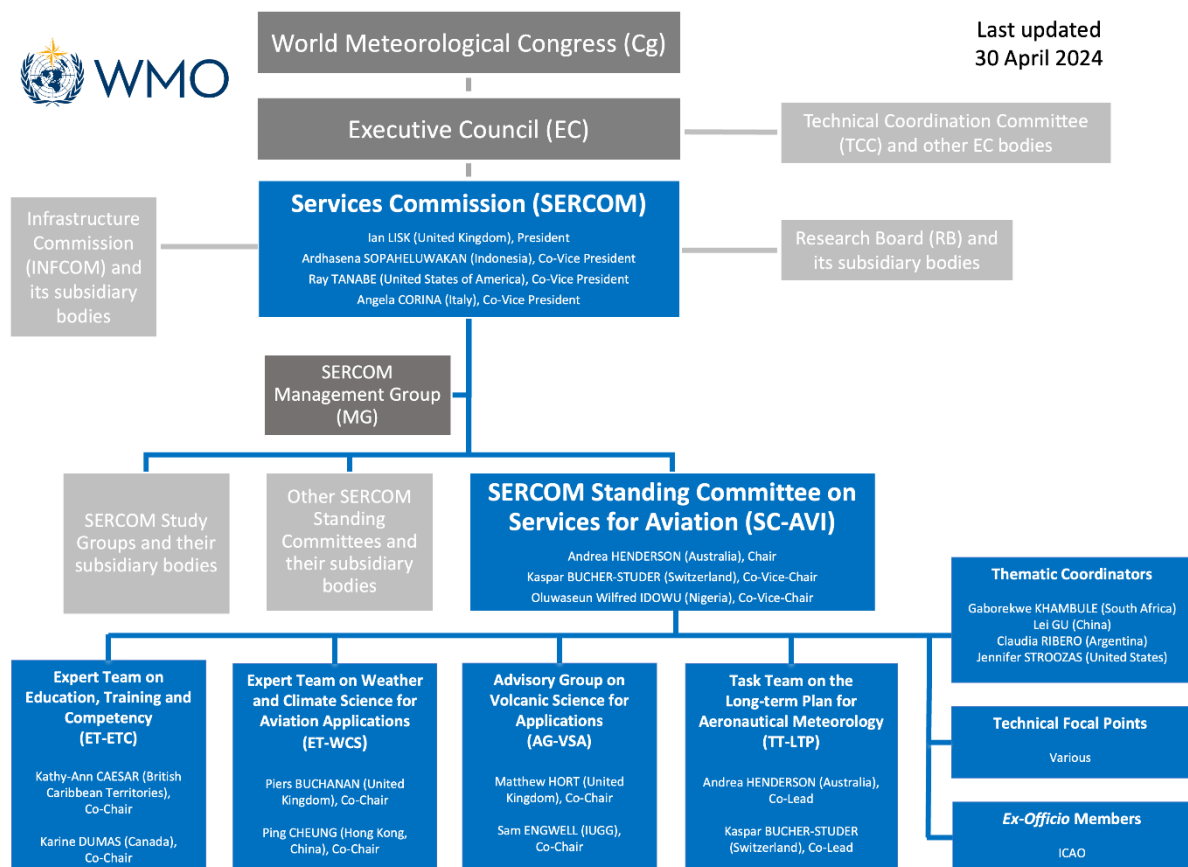
**2. DISCUSSION**

**Latest organization structure in the WMO Services for Aviation activity area**

2.1 As reported at recent METSG meetings (through [METSG/26-IP/02](#) and [METSG/27-IP/17](#)), in 2019 WMO embarked on a major reform of its governance structures. This reform was, to the greatest extent, completed in eighteenth financial period of WMO, 2020-2023. As part of the reform, a *non-governmental* Standing Committee on Services for Aviation (SC-AVI) was established under an

*intergovernmental* Commission for Weather, Climate, Hydrological, Marine and Related Environmental Services and Applications (abbreviated to ‘Services Commission’ or SERCOM). SC-AVI comprises approximately 15 experts, with representation from across all six WMO Regions. Its primary purpose is to contribute to furthering the standardized provision of meteorological services for international air navigation and to provide assistance to Members with aeronautical meteorological services to achieve compliance with those standards. ICAO is an ex-officio member of SC-AVI and, as such, is a key collaborator in all the Standing Committee’s activities.

2.2 SERCOM convenes ordinary sessions approximately once every two years. The third session of the Services Commission (SERCOM-3) took place in March 2024. Outcomes of SERCOM-3 can be found at §2.14 and §2.15 below. Amongst other topics, the Commission addressed the SERCOM work programme and the Commission's subsidiary body structures and leadership for the commencing new intersessional period 2024-2027. In particular, a new Chair of the Standing Committee was elected, namely Ms Andrea Henderson, from Australia, and two Co-Vice-Chairs, Mr Kaspar Bucher-Studer from Switzerland and Mr Oluwaseun Wilfred Idowu, from Nigeria. The latest working structure and reporting-line of SC-AVI are as follows:



2.3 The SC-AVI structure has been modified only slightly for 2024-2027 compared with the last intersessional period (2020-2023), hence ensuring a high degree of continuity with the previous structure, expert composition and activities. SC-AVI is currently supported by two expert teams (ET), one advisory group (AG) and one task team (TT). Information on these SC-AVI subsidiary bodies is available via the following links: [ET-ETC](#), [ET-WCS](#), [AG-VSA](#) and [TT-LTP](#). In addition, several thematic coordinators and other technical focal points contribute to the work of the Standing Committee (more information [here](#)). Final reports, executive summaries and other information pertaining to the outcomes of meetings of SC-AVI and its subsidiary bodies are available [here](#).

2.4 Insofar as the WMO Secretariat is concerned, the staffing of the Services for Aviation (AVI) Division has remained unchanged since 2021. It comprises Mr Greg Brock, Head, Ms Stéphanie Wigniolle, Scientific Officer, and Ms Adriana Oskarsson, Associate Programme Officer. The Secretariat of the AVI Division is contactable via email: [aviation@wmo.int](mailto:aviation@wmo.int)

### **WMO contribution to global initiatives (non-exhaustive)**

#### **WMO contribution to the ICAO Meteorology Panel (METP)**

2.5 Within the available resources, WMO continues to play an active role in the activities of the ICAO Meteorology Panel (METP) and its working groups (presently WG-MRAD, WG-MIE, WG-MOG and WG-MCRGG<sup>1</sup>) addressing an array of topics including but not limited to:

- Hazardous weather information service (HWIS) concept;
- New aerodrome observation and forecast services requirements;
- ICAO meteorological information exchange model (IWXXM) requirements, IWXXM extensions and IWXXM documentation;
- MET in SWIM (system-wide information management);
- Operation and development of global MET systems, namely:
  - International airways volcano watch (IAVW);
  - World area forecast system (WAFS);
  - Secure aviation data information system (SADIS) and WAFS internet file service (WIFS);
  - Space weather (SWx) information service.
- Cost recovery of aeronautical meteorological services
- Use and re-use of aeronautical meteorological information.

2.6 In the context of IWXXM, WMO continues to be responsible, at the request of ICAO, for the development and the publication of the IWXXM schemas. The latest version of the IWXXM schema – namely version 2023-1 – was published by WMO in January 2023 and updated in June 2023, and is available [here](#). (Release Notes for version 2023-1 are available [here](#).) This version was a minor release to address the SIGMET and AIRMET packages. Like its predecessor (2021-2), version 2023-1 supports the requirements of Amendments 79 and 80 to ICAO Annex 3. Technical specifications pertaining to IWXXM are included in the [Manual on Codes \(WMO-No. 306\), International Codes, Volume I.3 – Annex II to the WMO Technical Regulations: Part D – Representations derived from data models](#). The WMO Task Team on Aviation Data (TTAvData) has been working on a schema to support the next amendment (Amendment 82) of ICAO Annex 3 with intended applicability in November 2025. A first Release Candidate version of the updated IWXXM schema, namely 2025-2RC1, was made available in April 2024 for review and is available [here](#). TT-AvData has also recently expanded its expert composition, to better enable the Task Team to support these IWXXM-related developments.

2.7 In the context of system-wide information management (SWIM), the third session of the WMO Commission for Observation, Infrastructure and Information Systems (Infrastructure Commission) (INFCOM-3, 15-19 April 2024) approved the establishment by WMO, in consultation with ICAO, of a task team to address the interoperability needs between the WMO Information System (WIS) and ICAO SWIM. The task team, [TT-WIS2-SWIM Interoperability](#), comprises experts from WMO INFCOM SC-IMT<sup>1</sup> and the above-mentioned ICAO METP WG-MIE.

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<sup>1</sup> Infrastructure Commission (INFCOM) Standing Committee on Information Management and Technology (SC-IMT).

WMO contribution to other ICAO and non-ICAO initiatives

2.8 In addition to the above-mentioned METP-related activities, WMO actively contributes to ICAO's Committee on Aviation Environmental Protection (CAEP), most notably through CAEP Working Group 2, addressing airports and operations and CAEP ISG, addressing impacts and science. CAEP WG2 activities being supported by WMO include the updating of a climate adaptation synthesis report (through literature reviews and the re-running of a global survey on climate impacts) as well as the scoping of a cost impacts study. CAEP ISG activities being supported by WMO include matters relating to contrails and aviation-induced cirrus. WMO also contributes to ICAO's Airport Economics Panel and Air Navigation Services Economics Panel (AEP-ANSEP), particularly through AEP-ANSEP Working Group 4 (WG4), addressing guidance for the cost recovery of aeronautical meteorological services, with relevance of the updating of, inter alia, the Manual on Air Navigation Services Economics (ICAO Doc 9161) and Guide to Aeronautical Meteorological Services Cost Recovery: Principles and Guidance (WMO-No. 904).

2.9 The WMO Secretariat also continues to work with ICAO counterparts towards an update of the working arrangements between ICAO and WMO, thereby helping to enhance the organizations' coordination, collaboration and cooperation, particularly but not only in the aeronautical meteorology domain. After extensive recent work within WMO and ICAO, the update to the working arrangements has been endorsed by the executive management (and others concerned) of both organizations. The update to the working arrangements is (at time of writing) expected to soon be signed by the WMO Secretary-General, Prof. Saulo and the ICAO Secretary General, Mr Salazar. An announcement will be made available via the [Services for Aviation homepage](#) and other outlets. In addition, the WMO Secretariat and ICAO Secretariat, in coordination with the chairs of SC-AVI and METP, have commenced, initially in a trial mode, a 'Joint Aviation Forum' (JAF) between WMO (SC-AVI) and ICAO (METP MG). The JAF provides a venue for the parties concerned to periodically discuss, in an informal and online setting, matters of common interest or concern, particular focusing on matter of strategic importance, thereby helping to facilitate inter-agency coordination that will be to the benefit of WMO Members and ICAO States. The JAF in no way bypasses or replaces existing WMO and ICAO structures such as SC-AVI and METP. Rather, the JAF is complementary. To date, two JAF online meetings have been convened – the first in December 2023 addressing the implications of service delivery transformation in aeronautical meteorology and the second in May 2024 addressing succession planning and the next generation of leaders in aeronautical meteorology. If the prevailing trial proves to be a success and ultimately worthwhile to both organizations, the JAF may be continued beyond the end of 2025.

2.10 In respect of the International Air Transport Association (IATA), WMO continues to actively contribute to its Accident Classification Task Force (ACTF). WMO is a key contributor to the preparation of the annual IATA Safety Report, which provides an in-depth review and essential insight into global and regional accident rates and contributing factors, including those relating to weather/meteorological conditions and/or the unnecessary penetration by flight crew into adverse weather/meteorological conditions. The latest (2023) IATA Safety Report, published in February 2024, is available [here](#) in an interactive format. WMO also continues to collaborate with IATA on the further expansion and enhancement of the WMO AMDAR (Aircraft Meteorological Data Relay) observing system, through a WICAP arrangement (WMO-IATA Collaborative AMDAR Programme). Further information on the AMDAR observing system and the WICAP is available [here](#).

2.11 Recognizing growing interest in the impacts of climate change and variability on aviation, WMO has also periodically engaged, mostly informally or through existing bodies such as ICAO CAEP, with experts from IATA, Airports Council International (ACI) and the European Union Aviation Safety Agency (EASA) on matters of common interest, such as the downscaling of climate scenarios to the regional or local level, climate adaptation and resilience and extreme weather event preparedness and mitigation.

### **WMO contribution to regional initiatives (non-exhaustive)**

2.12 Within the available resources, WMO has contributed to activities or developments at a regional level, such as the supply of advice on the establishment of cost recovery arrangements (e.g. in Fiji), the establishment of bilateral and/or multilateral SIGMET coordination arrangements and updates to regional SIGMET guides (e.g. in Europe).

2.13 In addition, over the course of the past year or so, WMO has conducted several training events within the WMO regions such as the WMO RA II Aeronautical Meteorology Webinar 2024 about Quality Management System.

### **Outcomes of the third session of the Services Commission and expectations for the seventy-eighth session of the Executive Council**

2.14 As alluded at §2.2 above, the third session of the Services Commission (SERCOM-3) took place in Bali, Indonesia from 4 to 9 March 2024, including a one-day Gender Action Day on 7 March 2024 (the day immediately prior to International Women’s Day). Insofar as aeronautical meteorology/services for aviation is concerned, the Commission established SC-AVI for another four years through Resolution 3 (SERCOM-3), with amended terms of reference approved accordingly.

2.15 In addition, and taking into account the recommendations arising from the third meeting of SC-AVI ([SC-AVI-3](#)) held in September 2023, SERCOM-3 endorsed: the recommendations and statement arising from the Eighth International Workshop on Volcanic Ash ([IWVA-8](#)) held in February 2023 (more details are available in [METSG/27-IP/17](#)); and a proposed 2025 update to *Aerodrome Reports and Forecasts: A Users’ Handbook to the Codes* (WMO-No. 782) (see also at §2.28 below). Moreover, during SERCOM-3 a side-event was held addressing the impacts on Members of service delivery transformation in aeronautical meteorology. A summary of the outcomes of this side event is available [here](#).

2.16 The seventy-eighth session of the Executive Council (EC-78) will take place at WMO Headquarters in Geneva, Switzerland, from 10 to 14 June 2024. EC-78 will be invited to adopt a resolution (draft Resolution 4.1.1(3)/1) on the recommendations and statement arising from [IWVA-8](#) which, as alluded above, were endorsed previously at SC-AVI-3 and SERCOM-3. More information on EC-78 and its outcomes will be made available [here](#).

### **Other relevant developments/initiatives**

#### **Aeronautical Meteorology Scientific Conference**

2.17 The World Meteorological Organization (WMO) is convening, under the auspices of Services Commission, a 2024 Aeronautical Meteorology Scientific Conference (AeroMetSci-2024). The conference will be held at the WMO Headquarters in Geneva, Switzerland from 21 to 25 October 2024.

2.18 Following the success of an AeroMetSci conference in November 2017 ([AeroMetSci-2017](#)) plus AeroMetSci webinars in June 2022 addressing severe convection and associated hazards (more information [here](#)) and in December 2023 addressing turbulence and airframe icing (more information [here](#)), the main objective of AeroMetSci-2024 is to showcase scientific and technological advances in meteorological observations and forecasts, expand focus on the integration of meteorological information decision-support services into the global air traffic management system,

and deeply examine the impacts of climate change and variability on aviation. The theme of the conference is: “*Aviation, weather and climate: scientific research and development for enhanced aeronautical meteorological services in a changing climate*”. The conference programme includes three thematic sessions as follows:

- Session 1 - Science underpinning meteorological observations, nowcasting and deterministic and probabilistic forecasts
- Session 2 - Impact-based information and decision support services for aviation
- Session 3 - Science to understand the impacts of climate change on aviation and aviation environmental issues.

The conference will comprise a blend of plenary keynote presentations, national and regional case studies and panel discussions, taking into account leading scientific/academic research and aviation industry best practices and developments. Poster sessions will also take place.

2.19 An official announcement and call for abstracts was issued by WMO on 18 April 2024: [English](#) | [French](#) | [Spanish](#) | [Russian](#) | [Chinese](#) | [Arabic](#). Registration for the conference should be done not later than 20 September 2024. Further information about the conference, including the Concept Note, and the conference registration form, can be found on the [conference website](#).

2.20 The expected outcome of the conference will be a refinement of the common vision for scientific and technological research and development activities over the next 10 years or more aligned with the evolving needs and expectations of international civil aviation that are driving service delivery transformation, and a further raising of awareness of the impacts of climate change and variability on aviation operations now and into the future.

2.21 Outputs of the conference will include a set of recommendations and a statement to guide domestic, regional and/or global strategies on scientific and technological advancement in support of meteorological service for international civil aviation. The proceedings of the conference will be published as a WMO Publication comprising scientific articles, presentations, etc. to ensure outreach to all interested stakeholders.

#### Long-term plan for aeronautical meteorology

2.22 In 2019, WMO published its inaugural long-term plan for aeronautical meteorology – available here (English only). The long-term plan provides a framework upon which aeronautical meteorological service providers of Members/States in particular, and the broader meteorology and aviation communities in general, can plan a progressive transformation from a conventional “product-centric” approach to a modern “information-centric” approach to service provision for aviation through to 2030 and beyond.

2.23 SC-AVI, assisted by its aforementioned task team (TT-LTP), is working towards the development of an update to the long-term plan, with a publication timeframe expected to be between 2026 and 2028. The update will seek to elaborate upon some of the many factors influencing the current and future provision of aeronautical meteorological services, including the investment in the global weather enterprise, the recovery from the Coronavirus disease (COVID-19) pandemic, the aviation industry’s demand for seamless, high-quality, georeferenced, digitized meteorological information on a worldwide basis, the advances in science and technology (for example high-resolution, ensemble prediction systems), environmental sustainability, and the future role of aeronautical meteorological personnel. The TT-LTP will convene a writing workshop in October 2024 to further mature ideas and narrative text for the next edition of the LTP-AeM. A final draft of the LTP-AeM is expected to be available in time for review at the SC-AVI-4 meeting (tentatively) in September 2025.

Aviation Research and Development Project – Phase II (AvRDP2)

2.24 AvRDP2 is the second phase (2021-2025) of an Aviation Research and Development Project, a project of the World Weather Research Program (WWRP), led by the WMO Research Board (RB) with the support of SERCOM/SC-AVI. AvRDP2 focuses on scientific advancement and capacity development in observation, forecasting and warning of significant convection and associated hazards. It aims at demonstrating benefits of a gate-to-gate use of this advanced aeronautical meteorological information in the aviation operations environment. More information about AvRDP2 can be found [here](#), in particular the mid-term report (2021-2023) of the project.

2.25 The AvRDP2 Scientific Steering Committee (SSC) is now preparing its third meeting (AvRDP2-SSC-3) to be held in September 2024. AvRDP2-SSC-3 will be apprised on the most recent developments and results of a study conducted by the Hong Kong University of Science and Technology (HKUST) in collaboration with the Hong Kong Observatory on convection-induced turbulence (CIT) associated with significant convection.

2.26 The main focus of AvRDP2-SSC-3 will be on monitoring work progress over the two air routes chosen by the SSC at its first meeting in 2022, namely London to Johannesburg and Hong Kong to Singapore. In addition to the already developed innovative products and applications, AvRDP2-SSC-3 will review progress made in terms of blending nowcast products for an end-to-end nowcast prototype product for the London-Johannesburg route and the use of ensemble systems and probabilistic forecast information for the Hong Kong-Singapore route.

2.27 The preparation for trials and experiments expected to be conducted in the second half of 2024 and in 2025 will be investigated. For this purpose, SSC members are exploring effective engagement with several categories of aviation users, especially those directly involved in the safe conduct of flights such as pilots and air traffic controllers. Feedback from aviation users will be beneficial for the verification and validation phase of the project that the SSC is preparing for both routes. A plan for verification will be considered at AvRDP2-SSC-3.

Recently updated WMO publications and on-going related activities

2.28 New or recently updated WMO publications of direct or indirect relevance to aeronautical meteorology include:

- [Guide to Aeronautical Meteorological Services Cost Recovery: Principles and Guidance \(WMO-No. 904\)](#) (2023 edition, also available in French, Spanish and Russian)
- [Guide to Services for Aviation \(WMO-No. 732\)](#) (former Guide to Practices for Meteorological Offices Serving Aviation) (2023 edition, also available in French, Spanish and Russian)
- [Aerodrome Reports and Forecasts: A User's Handbook to the Codes \(WMO-No. 782\)](#) (2022 edition).
- [Technical Regulations, \(WMO-No. 49\), Volume I, General Meteorological Standards and Recommended Practices](#) (2023 edition)
- [Manual on the WMO Information System \(WMO-No. 1060\)](#) (2023 edition)
- [Guide to the WMO Information System, Volume I \(WMO-No. 1061\)](#) (2023 edition, updated in 2024)
- [Guide to the Implementation of Education and Training Standards in Meteorology and Hydrology, Volume I – Meteorology \(WMO-No. 1083\)](#) (2023 edition)
- [WMO Strategy for Service Delivery \(WMO-No. 1129\)](#) (2023 edition).

2.29 These and many other WMO publications are available via the [WMO e-Library](#). Pertinent publications in the aeronautical meteorology domain are also listed [here](#).

2.30 SC-AVI is (at time of writing) undertaking a review of several other publications of direct or indirect relevance to aeronautical meteorology, with a view to determining whether updates are required in the coming years. The publications under review include the *Guide to Meteorological Observing and Information Distribution Systems for Aviation Weather Services* (WMO-No. 731), last updated in 2014, and the *Guide to the Implementation of Quality Management Systems for National Meteorological and Hydrological Services and Other Relevant Service Providers* (WMO-No. 1100), last updated in 2017.

2.31 Finally, as highlighted last year at §2.6.18 to §2.6.21 of [METSG/27-IP/17](#), and according to the plan of action for the discontinuation of this publication, endorsed by Cg-19, the *Technical Regulations* (WMO-No. 49), Volume II, *Meteorological Service for International Air Navigation*, Parts I and II were discontinued on 31 December 2023, owing, essentially, to their duplication of ICAO Annex 3 (and upcoming *Procedures for Air Navigation Services – Meteorology*, PANS-MET). Meanwhile, Parts III and IV of WMO-No. 49, Volume II, which concern aeronautical climatology and the format and preparation of flight documentation, respectively, will be discontinued only once material of continuing relevance has been incorporated into ICAO PANS-MET (provisionally 2027).

#### Biannual Newsletters

2.32 WMO issues newsletters on a biannual basis to bring the community up to date on the latest global and regional developments in aeronautical meteorology, including national and regional case studies or good practice examples. At the time of this meeting, the most recent WMO Services for Aviation Newsletter (Issue No. 1/2024) was published in June 2024 and is available [here](#). Previous newsletters are available [here](#). Anyone wishing to subscribe (for free) to future newsletters is invited to email a request to the WMO Secretariat: [aviation@wmo.int](mailto:aviation@wmo.int)

#### Upcoming WMO meetings/events

2.33 The following provides an indication of upcoming global WMO meetings/events of relevance, together with weblinks where available. The information provided here is subject to change:

- Seventy-eighth session of the Executive Council ([EC-78](#)), 10 to 14 June 2024, Geneva, Switzerland.
- 2024 Aeronautical Meteorology Scientific Conference ([AeroMetSci-2024](#)), 21 to 25 October 2024, Geneva, Switzerland.
- 2024 Writing Workshop of the Task Team on the Long-term Plan for Aeronautical Meteorology ([TT-LTP-2024](#)), 28 to 30 October 2024, Geneva, Switzerland.

#### Available WMO resources and further information

2.34 WMO continues to maintain a Services for Aviation website, available [here](#). This website contains information and resources associated with WMO's Services for Aviation activity area, including direct access to regulatory and guidance materials, meeting documentation and reports, survey findings, newsletters, capacity development training aids and more.



2.35 WMO also maintains a Services for Aviation Moodle training portal, available [here](#). Supplementing the above-mentioned website, the Moodle training portal specifically provides aeronautical meteorology training and guidance material sourced from around the world, covering both operational and non-operational aspects of aeronautical meteorology. The portal's primary focus is the specialist needs of the aeronautical meteorological forecaster. To benefit from the full suite of materials hosted on the Moodle training portal, users are encouraged to register an account, for free, via this [link](#).

**3. ACTION BY THE MEETING**

3.1 The meeting is invited to note the information contained in this paper.

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