International Civil Aviation Organization

INFORMATION PAPER

ASIA AND PACIFIC (APAC) FIFTEENTH MEETING OF THE METEOROLOGICAL REQUIREMENTS WORKING GROUP (MET/R WG/15)

Bangkok, Thailand 07 April – 10 April 2026

Agenda Item 3: Collaboration between MET and ATM stakeholders

TROPICAL CYCLONE SENYAR (2025): TC SIGMET ISSUANCE IN FIR JAKARTA, IMPACT ON AVIATION OPERATIONS, AND TELECOMMUNICATIONS RESILIENCE

(Presented by Indonesia)

SUMMARY

This paper documents Indonesia's experience in issuing Tropical Cyclone (TC) SIGMETs for FIR Jakarta (WIIF) during TC Senyar (November 2025), the second documented tropical cyclone to form in the Strait of Malacca. It covers the complete TC SIGMET and SIGMET TS issuance timeline, direct aviation and infrastructure impacts, continuity of aviation meteorological services during the reconstruction period, unique SIGMET challenges for near-equatorial systems, and five proposed contributions to the APAC Regional SIGMET Guide.

1. INTRODUCTION

1.1 BMKG operates Meteorological Watch Offices (MWOs) at Jakarta and Ujung Pandang, responsible for issuing SIGMET information for significant meteorological phenomena, including Tropical Cyclones (TC), within FIR Jakarta (WIIF) and FIR Ujung Pandang (WAAF), respectively, under the provisions of ICAO Annex 3. BMKG also operates the Tropical Cyclone Warning Center (TCWC) Jakarta, which provides critical internal guidance to both MWOs for SIGMET decision-making.

1.2 Tropical Cyclone Senyar developed from Tropical Cyclone Seed 95B in the Strait of Malacca, eastern Aceh. TCWC Jakarta began intensive monitoring on 21 November 2025, when the system was first detected at approximately 6.2°N, 99.6°E. TC Senyar officially reached tropical cyclone intensity at 5.0°N, 98.0°E at 00:00 UTC on 26 November 2025 (~90 km southeast of Lhokseumawe, Aceh), triggering the TC SIGMET responsibility of MWO Jakarta.

1.3 TC Senyar presented a rare operational challenge: the Strait of Malacca is climatologically unfavorable for tropical cyclone development, and TC Senyar formed at exactly 5.0°N, the theoretical minimum latitude for cyclone spin-up. This made it scientifically significant (only the second documented tropical cyclone in the Strait of Malacca after Tropical Storm Vamei in 2001) and operationally challenging, compounded by the concurrent presence of TC Koto in the adjacent Bay of Bengal.

1.4 This paper documents BMKG's TC SIGMET issuance practices during TC Senyar, the impact on aviation operations.

2. DISCUSSION

Synoptic Development and SIGMET TS Pre-TC Phase (21–25 November 2025)

2.1 BMKG TCWC Jakarta began monitoring Bibit Siklon 95B on 21 November 2025 as it developed in the Andaman Sea and moved into the Strait of Malacca. The system intensified slowly due to warm sea surface temperatures (≥ 26.5°C) and an active equatorial Rossby waves. BMKG issued initial warnings to regional governments approximately eight days before peak intensity. From 21 November, MWO Jakarta issued WS SIGMETs (Thunderstorm) every four hours for convective activity associated with the intensifying disturbance, with SIGMET polygon boundaries adjusted at each cycle based on Himawari-9 Enhanced (EH) imagery. Details of the pre-TC SIGMET TS issuance are presented in **Appendix A**.

TC SIGMET Issuance Procedures Applied by MWO Jakarta (26–27 November 2025)

2.2 At 00:00 UTC on 26 November 2025, TC Senyar officially reached tropical cyclone intensity (43 kt, 998 hPa). MWO Jakarta applied procedures consistent with the APAC Regional SIGMET Guide (Eleventh Edition, 2025): (a) TC SIGMET (WC SIGMET) was issued with TC designation, position, movement, CB coverage, and intensity trend; (b) validity periods were nominally six hours with earlier updates when TC track or intensity deviated significantly, including immediate cancellation of SIGMET 08 by SIGMET 09 within 13 minutes to correct the movement direction; (c) upon TC dissipation after 06:00 UTC on 27 November, TC SIGMETs were immediately transitioned to WS SIGMETs for residual convective activity. A total of seven (7) TC SIGMETs were issued: six on 26 November and one final SIGMET on 27 November. The verbatim texts of all TC SIGMETs are presented in **Appendix B**. The complete lifecycle and SIGMET action timeline are in **Appendix C**.

Impact on Aviation Operations and Observation Infrastructure

2.3 TC Senyar caused significant aviation meteorological impacts across the northern FIR Jakarta, with extreme rainfall at multiple airports, including Sultan Iskandar Muda/BTJ (210.5 mm/day), Minangkabau/PDG (129.8 mm/day), and Kualanamu/KNO. TC Senyar's very slow movement (as low as 2–4 knots near landfall) caused extreme convective rainfall to persist over the same locations for two to three consecutive days (Aceh maximum: 411 mm/24 hr at Kuala, Bireuen). Detailed airport and aerodrome impact data are presented in **Appendix D**.

2.4 TC Senyar caused unprecedented damage to telecommunications infrastructure. According to Kemekomdigi, as of 27 November 2025, 495 out of 34,660 BTS in North Sumatra and 799 BTS in Aceh were non-operational due to PLN electrical grid interruption. The most significant impact on aviation meteorological services was the 12-day disruption of METAR transmission from Bandar Udara F.L. Tobing, Sibolga (WIMS), from 25 November until fully restored on 7 December 2025. Two meteorological stations also sustained direct equipment damage: Pos Meteorologi Rembele (WITK) PC AWOS was damaged, and Stasiun Meteorologi Malikussaleh (WITM) ARG, AWOS system, and station water tank were destroyed by flooding. The complete METAR availability timeline at Sibolga (WIMS) is in **Appendix E**.

Aviation Operational Impacts and Aerodrome Operational Limitations

2.5 During the peak phase of TC Senyar on 26–27 November 2025, several aerodromes in the northern part of FIR Jakarta experienced operational disruptions due to persistent heavy rainfall, strong convective winds, and reduced visibility associated with intense convective bands surrounding the cyclone. These conditions affected airport ground operations and resulted in delays and operational constraints at several aerodromes, including Sultan Iskandar Muda (BTJ), Kualanamu (KNO), and Minangkabau (PDG). In addition to weather-related impacts, widespread electrical power outages and telecommunications disruptions across Aceh and North Sumatra affected supporting aviation

infrastructure and meteorological observation systems. The most significant operational impact occurred at F.L. Tobing Airport Sibolga (WIMS), where METAR transmission was unavailable for twelve days due to telecommunication network damage. During this period, NOTAMs were issued to inform aviation stakeholders of the temporary unavailability of routine meteorological observations. Despite these challenges, continuous coordination between BMKG, AirNav Indonesia, aerodrome operators, and adjacent FIR meteorological services ensured the continued provision of essential aviation meteorological information.

3. ACTION BY THE MEETING

3.1 The meeting is invited to the following:

a) note the information contained in this paper.

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APPENDIX A SIGMET TS Issuance During Pre-TC Phase

Table A — Summary of SIGMET TS Issuance During Pre-TC Phase (21–25 November 2025)

Period	SIGMET Type	Coverage Area	Update Frequency	Remarks
21–25 Nov 2025	WS SIGMET (Thunderstorm / TS)	Polygon encompassing Bibit Siklon 95B location in the eastern Strait of Malacca / eastern Aceh area	Every 4 hours	First SIGMET TS was issued 21 Nov 2025 at 02:01 UTC. Movement: W–WNW at 10 kt; intensity NC. Polygon adjusted at each cycle per Himawari-9 EH imagery.

APPENDIX B TC SIGMET Bulletins Issued by MWO Jakarta for TC Senyar

Table B — TC SIGMET Bulletins Issued by MWO Jakarta for TC Senyar

Date	SIGMET No. / Validity	SIGMET Text
26 Nov 2025	SIGMET 04 Valid: 260706/260906 UTC	WCID20 WIII 260706 WIIF SIGMET 04 VALID 260706/260906 WIII- WIIF JAKARTA FIR TC SENYAR PSN N0500 E09800 CB OBS AT 0355Z WI 100NM OF TC CENTRE MOV W 07KT INTSF=
26 Nov 2025	SIGMET 07 Valid: 261010/261510 UTC	WCID20 WIII 261010 WIIF SIGMET 07 VALID 261010/261510 WIII- WIIF JAKARTA FIR TC SENYAR PSN N0442 E09748 CB OBS AT 0600Z MOV S 07KT NC=
26 Nov 2025	SIGMET 08 (CNL'd by 09) Valid: 261020/261520 UTC	WCID20 WIII 261020 WIIF SIGMET 08 VALID 261020/261520 WIII- WIIF JAKARTA FIR TC SENYAR PSN N0442 E09748 CB OBS AT 0600Z WI 100NM OF TC CENTRE MOV SSW 07KT NC=
26 Nov 2025	SIGMET 09 (CNL SIGMET 08) Valid: 261033/261520 UTC	WCID20 WIII 261033 WIIF SIGMET 09 VALID 261033/261520 WIII- WIIF JAKARTA FIR CNL SIGMET 08 261020/261520=
26 Nov 2025	SIGMET 14 Valid: 261615/262115 UTC	WCID20 WIII 261615 WIIF SIGMET 14 VALID 261615/262115 WIII- WIIF JAKARTA FIR TC SENYAR PSN N0418 E09806 CB OBS AT 1200Z MOV SSE 05KT WKN=
26 Nov 2025	SIGMET 24 Valid: 262200/270315 UTC	WCID20 WIII 262200 WIIF SIGMET 24 VALID 262200/270315 WIII- WIIF JAKARTA FIR TC SENYAR PSN N0400 E09830 CB OBS AT 1800Z MOV ESE 03KT NC=
27 Nov 2025	SIGMET 03 (LAST)	WCID20 WIII 270425 WIIF SIGMET 03 VALID 270400/270600 WIII- WIIF JAKARTA FIR TC SENYAR PSN N0342 E09912 CB OBS AT 0000Z MOV ESE 02KT WKN=

	Valid: 270400/270600 UTC	(LAST TC SIGMET — TC SENYAR DISSIPATED AFTER 0600Z 27 NOV)

APPENDIX C TC Senyar Lifecycle Timeline and MWO Jakarta Aviation Response

Table C — TC Senyar Lifecycle Timeline and MWO Jakarta Aviation Response

Date/Time (UTC)	System Status	Position / Location	Meteorological Conditions	MWO Jakarta Aviation Action
21 Nov 2025 00:00 UTC	Tropical Disturbance 95B	Andaman Sea / N. Strait of Malacca (~6.2°N, 99.6°E)	Max wind 15 kt; MSLP ~1008 hPa. TCWC Jakarta begins intensive monitoring.	SIGMET TS issued 02:01 UTC. WNW 10 kt, NC. Updated every 4 hr.
22–25 Nov (Continuous)	Bibit Siklon 95B (intensifying)	E. Strait of Malacca / E. Aceh coast	Persistent convection. Warm SST > 26.5°C. Active Equatorial Rossby Wave.	Continuous WS SIGMET TS, 4-hourly updates. TCWC Jakarta ongoing analysis.
25 Nov 2025 03:30 UTC	Bibit 95B (intensifying) Telecommunication disruption begins	E. Strait of Malacca / Sibolga area	Last METAR from Sibolga (WIMS): 495 BTS in N. Sumatra and 799 BTS in Aceh are non-operational.	WS SIGMET continues. Monitoring METAR availability. Aerodrome warning coordination.
26 Nov 2025 00:00 UTC OFFICIAL TC DESIGNATION	TC SENYAR (Category 1)	5.0°N, 98.0°E (~90 km SE of Lhokseumawe) Within FIR Jakarta (WIIF)	Max wind: 43 kt (80 km/h). MSLP: 998 hPa. Moving W ~7 kt. TC Koto simultaneously active in Bay of Bengal. Aceh Utara: 310.8 mm/day.	TC SIGMET activated (SIGMET 04, 07:06 UTC). 6 TC SIGMETs on 26 Nov. Coord. with Singapore MSS and MetMalaysia. INMC ad-hoc briefing.
26 Nov 2025 (late)	TC Senyar (weakening) Landfall	Near Langsa, Aceh–N. Sumatra border (~4.18°N, 98.06°E)	Wind shear and land interaction accelerate weakening. Belawan/Medan: 262.2 mm/day.	SIGMET 14 and 24 issued. Intensity: WKN. TS SIGMET maintained for convective areas outside TC envelope.
27 Nov 2025 04:00–06:00 UTC	TC Senyar (Final TC SIGMET)	3.42°N, 99.12°E (over Aceh / N. Sumatra)	The max wind is decreasing. Movement: ESE 2 kt (near-stationary). WKN.	Last TC SIGMET (SIGMET 03) valid 0400–0600 UTC. After 0600 UTC: TC SIGMET terminated.
27 Nov 2025 After 06:00 UTC	Ex-TC Senyar (Dissipated)	Residual convection over Aceh / N. Sumatra / W. Sumatra	TC circulation loses integrity. Residual CB/TS persist. TC Koto continues in Bay of Bengal.	Transition to WS SIGMET (TS) for residual Ex-TC convective activity immediately after TC SIGMET expiry.
28 Nov 2025 – 18 Jan 2026	Ex-TC Senyar (Sustained impact)	Aceh, N. Sumatra, W. Sumatra, Riau	OMC/cloud seeding: 312 sorties, 139.8t NaCl + 156.6t CaO from BTJ,	WS SIGMET as required. Special INMC briefings. OMC NOTAM coordination.

			KNO, PDG. Emergency extended to 22 Jan 2026.	WIMS METAR restored 7 Dec 2025.

APPENDIX D Aviation Impact of TC Senyar on Airports and Meteorological Stations within FIR Jakarta

Table D — Aviation Impact of TC Senyar on Airports and Meteorological Stations within FIR Jakarta (WIIF)

Airport (ICAO)	FIR	Period Affected	Max Rainfall	Significant Phenomena	Operational Notes
Sultan Iskandar Muda (BTJ/WITT) Banda Aceh	WIIF	26–27 Nov	210.5 mm/day (26 Nov)	TS, SHRA, BCFG; strong winds; low visibility	OMC Operations Base (BMKG–BNPB). Flights affected by extreme weather.
Kualanamu (KNO/WIMM) Medan	WIIF	26–28 Nov	79.8 mm/day (26 Nov)	TS, HVY RA; high waves on nearby waters	Second OMC base. AirAsia Travel Advisory issued 27 Nov.
Minangkabau (PDG/WIEE) Padang	WIIF	26–27 Nov	129.8 mm/day (26 Nov)	TS, HVY RA; strong winds	Third OMC base. Padang Pariaman: 154–218 mm/day.
Sultan Syarif Kasim II (PKU/WIBB) Pekanbaru	WIIF	26–27 Nov	Heavy (SIGMET area)	TS, RA; low-level wind shear	Indirect impact zone. Significant rainfall increase.
Hang Nadim (BTH/WIDD) Batam	WIIF	26–28 Nov	Moderate-heavy	RA, TS; Riau Archipelago affected	Riau Islands in the affected zone; strong winds reported.
Malikussaleh (LSW/WITM) Aceh Utara	WIIF	25–27 Nov	Extreme	TS, HVY RA; flooding at station	ARG, AWOS, and the water tank were damaged by flooding. METAR observing capability impaired.
Rembele (WITK) Aceh Tengah	WIIF	25–27 Nov	High	TS, RA; equipment failure	PC AWOS damaged. METAR automated observation disrupted.

APPENDIX E METAR Availability at Sibolga (WIMS) During and After TC Senyar

Table E — METAR Availability at Sibolga (WIMS/Bandara F.L. Tobing) During and After TC Senyar

Period	Status	Details
Until 25 Nov 2025 03:30 UTC (10:30 WIB)	Normal → INTERRUPTED	Last METAR received from WIMS before telecommunications failure. 495 BTS in N. Sumatra and 799 BTS in Aceh are nonoperational due to PLN power outages and flood damage.
25 Nov – 30 Nov 2025	**METAR UNAVAILABLE**	Complete absence of METAR from WIMS. No automated or manual weather observations are available for aviation planning at the Sibolga aerodrome.
1 Dec 2025 00:00 UTC	Partial recovery (unstable)	METAR transmission resumed partially but was interrupted again until 3 December 2025, 06:00 UTC (13:00 WIB).
4–6 Dec 2025	Intermittent	METAR availability is unstable. Observations present but not reliable for continuous use in TAF verification.
From 7 Dec 2025	**FULLY RESTORED**	METAR from WIMS confirmed stable and continuous. Normal observing operations resumed 12 days after TC Senyar's dissipation.

APPENDIX F Meteorological Stations Supporting Aviation Services During Reconstruction Period

Table F — Meteorological Stations Supporting Aviation Services During Reconstruction Period (Post-TC Senyar)

No.	Meteorological Station	Supported Aerodrome / Province
1	Sultan Iskandar Muda	Bandar Udara Sultan Iskandar Muda (BTJ/WITT) — Banda Aceh, Aceh
2	Malikussaleh	Bandar Udara Malikussaleh (LSW/WITM) — Aceh Utara, Aceh (partial operation pending equipment restoration)
3	Cut Nyak Dhien	Bandar Udara Cut Nyak Dhien (MEQ/WITC) — Nagan Raya, Aceh
4	Maimun Saleh	Bandar Udara Maimun Saleh (SBG/WITB) — Sabang, Aceh
5	Kualanamu	Bandar Udara Internasional Kualanamu (KNO/WIMM) — Deli Serdang, North Sumatra
6	Silangit	Bandar Udara Silangit (DTB/WIMN) — Tapanuli Utara, North Sumatra
7	Binaka	Bandar Udara Binaka (GNS/WIMB) — Gunung Sitoli, North Sumatra
8	F.L. Tobing	Bandar Udara F.L. Tobing (FLZ/WIMS) — Tapanuli Tengah (Sibolga), North Sumatra
9	Aek Godang	Bandar Udara Aek Godang (AEG/WIME) — Padang Sidempuan, North Sumatra
10	Minangkabau	Bandar Udara Internasional Minangkabau (PDG/WIEE) — Padang Pariaman, West Sumatra
11	Sultan Syarif Kasim II	Bandar Udara Sultan Syarif Kasim II (PKU/WIBB) — Pekanbaru, Riau
12	Japura	Bandar Udara Japura (RGT/WIAJ) — Indragiri Hulu, Riau