International Civil Aviation Organization
Asia and Pacific Office

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Agenda Item 5: Presentations – State / Industry / ICAO

LACK OF REAL-TIME WEATHER UPDATES FOR OPERATIONS OVER OCEANIC AIRSPACE

(Presented by the International Air Transport Association)

SUMMARY

This paper explores the challenges and implications of the absence of real-time weather updates for operations over oceanic airspace. It highlights the limitations of current systems, the impact on decision-making, and potential solutions to enhance safety and efficiency.

1. INTRODUCTION

1.1 The ICAO Annual Safety Report 2024 Asia Pacific Region[1] identified turbulence as one of the most prevalent accident categories in the region over the past five years (2019–2023).

1.2 The following measures are effective in mitigating the turbulence-associated risks:

- Anticipation and avoidance of turbulence and adverse weather conditions
- Real-time weather monitoring and data sharing
- Strategic flight planning adjustments based on improved weather forecasts
- Pilot training for turbulence management
- Cabin Preparedness to ensure passenger and Crew safety

1.3 This paper examines the limitations of current systems in oceanic airspace and their operational consequences. It also explores potential technological advancements to enhance weather monitoring for safer operations.

2. DISCUSSION

2.1 Overview of oceanic airspace operations and Preliminary challenges:

2.1.1 Reliance on Procedural Separation: Oceanic ATC relies on procedural longitudinal separation minima for non-equipped traffic and RNP-based separation for equipped traffic.

[1] ICAO Annual Safety Report 2024 Link: https://www.icao.int/APAC/RASG/RASG%20eDocs/APAC%20Annual%20Safety%20Report%202024.pdf

2.1.2 Lack of Real-Time Weather Integration: Despite enhancements in situational awareness through ATM automation, current systems cannot display detailed “real-time” weather information.

2.1.3 Impact on Decision-Making: This limitation restricts effective decision-making, particularly in managing enroute weather deviations, posing significant challenges in high-traffic density oceanic ATC sectors.

2.1.4 Given the increasing occurrences of RFI to GNSS, a combination of Adverse weather along with RFI to GNSS scenarios cannot be uncommon.

2.2 Key Concerns:

2.2.1 Weather Deviations Without Prior Clearance: Pilots may execute weather deviations without obtaining prior clearance due to unanticipated conditions.

2.2.2 Communication Challenges: Over the portions of oceanic airspace with VHF coverage, adverse weather often leads to increased frequency congestion, resulting in temporary loss of communication or communication blocks. While on CPDLC, increased message traffic may result in delayed response and similar is the case with HF communication – poor signal quality and delayed responses due to an additional level (HF Radio Operator) needed in the coordination.

2.2.3 Loss of Separation: Deviations, lack of situational awareness and communication lapses can lead to (or potential to) loss of separation minima.

2.2.4 RFI to GNSS: An ATM system that incorporates space-based ADS-B position reports relies on quality factors—specifically NIC and NACp values—to filter out low-integrity or low-quality ADS-B tracks. When these tracks are degraded, the automation system overrides them with extrapolated tracks until quality and integrity return to an acceptable level. However, in high-density air traffic, especially during weather deviations, extrapolated tracks could be misleading, potentially impacting situational awareness and traffic management.

2.2.5 Confusion During Weather Deviations: Lack of clear and consistent communication clubbed with erroneous situational awareness may result in contradictory clearances, adding to operational complexity.

2.2.6 Escalation to TCAS Alerts: Although the airspace management plan, airway structure, and ATC procedures are designed to handle such challenges, the combined factors mentioned above could still result in TCAS TAs and RAs.

2.3 Measures to Enhance the Safety of Flight Operations During Adverse Enroute Weather:

2.3.1 Establishment of Temporary ATC Sectors: Creating temporary air traffic control (ATC) sectors can help manage high-density traffic and provide more focused monitoring during adverse weather conditions. This allows for better coordination and quicker response to weather-related deviations.

2.3.2 Increased CPDLC Staffing: Enhancing Controller-Pilot Data Link Communications (CPDLC) staffing ensures that there are sufficient personnel to handle the increased communication demands during adverse weather. This will improve the efficiency of information exchange and decision-making processes.

2.3.3 Strategic ATM Adjustments: Implementing strategic air traffic management (ATM) adjustments, such as the temporary withdrawal of Reduced Horizontal Separation (RHS), can provide additional safety margins, reducing the risk of weather-related incidents.

2.4 Basic Challenges and a Possible way-out:

2.4.1 While modern ATM systems can integrate weather data, they still lack real-time enroute updates. This limitation is a basic challenge for Oceanic Control Centers (OCCs), restricting their ability to implement proactive safety measures discussed above.

2.4.2 Energy/Eddy-Dissipation Rate (EDR) is a standardized measure used to quantify atmospheric turbulence intensity. Unlike subjective turbulence reports or aircraft-specific responses, EDR provides an objective estimate of the turbulence state in the atmosphere, making it the official metric endorsed by ICAO and WMO for assessing turbulence intensity.

2.4.3 IATA Turbulence Aware[2]: IATA has developed a global data exchange platform that collects live EDR data from aircraft, enabling real-time turbulence monitoring. This platform is currently utilized by airlines and can also be explored to share with Oceanic Control Centers to enhance situational awareness and improve flight safety over oceanic airspace.

3. ACTION BY THE MEETING

3.1 The Meeting is invited to:

a) Note the information contained in this paper; and

b) Discuss any relevant matters as appropriate.

— END —

[2] IATA Turbulence Aware Platform link: https://www.iata.org/en/services/data/safety/turbulence-platform/#