



**BMKG**

# **SPACE WEATHER INFORMATION FOR AVIATION - METEOROLOGICAL PERSPECTIVE**

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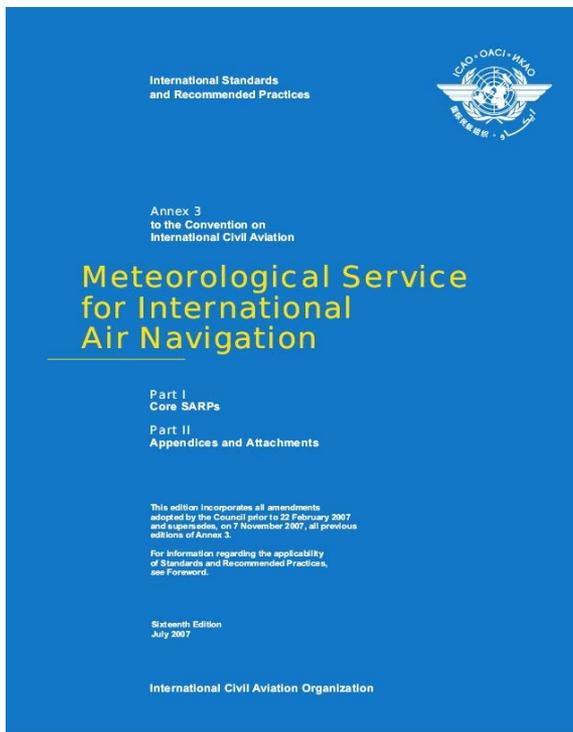
Indonesian Agency for Meteorology Climatology and Geophysics (BMKG)

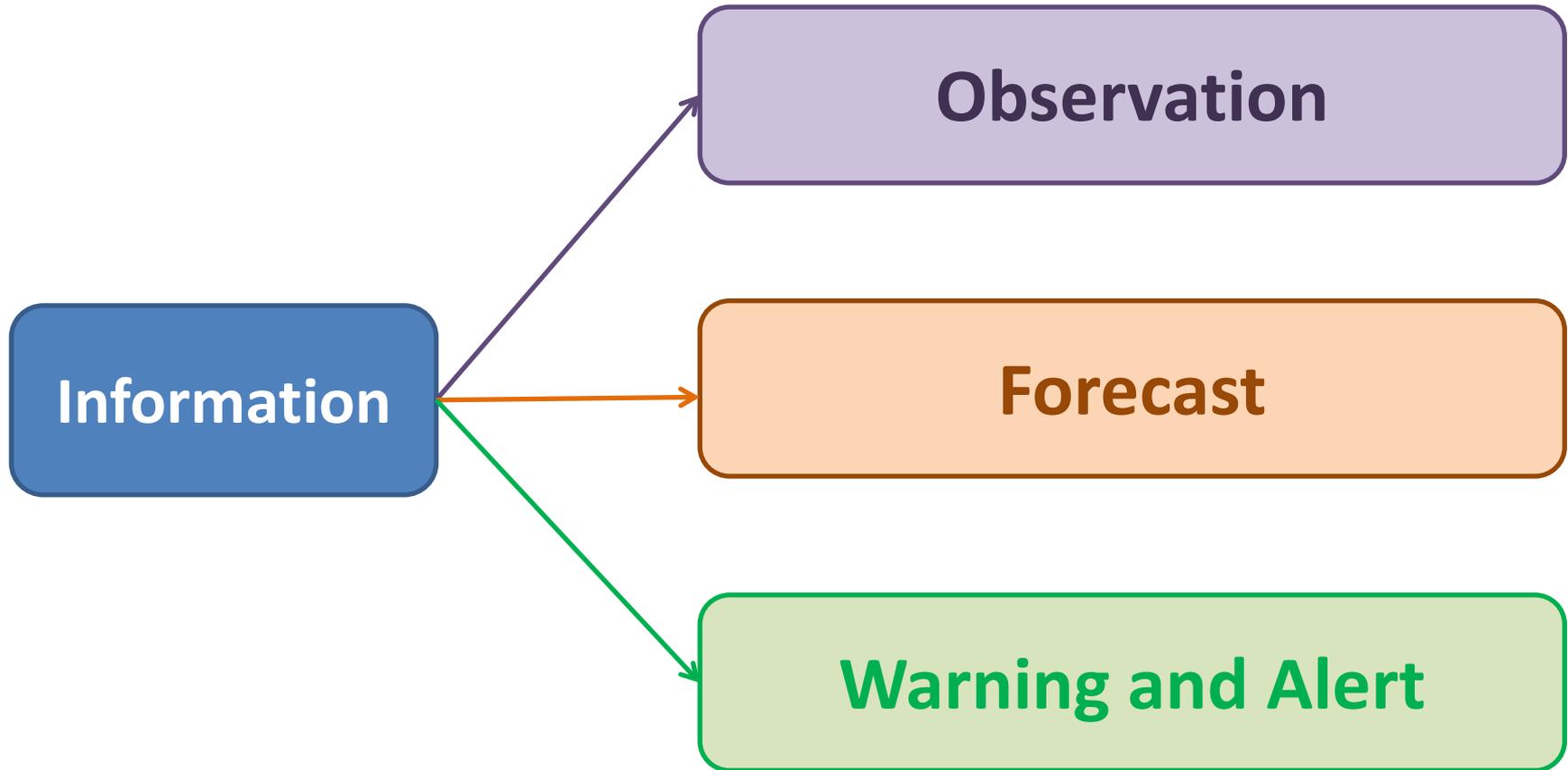
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1. Standard and Technical Regulation of Meteorological Information for Aviation
2. Existing Requirements
3. Future Requirements (Space Weather Information)

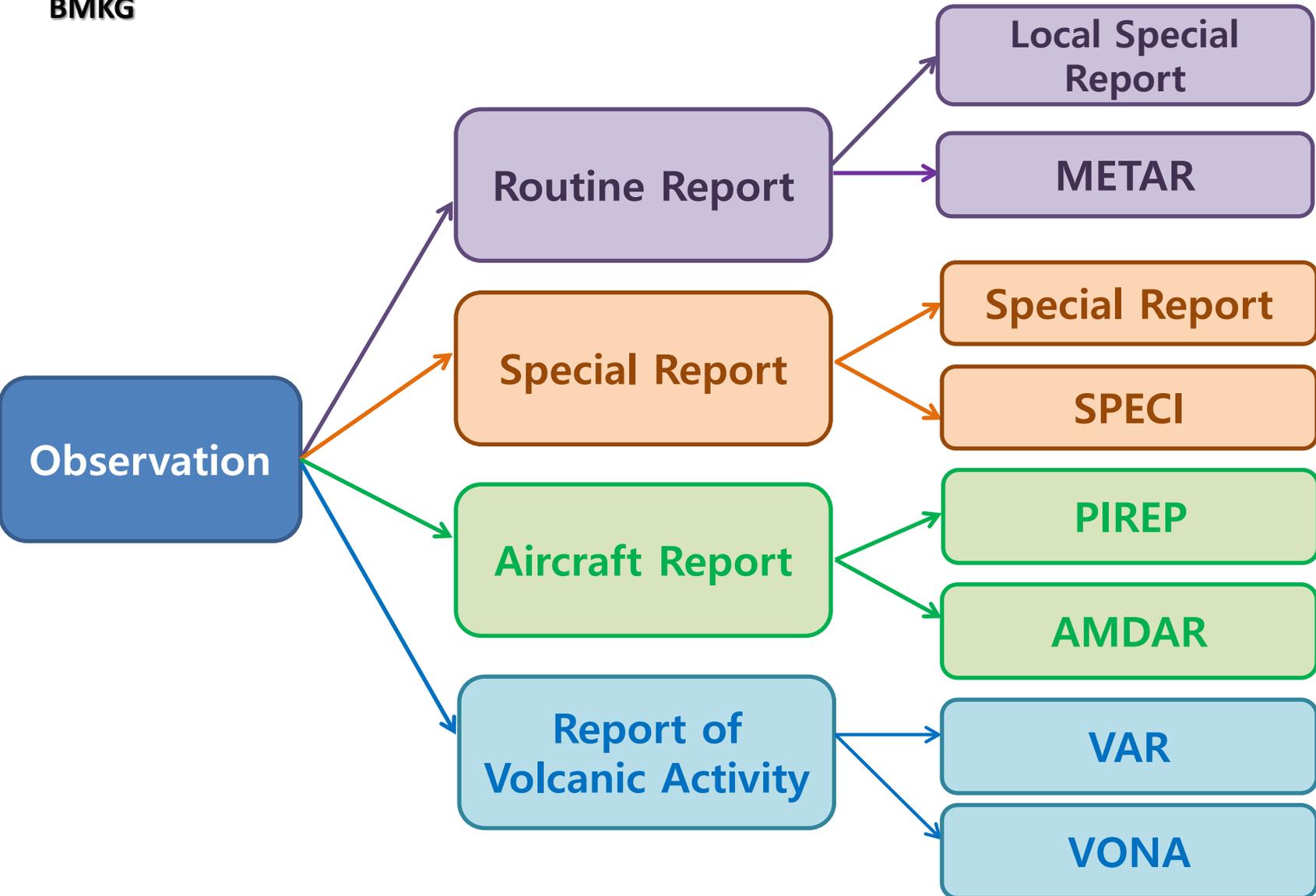


# STANDARD AND TECHNICAL REGULATION





# METEOROLOGICAL OBSERVATION FOR AVIATION





- World Area Forecast Services

- Volcanic Ash Advisory Centre
- Tropical Cyclone Advisory Centre

- Information for FIR (Flight Information Region)

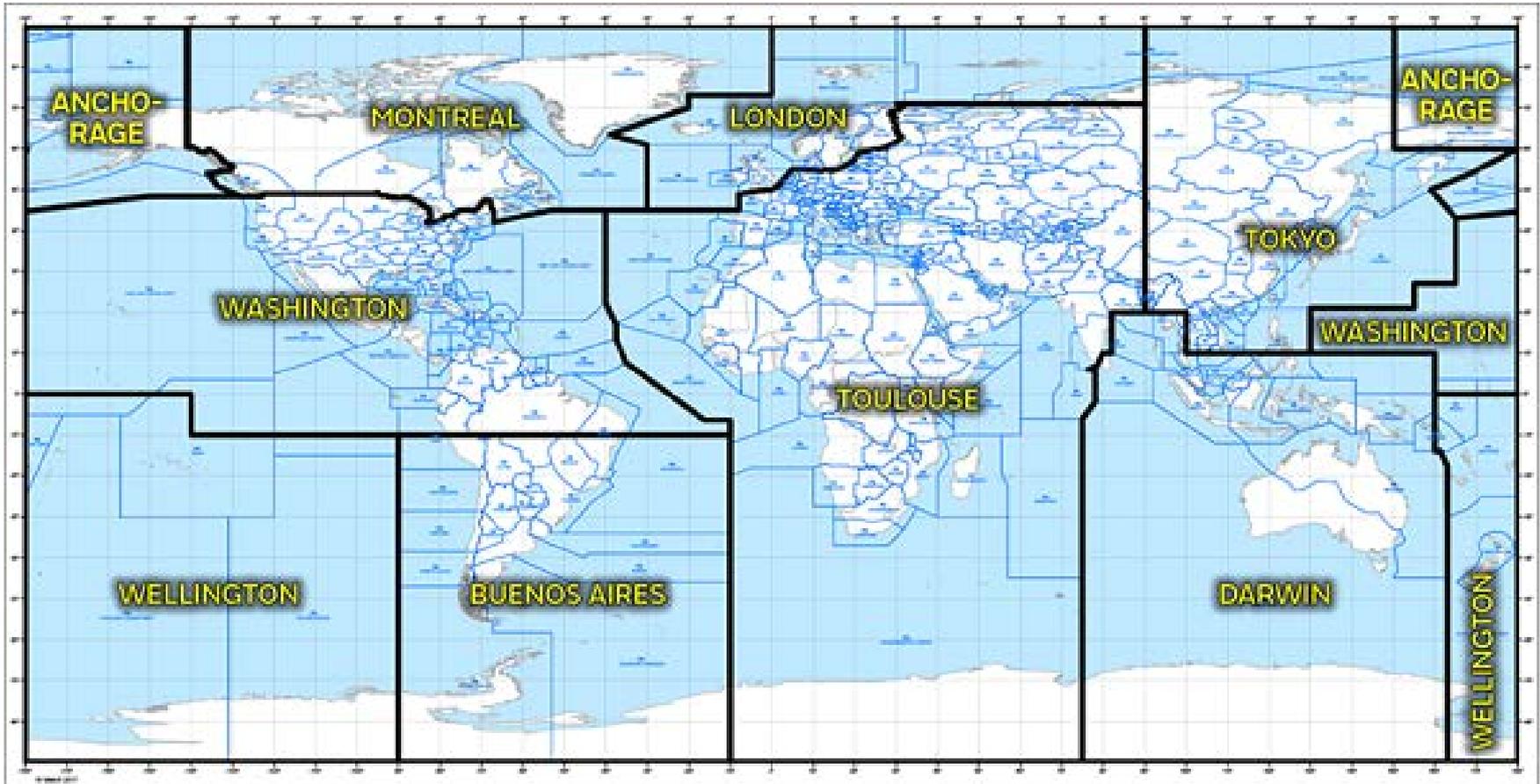
- Observation
- Forecast
- Warning and Alert



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# EXAMPLE - REGIONAL BASIS INFORMATION

VAAC (Volcanic Ash Advisory Centre) Area of Responsibility





## DEVELOPMENT OF PROVISIONS FOR SPACE WEATHER INFORMATION

- In 2002 the ICAO Meteorology Divisional Meeting requested the evaluation of the need to provide information for international air navigation, inter alia, on solar radiation storms.
- In 2011 the International Air Transport Association (IATA) confirmed a high-level user requirement for information on space weather.



## DEVELOPMENT OF PROVISIONS FOR SPACE WEATHER INFORMATION

**In 2014 the Meteorology (MET) Divisional Meeting recommended:**

Recommendation 2/7 – Development of provisions for information concerning space weather

That an appropriate ICAO expert group, in close coordination with WMO, be tasked to develop provisions for information on space weather to international air navigation consistent with the Global Air Navigation Plan (Doc 9750), including the integration of the information produced into the future system-wide information management (SWIM) environment underpinning the future globally interoperable air traffic management system



# INCLUSION OF SPACE WEATHER INFORMATION IN ICAO REQUIREMENTS

- Amendment 78 to Annex 3 is intended to: introduce basic initial provisions for space weather advisory information services in response to user needs expressed by IATA as no information of any kind is currently available to assist operators in assessing the risks associated with space weather events;

# ICAO ANNEX 3 REQUIREMENTS

## Annex 3- Meteorological Service for International Air Navigation

- Chapter 1-Definitions;
- Chapter 3- Specific SW requirements;
- Chapter 9- Service for operators and flight crew members;
- Appendix 2- New Space Weather Centres and Table A2-3. Template for advisory message for space weather information;
- Appendix 8 - Specifications related to flight documentation; and
- Attachment E - Spatial ranges and resolutions for space weather advisory information



# SPACE WEATHER CENTRE

Space weather centre (SWXC). A centre designated to monitor and provide advisory information on space weather phenomena expected to affect high-frequency radio communications, communications via satellite, GNSS-based navigation and surveillance systems and/or pose a radiation risk to aircraft occupants.

Note. – A space weather centre is designated as global and/or regional

# RESPONSIBILITY OF SWCX

a) monitor relevant ground-based, airborne and space-based observations to detect, and predict when possible, the existence of space weather phenomena that have an impact in the following areas:

- 1) high frequency (HF) radio communications;
- 2) communications via satellite;
- 3) GNSS-based navigation and surveillance; and
- 4) radiation exposure at flight levels;

b) issue advisory information regarding the extent, severity and duration of the space weather phenomena that have an impact referred to in a);

c) supply the advisory information referred to in b) to:

- 1) area control centres, flight information centres and aerodrome meteorological offices in its area of responsibility which may be affected;
- 2) other SWXCs; and
- 3) international OPMET databanks, international NOTAM offices and aeronautical fixed service Internet-based services.

## SPECIFIC REQUIREMENTS

- a. Advisory information on space weather should be issued in abbreviated plain language. When no approved ICAO abbreviations are available, English plain language text, to be kept to a minimum, should be used.
- b. As of 7 November 2019 until 4 November 2020, space weather advisory information should be made available in IWXXM GML form, in addition to the dissemination of space weather advisory information in abbreviated plain language
- c. As of 5 November 2020, space weather advisory information shall be disseminated in IWXXM GML form, in addition to the dissemination of this advisory information in abbreviated plain language



# SPACE WEATHER ADVISORY

## SWX ADVISORY

**DTG:** 20161108/0000Z

**SWXC:** (to be determined)

**SWX EFFECT:** RADIATION MOD

**ADVISORY NR:** 2016/2

**REPLACES  
ADVISORY NR:** REPLACES NR: 2016/1

**FCST SWX:** 20161108/0100Z HNH HSH E18000 – W18000 ABV FL350

**FCST SWX +6 HR:** 20121108/0700Z HNH HSH E18000 – W18000 ABV FL350

**FCST SWX +12 HR:** 20161108/1300Z HNH HSH E18000 – W18000 ABV FL350

**FCST SWX +18 HR:** 20161108/1900Z HNH HSH E18000 – W18000 ABV FL350

**FCST SWX +24 HR:** 20161109/0100Z NO SWX EXP

**RMK:** RADIATION LEVELS HAVE EXCEEDED 100 PERCENT OF BACKGROUND LEVELS AT FL350 AND ABOVE. THE CURRENT EVENT HAS PEAKED AND LEVELS ARE SLOWLY RETURNING TO BACKGROUND LEVELS. SEE [WWW.SPACEWEATHERPROVIDER.WEB](http://WWW.SPACEWEATHERPROVIDER.WEB)

**NXT ADVISORY:** NO FURTHER ADVISORIES



**Thank you**

6.1.3 Recommendation.— One or more of the following space weather effects should be included in the space weather advisory information, using their respective abbreviations as indicated below:

- HF communications (propagation, absorption) HF COM
- Communications via satellite (propagation, absorption) SATCOM
- GNSS-based navigation and surveillance (degradation) GNSS
- Radiation at flight levels (increased exposure) RADIATION

6.1.4 Recommendation.— The following intensities should be included in space weather advisory information, using their respective abbreviations as indicated below:

- moderate MOD
- severe SEV

Note.— Guidance on the use of these intensities is provided in the Manual on Space Weather Information in Support of International Air Navigation (Doc 10100).

6.1.5 Recommendation.— Updated advisory information on space weather phenomena should be issued as necessary but at least every six hours until such time as the space weather phenomena are no longer detected and/or are no longer expected to have an impact.

# Space Weather Centres

## Selection Process

1. WMO will assist in assessing potential provider(s).
2. The criteria are divided into the following four areas:
  - a. Institutional;
  - b. Operational;
  - c. Technical; and,
  - d. Communications/Dissemination.
3. Need to be able to deliver the space weather information services as defined in Annex 3 (proposed for applicability in November 2018).
4. Guidance on the selection of providers doesn't delineate between potential provider(s) of the global scale space weather information capability and the regional scale.
5. The optimal number of space weather information provider(s) to efficiently deliver a globally harmonized space weather service may be comprised of a single entity or multiple entities as part of a consortium.