**OUTCOMES OF THE EC-69 SPECIAL DIALOGUE ON
THE FUTURE OF AERONAUTICAL METEOROLOGICAL SERVICES**

The Annex to this information paper provides the text of approved
Doc. 6.2(2) of EC-69 (10 to 17 May 2017) pertaining to the outcomes of the Special Dialogue on the future of aeronautical meteorological services (held on 11 May 2017).

**ANNEX**

**Extract of EC-69/Doc. 6.2(2), APPROVED**

**DRAFT DECISION**

**Draft Decision 6.2(2)/1 (EC-69)**

**FUTURE OF AERONAUTICAL METEOROLOGICAL SERVICES**

THE EXECUTIVE COUNCIL,

**Recalling** Resolution 66 (Cg-17) concerning WMO support to evolving aeronautical meteorological services, where future developments at a global, regional and national level should be fully aligned with the International Civil Aviation Organization (ICAO) Global Air Navigation Plan (GANP) and its aviation system block upgrades (ASBU) methodology,

**Recalling further** Decision 43 (EC-68) concerning an action plan for meteorological services for aviation which, inter alia, requested the development of a draft long-term plan for the WMO Aeronautical Meteorology Programme (LTP-AeMP) aligned with the ICAO GANP and ASBU methodology,

**Noting** the development of the draft LTP-AeMP,

**Further noting** the findings of the 2016/17 CAeM global survey on aeronautical meteorological service provision,

**Having held** an EC-69 Special Dialogue on the Future of Aeronautical Meteorological Services involving stakeholders from the meteorological and aviation communities, including the participation of public and private sector representatives, with the outcomes of the Special Dialogue summarized in the [Annex](#_Annex_to_Draft) to this Decision,

**Considering** the key issues to be addressed in enhancing the provision of meteorological service for international air navigation,

**Welcomes** the open dialogue with the aviation stakeholders and their recognition of the continuing and ever growing importance of the provision of high quality, consistent, fit-for-purpose, meteorological information and services to the safety, efficiency and regularity of the aviation operations;

**Acknowledges** the significant challenges and opportunities related to the growth of the air transport industry and the rapidly changing service requirements, institutional arrangements, technological developments, and related environment and climate change issues which will lead to respective major changes in the ways the meteorological information and services will be provided to users, as outlined in the ICAO GANP and ASBU;

**Acknowledges further** the importance of applying fair and transparent cost recovery for aeronautical meteorological service provision to help sustain basic meteorological infrastructure and ensure high quality services;

**Recognizes** the pressing cost-effectiveness requirements, coupled with the need to sustain high-performing meteorological services for aviation, compliant with the requirements for quality management, competency and qualification of personnel, and other ICAO and WMO requirements;

**Decides** that the outcomes of the Special Dialogue as outlined in the Annex should be reflected on the activities of the Aeronautical Meteorology Programme (AeMP) of the WMO;

**Agrees** that the underpinning basic infrastructure, data and information provision, and the aviation-related science and research developments shall be considered as vital contributions of WMO Members to the air transport industry which need to be sustained and enhanced in the planning of the future systems and services;

**Requests** the president of CAeM:

(1) To consider the outcomes of the Special Dialogue in preparing the agenda for the sixteenth Session of the CAeM (July 2018) as well as to continue regular dialogue and consultation with relevant aviation stakeholders; and

(2) In collaboration with presidents of regional associations, to develop a methodology and conduct a sensitivity analysis of various scenarios of future meteorological service delivery for aviation, including the degree of engagement of private sector providers, to assess possible impacts both on the NMHSs as aeronautical meteorological service providers and on the resulting service quality levels, where such analytical information is to inform WMO planning of aviation-related activities in the future;

**Requests** the presidents of regional associations, in coordination with the president of CAeM, to organize appropriate regional awareness events to highlight the issues discussed at the EC‑69 Special Dialogue and downscale them to the regional and Members’ level in order to raise their awareness and preparedness for the foreseen changes in the provision of meteorological services to aviation;

**Urges** Members to analyse the outcomes of the Special Dialogue, including through the conducting of a SWOT (strengths, weaknesses, opportunities, threat) analysis of their NMHSs, and to consider developing their own plans taking into account national stakeholder requirements for aeronautical meteorological service provision, global and regional plans and trends;

**Requests** the Secretary-General, in coordination with the presidents of regional associations and the president of CAeM, to support future GANP and ASBU awareness and planning activities in the regions.

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[Annex: 1](#_Annex_to_Draft)

**Annex to draft Decision 6.2(2)/1 (EC-69)**

**SUMMARY OF THE SPECIAL DIALOGUE ON THE
FUTURE OF AERONAUTICAL METEOROLOGICAL SERVICES**

***Introduction***

The Executive Council recognized the importance of this timely dialogue on the evolving requirements for the provision of meteorological services to international air navigation given existing and foreseen changes within the aviation sector over the next 10 to 15 years and the perceived impacts of change on aeronautical meteorological service provision.

With a view to stimulating strategic thinking and to assist the Executive Council chart a path for WMO Members that provide meteorological services to aviation, the dialogue highlighted both the challenges and the opportunities that lie ahead. Consideration was also given of the existing and new service delivery models intended to ensure sustainable aeronautical meteorological service provision to the required levels of performance, quality and cost effectiveness.

A keynote address was given by Mr C.M. Shun, President of the CAeM, Director of Hong Kong Observatory and Permanent Representative of Hong Kong, China with WMO, followed by presentations given by Mr Yong Wang, Chief of Airport Operations and Infrastructure, International Civil Aviation Organization (ICAO); Mr Magdy Reda, Manager of ATC Charges, International Air Transport Association (IATA); Captain Mark Hoey, General Manager of Operations, Cathay Pacific Airways; Mr Dennis Hart, Head of System Wide Information Management, EUROCONTROL; Mr Robert Rutledge, Lead Operations, Space Weather Prediction Centre, NOAA National Weather Service, United States of America; Dr Agnes Kijazi, Director General of the Tanzania Meteorological Agency and Permanent Representative of the United Republic of Tanzania with WMO; Ms Mary Glackin, Senior Vice-President, Science and Forecasting Operations, The Weather Company; and Ms Maria Lundblad, Senior Advisor, Aviation Services, Swedish Meteorological and Hydrological Institute.

In addition, the Executive Council valued an interactive panel discussion, moderated by the President of WMO, Mr David Grimes, with Members which expanded consideration of the key topics with a view to building awareness and understanding.

***Summary of keynote address and presentations***

The Executive Council noted that air transport plays a major role in driving sustainable social and economic development and that, today, it carries more than 3 billion passengers – a figure which is expected to double by the end of the next decade. The Executive Council recalled that the Global Air Navigation Plan (GANP) of the International Civil Aviation Organization (ICAO) provides a rolling, 15-year strategic methodology for air transport upgrade progress, including a description of expected enhancements in the aeronautical meteorology domain which, together with other domains, are considered necessary or desirable to achieve tangible air navigation capacity and efficiency performance improvements while sustaining aviation’s number one priority: safety.

The Executive Council observed some of the key findings to emerge from a recent global survey on aeronautical meteorological service provision conducted by the Commission for Aeronautical Meteorology (CAeM), for which there had been a highly commendable 92 percent response rate amongst Members. The survey highlighted, inter alia, that while NMHSs of WMO Members were still heavily involved in aeronautical meteorological service provision – at local, national, regional and/or global levels – a number of other parties were now typically involved, including air navigation service providers and commercial meteorological service providers. The Executive Council observed also that while there had been great progress in the implementation, by Members, of key initiatives including quality management systems for aeronautical meteorological service provision and competency assessment of aeronautical meteorological personnel, gaps still remained in some regions.

Recognizing the prevailing drivers for change: the foreseen growth of air traffic, the need to maintain aviation safety whilst also increasing air navigation capacity and efficiency, reduction of the impacts of aviation on the environment, and noting the trend of increasing regionalization and globalization in response to user’s needs for globally harmonized and seamless services, the Executive Council recognized the need for the meteorological community to respond to the associated paradigm shift in modes of service delivery. These would include the development of new business models, utilization of the latest information technologies and scientific research, harnessing new and innovative methods of service delivery and being able to leverage a higher level of regional and international cooperation to bridge existing gaps. In this connection, the Executive Council acknowledged that WMO and ICAO should further strengthen their cooperation and collaboration in aeronautical meteorology matters – as emphasized at the recent bilateral meeting between the Secretary-General of WMO and the Secretary General of ICAO – to thereby enable Members/States to better fulfil their mandates.

The Executive Council recognized that aeronautical users, including but not limited to the airlines represented by the International Air Transport Association (IATA), require more transparency and a simplification of aeronautical meteorological charges, and that this could be achieved through improved engagement between, not least, the aeronautical meteorological service provider and user communities, facilitated through WMO, ICAO and IATA. It was also recognized that, on occasion, the costs recovered from aviation do not always make their way back to the service provider(s), often due to the arrangements within a Member/State, with consequent ramifications on the ability of the service provider(s) to deliver and further develop their services.

The Executive Council noted the growing need for more aircraft based meteorological data and appreciated the support of IATA in helping to expand the AMDAR programme and the effective sharing of aircraft meteorological data available from both public and private sectors with the meteorological community.

In respect of aviation safety, the Executive Council was informed that hazardous meteorological conditions continue to be a significant factor in aviation incidents and accidents at airports and in the air. When considering flight safety as well as the efficiency, economy and environmental protection factors, aeronautical meteorology understandably continues to be a priority area of interest to, not least, the airlines and air traffic management (ATM).

The Executive Council noted the rapid advancement in the methods of disseminating meteorological information to the flight deck, including increased use of computer tablets, which was also now influencing how users were undertaking flight crew training in meteorology. It was noted, for example, that the pilots are now harnessing the power of new technologies and that, as a consequence, the traditional means of obtaining pre-flight briefing materials and in-flight updates were likely to become outdated sooner rather than later. It was further noted that meteorological information was at the heart of ATM and that emerging operational concepts in support of trajectory-based operations would be heavily reliant on the availability of relevant ATM information (including meteorological information) at the right time, in the right place and in the right format. Meteorological information with increased granularity covering the wide range of weather scales down to the nowcasting scale (< 20 min) was envisaged for the future.

The Executive Council acknowledged that, through the implementation of the system-wide information management (SWIM) that will underpin the future ATM system, issues may arise concerning the physical management of the information (including meteorological information) which will require appropriate governance arrangements to be developed, including data management policies for both the providers and consumers of the information within SWIM. The need for interoperability of the WMO Information System (WIS) with SWIM was noted.

In the context of service delivery models, the Executive Council considered a variety of current models – at a global, regional, sub-regional/multi-national and national level – that may serve as guidance and inspiration for the future. The Executive Council recognized that all models, regardless of their geographic coverage, shared a common characteristic: their intent to provide an efficient and effective, globally harmonized and seamless meteorological service for international air navigation typically building on collaborative partnerships and a spirit of cooperation unconstrained by national borders.

In considering multi-national coordination and collaboration in aeronautical meteorological service provision, the Executive Council appreciated that challenges often have to be overcome, including national legislative barriers. However, it was noted that overcoming the challenges often leverages new opportunities, through the building of mutual trust, honesty and engagement amongst the parties involved.

On a related matter, the Executive Council recognized the importance of public-private engagement, noting a need to ensure harmonization between the activities of the public and private sectors to improve aeronautical meteorological service provision and, ultimately, to achieve “win-win” outcomes for all concerned. It was highlighted that while establishing such partnerships can be challenging, the returns on the investment can be huge, leading to a mutual understanding of the missions, strengths and constraints of the parties involved. Such engagement helps to develop a common view of the service demands, science and technology challenges and opportunities, as well as helping to define goals and manage expectations. The importance of sustaining dialogue in public-private engagement was strongly underscored.

***Summary of panel discussion***

**1. Need for dialogue and partnership with the stakeholders**

It was emphasized that the dialogue and partnership with stakeholders was of the utmost importance to aeronautical meteorological service provision, given that aviation users are advanced users with challenging targets. It was also well understood that private sector service providers will continue to have a growing and complementary role which could make the PPE (public-private engagement) in aviation a model for other service delivery areas.

As a strongly user focused service area, aeronautical meteorology benefits from a clear and detailed definition of users’ requirements. The ICAO Meteorology Panel (METP) has the main role in this regard in coordination with relevant user’s representatives and bodies, including WMO and IATA.

The ongoing and foreseen changes in the global ATM system and related changes in MET service provision are happening in a very dynamic, rapidly changing environment; thus, the continued dialogue between the different communities – users and providers, at all levels (national, regional and global) – has been identified as a crucial factor to ensure the required levels of flexibility, agility and adaptability. The Executive Council was reminded that the MET developments discussed here, were a part of similar intensive discussions and coordination among other stakeholders of the aviation industry. With this complexity, the formulation of the user requirements for MET information and services was not an easy task.

**2. Understanding the GANP and ASBU requirements and their impacts on MET**

Understanding the GANP and ASBU requirements for the integration of the meteorological information into the ATM decision-making processes in support of trajectory-based operation (TBO) was understood to be crucial. Entering into an increasingly automated decision-making environment will require respective automation of the MET information generation and sharing, and will require a close dialogue with users.

In response to the concerns relating to the potential impacts on the role of the service providers in the smaller or least developed countries, it was affirmed that in a future regionalized or globalized framework of services, the local providers would still have a role to play, especially in the provision of essential information and services, e.g., for the airports and terminal areas of their airports. Sharing of information from the underpinning meteorological infrastructure will also need to be maintained, particularly for nationally, regionally or globally assembled and processed information, in due consideration of the relevant data policy frameworks.

It was further clarified that not all ASBU modules contained in the GANP need to be applied to all countries around the globe. Each region and State would have to make an analysis of the operational requirements and define what capacities need to be built, bearing in mind the technological advancement. A crucial factor in this regard was the engagement and cooperation, at national level, between the relevant MET and aviation stakeholders.

Recognizing that the ASBU modules were aimed at structured and scheduled performance improvements, the inhomogeneous distribution of air traffic density would inevitably result in different needs for implementation of ASBU components, i.e., “one size does not fit all”. The definition of “What is good enough” will increasingly need to be used to define the minimum levels of service quality in due consideration of flight safety and cost-effectiveness requirements.

**3. Growth of private sector**

It was considered that the growth of the private sector in information and service provision would need relevant legislative and oversight measures to ensure quality, consistency and accountability. Thus, the role of the MET Authority designated by the government should be maintained as well as clear rules for designation of service providers. It was felt that the roles of the MET authority and MET service provider should be better defined.

With regard to the need to regulate the participation of the private sector in service delivery, it was clarified that this is a matter of fact even today. Private sector players are required to ensure that they comply with the requirements from ICAO and WMO on the training and competence of their personnel in the same manner as the public sector. Improved governance of aeronautical meteorological services to ensure that a minimum service quality level is consistently maintained across the public and private sectors may be required in the future. Recognizing that there were national variations in the engagement of the private sector, it was also clear that airlines require globally consistent and harmonized levels of service. Both sectors therefore should work towards optimum solutions in this regard and WMO should try to facilitate this work. From the airlines perspective, the main call was for service provision models that will guarantee agreed levels of quality and global consistency (through appropriate governance mechanisms) as well as efficiency (optimum cost/quality), with data and information acquired from recognized and approved trustworthy sources.

In discussing the relationship between the public and private sector, it was noted that it could take the form of complementary partnership, provider-customer relation, or competition. All these were available in today’s service delivery models, moreover, such relationships were present within each of the sectors (e.g., there were possible cases of competition between the NMHSs).

**4. Changing service delivery models – regionalization and globalization**

With regard to concerns expressed by some Members of the envisaged further regionalization and globalization of MET service provision, it was made clear that such developments were a part of the overall consolidation of air navigation services, as a measure to eliminate the current fragmentation of the airspace with related significant unnecessary cost for the aviation users (estimated at 2 billion euros/year in the EUROCONTROL airspace alone). With the understanding that these changes are inevitable, some Executive Council members sought assurance that the decisions concerning the establishment of future regional centres and facilities should be well coordinated and justified to allow for respective forward looking national planning.

It was recognized that the regionalization and globalization were concepts necessary to support the requirements of the global ATM community. The discussion about how far are the realization of such concepts and what would be the implications for the current providers was still ongoing, most prominently with ICAO. The two-year amendment cycle of the Standards and Recommended Practices of ICAO Annex 3 / WMO-No. 49, Technical Regulations, Volume II, was noted and thus the issue of establishment of regional centres will be a subject of further deliberation in the next amendment due for 2020. It was also noted that the realization of future regional systems, e.g., the potential Regional Hazardous Weather Advisory Centres (RHWAC), would require a rebalancing of the roles of current service providers including NMHSs.

**5. Changing technology and Information Management**

The integration of MET information into the ICAO system-wide information management (SWIM) environment was considered as a main priority for Members in the next couple of years. In this connection, the implementation of the ICAO Meteorological Information Exchange Model (IWXXM) was due for completion by 2020 as the first step of the integration. WMO and ICAO should coordinate to ensure the interoperability of their information management concepts and systems and also in facilitating the implementation through coordinated capacity development actions.

It was acknowledged that there were aspects of SWIM that needed further consideration. For example, the authorized MET providers will use the available interfaces to insert the required information, but there will be many other players also supplying information. In a highly-automated, data-rich digital environment, one side effect is that NMHSs may lose contact with the end-users, e.g. pilots, relative to the situation today. Similarly, with quality a global concern, feedback from the users may be lost. As a consequence, mechanisms to ensure that effective interfaces and interactions between provider and consumer can be sustained will need to be sought.

**6. How the less developed Members (LDCs and SIDS) will cope with the change**

The implementation of the MET elements of the GANP and ASBU was seen as a massive effort by Members in the years to come. This would necessitate an intense capacity development programme and increased level of awareness on the implications and impact of these changes in particular for the LDCs and SIDS. These countries were concerned about the strong pressure to improve the services in view of their scarce resources. The Executive Council therefore emphasized the importance of fair cost recovery schemes in order to sustain the basic and underpinning meteorological infrastructure. It was further explained that GANP and ASBU implementation was to be localized in accordance with the level of aviation operations and the needs of each sub-region or State. To facilitate such regional and national impact assessment and planning, WMO was requested to extend these types of awareness building discussions to the regional level. This was related to the proclaimed “no country left behind” approach and the need to assist the developing countries to cope with the forthcoming changes, which had also been highlighted in the joint statement on the occasion of the recent meeting between the Secretary General of ICAO and the Secretary-General of WMO.

**7. Need for research and development**

The primary importance of intensive research and development to underpin the foreseen performance improvements in the GANP and ASBU was emphasized. Various demonstration projects (e.g. the Aviation Research Demonstration Project (AvRDP)) and experimental services currently conducted in the WMO framework, but also similar developments in the private sector, have raised expectations of what can be ‘pulled through’ from the global research community. WMO is planning a large-scale scientific event on aeronautical meteorology in November 2017 as a collaboration between the CAS, CAeM and CBS. Executive Council members felt that the meteorological community has a lot more information that could potentially be used for enhanced service provision, noting however, there were resource constraints on what could be ‘pulled through’.

The modern digital stream of information and services poses new challenges that need to be subject to research, for instance “the seductive element” of the easily accessible forecast products through web-based applications and other such tools and the user’s perception of their accuracy (i.e. weather forecast being perceived as faultless). The trend is towards more and more automated generation of forecasts. There are aspects of the decision making based on such data that need to be studied from social science perspectives.

There was also a need to build new approaches different to the classical notion of “best forecast”, such as the quality of the utilization of impact- and risk-based forecast . Thus, instead of only trying to improve the accuracy of the forecast, the translation of the meteorological forecast elements, qualified with uncertainty and confidence information, into operational impacts, and the communication of such information to users, should also be addressed to improve their decision-making. Thus, the question is how to make the ‘best decision’, rather than simply to supply the ‘best forecast’.

**8. What can WMO and ICAO do to facilitate the process**

WMO has a clear role to play in providing guidance and raising awareness for the different scenarios and use cases, including the engagement of NMHSs with users at national level. Regional awareness events, such as the planned African Conference on Meteorology for Aviation (ACMA), would help the regional and national discussions.

A recent joint circular letter signed by the Secretary-General of WMO and the Secretary General of ICAO strongly encouraged the enhancement of the dialogue and coordination between the national authorities. It also expressed the commitment of ICAO and WMO to jointly plan and support capacity development actions for the LDCs, LLDCs and SIDS.

***Closing remarks***

In his concluding remarks, **Mr CM Shun, President of CAeM**, strongly encouraged all NMHSs to do their SWOT analysis vis-a-vis the outlined challenges and paradigm changes in the air navigation service provision of which meteorology is a key enabler. The meteorological services for aviation need to modernize and develop in alignment with the GANP and ASBU developments. The trustworthiness and fitness for purpose of these services should be ensured. The recognition that there will be increasing competition was crucial for success. The competition will accelerate innovation which will in turn drive service enhancements to meet the evolving performance requirements of users. Members’ concerns on the challenges are valid and need to be addressed by measures for establishing level playing field conditions to ensure fair and equitable competition, including the sharing of existing and new aeronautical meteorological data, e.g. aircraft data, while respecting IP rights. The “no country left behind” principle should result in concrete capacity development actions. A major undertaking for all will be to ensure the sustainability of the NMHSs and the basic infrastructure provided by all Members collectively to underpin the services provided to aviation; more appropriate cost-recovery mechanisms may be needed in this regard. Mr Shun strongly supported that similar dialogues and awareness events should be facilitated at the regional level, and envisaged that aeronautical meteorological services would remain a focus in the future strategic planning of WMO. Finally he called for all to embrace change because only by doing so could we turn challenges into opportunities.

**Prof. Petteri Taalas, WMO Secretary-General** expressed his satisfaction of the dialogue as an “eye-opening” exchange between the MET community and the other players of the aviation industry. He stressed that the world was changing and the Members’ NMHS needed to change accordingly. To achieve this, they should understand better the needs of customers. Another major driver is the technology advancement that provides new opportunities for enhancing en-route services which will help airlines to avoid hazardous weather. The changing business models and the private sector growing share poses serious questions about future funding of NMHSs if aviation customer is lost, including the development of improved services. All of this necessitate an impact assessment to be made, in particular for the developing countries some of which rely heavily on the aviation customer. The question many were facing was about the price for safety combined with the pressure for cost reduction. Prof. Taalas strongly encouraged meteorological services to keep the dialogue with end users; he also called for WMO, ICAO and IATA to use their mechanisms and power to address the issues and challenges in a collaborative manner.

**Mr David Grimes, President of WMO** referred to the new paradigm and the need for a new approach. He recommended the use of a sensitivity analysis of different possible scenarios, including extreme cases, such as the NMHS not anymore engaged as aeronautical meteorological service provider (AMSP). Such analysis should be two-fold – not only on effects on the NMHS, but also on potential impacts on the users and the aviation industry. In his view, the impacts on aviation will be highly negative because of the loss of the significant science and technology infrastructure built and maintained by the Members. Thus, when we reflect on the next steps – what are the risks – we need to think on both sides because there is a strong co-dependence. Historically, many NMHSs have been established mostly for the need of air navigation; massive science, research and infrastructure development have also been funded to support aviation safety and efficiency. In the current pressure for cost effectiveness, it should be remembered that when the users state they need “good enough service”, it does not mean “the cheapest service”. The big question now is how to provide an enterprise solution to meet the needs and expectations of the aviation users. The sensitivity analysis will inform how WMO should plan its aeronautical meteorology activities in this regard.

Mr Grimes stressed further that the new digital world brings new players, processes and systems. This necessarily leads us to embrace new cooperation and partnerships. Different solutions could be foreseen – both centralization and de-centralization of services. The important consideration is how to raise the collective capacity by working together. An important prerequisite for such collaboration will be better definition of roles and responsibilities because of the complexity of the stakeholder’s landscape. WMO, as a standard-making organization, has an important role to play in cooperation with its partner agencies.

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