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THIRTEENTH AIR NAVIGATION CONFERENCE

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COMMITTEE A

Agenda Item 2: Enabling the global air navigation system
2.3: Future provision of aeronautical meteorological service

SUPPORT OF ONGOING COLLABORATION, MANAGEMENT, AND DEVELOPMENT OF THE GLOBAL AERONAUTICAL METEOROLOGICAL SYSTEM

(Presented by New Zealand)

EXECUTIVE SUMMARY

In order to cope with current and future demands, States, international organisations, and ICAO will need to provide greater capability and capacity in order to effectively support and implement the aeronautical meteorological programme.

This is especially significant in the context of many objectives detailed in the *Global Air Navigation Plan* (GANP, Doc 9750) where aeronautical meteorology is a critical enabler.

Action: The Conference is invited to agree to the recommendation in paragraph 4.

1. INTRODUCTION

1.1 Aeronautical meteorology is a core enabler of civil aviation. As the science is refined, and new meteorological information and communication technologies are implemented, the critical role played by aeronautical meteorology can be underestimated or not recognised.

1.2 In recent times, and into the foreseeable future, there are expected to be many changes and advancements in aeronautical meteorology to better support aviation as set out in the GANP.

1.3 While some gains and new approaches have been achieved, the ability to sustain this progress is being increasingly compromised as States and international bodies divert resources away from aeronautical meteorology, its management, and development. Ultimately this situation could have a materially negative economic and social impact across the globe.

1.4 This paper seeks to inform capacity allocation decision processes in States and international bodies so they can better address the critical management and development resource and capacity needs of the global aeronautical meteorological programme.

2. DISCUSSION

2.1 Aviation Economics and the Value of Aeronautical Meteorology

2.1.1 Aeronautical meteorology is critical to the safe and sustainable operation of the global aviation system. This is underscored by the headline book-value to aviation; the gross benefit of aeronautical meteorology to airlines is in the vicinity of USD 20 to 30 billion[1] annually.

2.1.2 The loss of that gross benefit would be experienced in the form of increased fuel burn, increased flight times, increased maintenance costs, shorter aircraft life, loss of airspace capacity, reduced certainty in service delivery, increased air navigation and airport costs, increased weather related incidents and accidents, and so on.

2.1.3 Given the net profit for global aviation in 2017 was USD 38 billion on a turnover of USD 787[2] billion, it is clear that the removal or dysfunction of aeronautical meteorology would create significant financial problems for some airline operations.

2.1.4 The wider social cost of such dysfunction would likely be orders of magnitude greater, considering that the annual global gross domestic product (GDP) contribution of aviation is over USD 2.7[3] trillion.

2.1.5 The social costs would include the downstream reduced employment effects of a marginal aviation industry, reduction in trade and reduced GDP, reduction in social connection for people, reduction in emergency capabilities, potential harm to property and people, and the loss of lives.

2.1.6 Hence the effects that could be expected in the event of the loss or degradation of aviation meteorological services, in summary, are the increase in safety and financial risk in airline operations, and an increase in wider negative social effects.

2.1.7 Compared to these marked economic and social costs and values, the much smaller estimated annual global cost of aeronautical meteorology is a good investment, estimated at around USD 1.5[4] billion. As such, this leaves ample financial capacity for increased management and development capacity in global aeronautical meteorology.

2.2 One Atmosphere

2.2.1 Climate change is bringing new dynamically changing issues for aviation and aeronautical meteorology. The nature of the global atmospheric circulation and its local effects are clearly changing[5].

2.2.2 There is only one atmosphere. It is not a construct like the human concepts of air navigation, aircraft, or management systems. It is a perilously scarce resource that we will need to increasingly strive to protect. In doing that, the use of airspace will have to be much more carefully managed in terms of aircraft numbers, density, and emissions. There are many initiatives, both international and State-based that seek to better manage these particular matters.

2.2.3 To assist in meeting these dramatic climate related challenges, the development of aeronautical meteorology needs to move from a relatively steady state perspective to one of operationally recognising ongoing dynamic and rapid climatological change across the globe.

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[1] Noted at the World Meteorological Organization (WMO) Aeronautical Meteorological Conference 2017, held in Toulouse, France. The estimates are based on UK work in 2012 and applying an update extrapolation methodology based on RPK data.
[2] From IATA *Economic Performance of The Airline Industry, Mid-year Report 2018*, (https://www.iata.org/publications/economics/Reports).
[3] From *Aviation Benefits Beyond Borders*, 2014 data (https://aviationbenefits.org/economic-growth/value-to-the-economy).
[4] From *Improving Meteorological Information for Air Transport*, Jaako Nuottokari, Finnish Meteorological Institute, 2017 (ISBN978-952-336-032-7)
[5] WMO presentation at ICAO GANIS, December 2017.

2.2.4 The aeronautical meteorology programme has begun to better recognise these challenges in its further progression toward regionally and globally based phenomena based information, as set out in the following paragraphs.

2.3 **Direction and Span of the Aeronautical Meteorology Programme**

2.3.1 The working paper on *Future Provision of Aeronautical Meteorological Service* (AN-Conf/13-WP/3) discusses the key developments in the aeronautical meteorology programme, namely:

a) implementation of a global space weather advisory system;

b) development of regional hazardous weather information systems;

c) implementation of the ICAO Meteorological Exchange Model (IWXXM);

d) implementation of System Wide Information Management (SWIM) for aeronautical meteorology; and

e) development of improved and regional cost recovery guidelines.

2.3.2 There are also a number of areas of development both within the ICAO aeronautical meteorology programme framework and that of the WMO that will bring fundamental change to the delivery of aeronautical meteorology to support the GANP and, in particular, performance-based navigation (PBN) and trajectory-based operations (TBO). These include development work regarding the provision of information on:

f) new probabilistic density based volcanic ash and sulphur dioxide forecasts;

g) high ice water content forecasts;

h) wake vortex forecasts;

i) turbulence forecasts; and

j) spatially wide and temporally long terminal area forecasts.

2.3.3 Importantly, within the ICAO aeronautical meteorology programme, significant capacity is applied to the overall management and co-ordination of existing and pending global systems, including:

k) World Area Forecast System (WAFS)

l) Secure Aviation Data Information Service (SADIS)

m) International Airways Volcano Watch (IAVW) system

n) Global space weather information system – pending (SWC)

2.3.4 Concurrently there is significant work being done on the development of a new detailed *Procedures for Air Navigation Services — Meteoroogyl* (PANS-MET) document to support a refined Annex 3 — *Meteorological Service for International Air Navigation*.

2.3.5 As yet less defined, but nevertheless expected new demands for aeronautical meteorology support will come from:

o) longer range and higher aircraft operations;

p) the renaissance of supersonic aircraft operations;

q) specialised unmanned aircraft systems (UAS)/remotely piloted aircraft system (RPAS) aircraft operations; and

r) low altitude personal aerial vehicle operations.

2.3.6 In essence, all of this work, developments, and expectations recognise the singularity of the atmosphere and seek to provide globally seamless, phenomena based, aeronautical meteorological information.

2.3.7 The work facing the ICAO aeronautical meteorology programme can be summarised as implementing a big data (SWIM), seamless, global approach. It continues to underscore the unique global perspective of the aeronautical meteorology community; one of a consolidated and collaborative global view where meteorological products and services provided by any one State, regionally, or globally are inter-dependent with the global aeronautical meteorological system, its total observational data, and its global models.

2.4 Capacity Challenges Facing the Aeronautical Meteorological Effort

2.4.1 There is a basic level of operational support to the global aeronautical meteorological programme from most of the 192 States signatory to the Chicago Convention. However, many States are already having difficulty in keeping pace with the current changes in Annex 3, let alone the significant changes that will be implemented over the next ten years.

2.4.2 There are barely a few tens of States that actively take part in work on developments in the aeronautical meteorological programme through the Meteorology Panel (METP), and the equivalent in the WMO Commission for Aeronautical Meteorology (CAeM). This puts significant pressure on those active individuals and States. Importantly, it also reduces the diversity of view represented, meaning that developments and solutions might not meet the needs of the States that do not actively participate.

2.4.3 Compounding this difficult situation, there is a trend in both the ICAO and WMO technical agencies of the United Nations, and in international user representative bodies to reduce their allocated capacity; in support of the management and development of global aeronautical meteorology, and in support of the changing needs of aviation and States.

3. CONCLUSION

3.1 Clearly aeronautical meteorology is undergoing a revolutionary change in the nature of the information it provides, how it is provided, and the atmospheric environment with which it is concerned. These developments and changes impact directly on the whole globe, concurrently impacting on each and every State in the provision of seamless aeronautical meteorology information, almost as if the globe was just one flight information region.

3.2 To properly develop and implement existing and new global aeronautical meteorology capabilities and capacities, States and United Nations agencies, especially ICAO, and international user representative bodies need to ensure that they provide sufficient internal capacity to underpin the collaborative global development already underway, and those developments currently envisaged.

3.3 Without the fully co-ordinated, informed and applied development of aeronautical meteorology systems, as a key enabler to the international aviation system, many of the critical gains expected from the GANP cannot be realised. The Conference is invited to agree to the following recommendation:

Recommendation 2.3/x – Strong support of the ongoing management and development of the global aeronautical meteorological system

That the Conference request ICAO to:

a) strongly remind States and international user representative organisations that they need to ensure there is ongoing, adequate, and equitable internal capacity made available for application in the collaborative management and development of the global aeronautical meteorological system; and

b) place much greater emphasis on the provision of sufficient internal capacity and resources in ICAO to support, through the aeronautical meteorology programme, the high level of co-ordination needed in the collaborative management and development of the global aeronautical meteorological system.

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