International Civil Aviation Organization

AN-Conf/13-WP/230
27/9/18
English only

WORKING PAPER

THIRTEENTH AIR NAVIGATION CONFERENCE

Montréal, Canada, 9 to 19 October 2018

COMMITTEE A

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

METEOROLOGICAL SERVICES TO SUPPORT FUTURE AIR TRAFFIC MANAGEMENT IN THE TROPICS

(Presented by Singapore)

EXECUTIVE SUMMARY

This paper presents an overview of the roles of, and the challenges faced by local and sub-regional meteorological communities in the tropics, in the provision of meteorological services to air traffic management (ATM) in the context of increased tropical convections and their potential future impact due to climate change. The paper further urges ICAO to give due consideration to such foreseen aviation impact when further refining the relevant meteorology components of the Aviation System Block Upgrades (ASBU) in the ICAO Global Air Navigation Plan (GANP, Doc 9750), including ASBU performance requirements.

Action: The Conference is invited to agree to the recommendation in paragraph 3.2.

1. INTRODUCTION

1.1 Aeronautical meteorology is an enabling function of international air navigation. The aviation system block upgrade (ASBU) thread described in the ICAO Global Air Navigation Plan (GANP) provides a long-term strategy to guide the development and full implementation of the next generation aeronautical meteorological services to meet the requirements of international civil aviation. The realization of the advanced meteorological components of the ASBU will depend on the progress in meteorological science and technology, as well as the transition of research to operations.

2. DISCUSSION

2.1 The air traffic management (ATM) and meteorological (MET) communities in Singapore have been working closely together in line with the ICAO GANP framework and the ASBU initiatives. Various customized aeronautical MET solutions have been developed to support provision of air traffic services to enable air traffic controllers to make effective decisions when the airport or portions of the airspace are affected by adverse weather such as intense thunderstorms. In addition, MET forecasting horizon and accuracy would need to continually improve in order to support Air Traffic Flow Management (ATFM) measures required for proactive planning to better balance between demand and

capacity. Furthermore, near real-time warning information on the occurrence or expected occurrence of significant weather such as significant convection in the form of harmonized SIGMETs for thunderstorms are routinely issued by the Meteorological Watch Offices (MWOs) to alert pilots in the en-route sectors of the respective flight information regions (FIR). In response to users' need for harmonized information across FIR borders, various SIGMET coordination projects have started in the Asia Pacific region. Singapore for example, has been performing the SIGMET coordination role in Southeast Asia since 2016.

2.2 Weather systems in the tropics especially the region in the proximity of the Equator tend to be dominated by thunderstorms that are localized and short-lived but yet have great impact on ATM. Such systems generally have limited predictability beyond the nowcast to very-short-range time scale (up to 6 hours) and it remains a challenge to forecast their occurrence reliably.

2.3 To address these challenges, Singapore has been developing a convective scale Numerical Weather Prediction (NWP) system with data assimilation/nowcasting capability in collaboration with the UK MET Office. An ensemble prediction system designed to account for uncertainties in the initial conditions is currently being evaluated. Despite the improvement in the modelling technology, more work is necessary to enhance the model capability in predicting localized thunderstorms. In view of the challenge of limited predictability of such convective-scale weather systems in the equatorial tropical region, the relevant ICAO expert groups are invited to take into consideration this inherent limitation due to the nature of the convective weather systems in the tropics when defining ASBU performance requirements, instead of a one-size-fits-all approach.

2.4 The World Meteorological Organization (WMO) Aeronautical Meteorological Science Conference 2017 recommended the research community to advance the research and improve communication to end users on the potential impact of climate and variability on aviation. The challenges in the provision of aeronautical meteorological services in the tropics could be further aggravated by the effects caused by of climate change. The frequencies and intensities of thunderstorms in Singapore are observed to have increased over the last 30 years, consistent with various climate projection studies that show an increased likelihood of occurrence of extreme weather including thunderstorms. With more frequent and intense thunderstorm occurrences, the safety impact on aircraft operations (such as in-cloud turbulence and jet-engine icing) is also likely to increase, affecting ATM operations and reducing aerodrome and airspace capacity. The increased convection in the tropics has also been shown to be linked to a stronger subtropical jetstream which can in turn trigger more occurrences of clear-air-turbulences in the mid-latitudes.

3. CONCLUSION

3.1 As air traffic movement in the tropical regions will continue to grow strongly in the coming years, and with the impact of climate change on aviation expected to rise in tandem, there is a need for deeper understanding of the challenges faced by the meteorological communities in the tropical region and the potential meteorological hazard risks on aviation associated with the effects of climate change.

3.2 The Conference is invited to agree on the following recommendation:

Recommendation 3.2/x – Meteorological services to support future air traffic management in the tropics

That the Conference:

a) consider and recognize the important roles of and the challenges faced by local and sub-regional meteorological communities in the tropics in the provision of meteorological services to the ATM community in the context of increased tropical convective systems due to climate change;

b) urge ICAO, in coordination with WMO, to give due consideration on the foreseen weather impact on aviation due to climate change when further refining the relevant meteorology components of the ASBU, including ASBU performance requirements; and

c) discuss any relevant matters as appropriate.

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