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| WORLD METEOROLOGICAL ORGANIZATION **COMMISSION FOR BASIC SYSTEMS OPAG on DPFS**  **expert team on emergency response activitIes (et-era)**  **VIENNA, AUSTRIA, 1 – 5 OCTOBER 2018** |  | CBS-DPFS/ET-ERA/Doc. 4.3(1)  (15.IX.2018)  \_\_\_\_\_\_\_  Agenda item: 4.3  ENGLISH ONLY |

**Follow up on nuclear ERA Actions 15 and 16 from the**

**Buenos Aires ET meeting on Guidance for Radioactive Cloud SIGMET**

*(Submitted by ICAO and the co-Chair)*

##### Summary and purpose of document

Answering the question of the possible use of modelling as guidance to write radioactive cloud SIGMET in a timely matter is, in essence, the objective of action 15 from the last ET-ERA meeting. It is part of a long-standing collaboration between IAEA, ICAO and the WMO to solve this difficult problem.

The IAEA’s Inter-Agency on Radiological and Nuclear Emergencies created in November 2015 the Task Group on the *Development of Criteria to Support the Issuance of SIGMET in Case of a Release of Radioactive Material into the Atmosphere*. The Task Group’s report was submitted in 2017 and Action 15 is therefore completed. The results are presented in section 2 of this paper.

Action 16 asked the RSMCs to explore modelling options, conditional on the outcome of Action 15. As a result, it is closed.

##### Action Proposed

The meeting is invited to note and discuss the information presented in this paper.

**1. INTRODUCTION**

1.1 At the last meeting of the group in Buenos Aires, papers 4.3 (4), 4.3 (5) and 4.5 (4), available at <https://www.wmo.int/pages/prog/www/DPFSERA/Meetings/ET-ERA_BuenosAires2015/DocPlan_000.html>, covered activities related to radioactive clouds and aviation. The group discussed the long-standing question of the possible use of Atmospheric Transport and Dispersion Models (ATDM) in support of aviation.

 1.2 Paper 4.3 (5) reported on related activities at the ICAO Meteorology Panel’s (METP) Meteorological Information and Service Development (MISD) Working Group on the Release of Radioactive Material (RRM). The MISD RRM deals specifically with the topic of radioactivity and aviation. The paper also informed the group that ICAO and WMO had asked the IACRNE (IAEA’s Inter-Agency Committee on Radiological and Nuclear Emergencies) to help determine if atmospheric transport modelling guidance could/should be used to define an internationally applicable standard for the 3D, time evolution of the radioactive cloud SIGMET (Significant meteorological information that concerns the safety of aircraft). The SIGMET is a requirement defined in ICAO’s [Annex 3 — *Meteorological Services for International Air Navigation*](https://portal.icao.int/icao-net/Annexes/an03_20ed.pdf) (user/password protected).

1.3 The following actions, defined at previous ET-ERA meetings, were carried over in the Buenos Aires meeting report:

ACTION 15: ICAO, WMO and IAEA

Response from IACRNE Working Group

DUE DATE: Expected in 2016

Provide answers to the Expert Team on ERA regarding the questions raised by the CG-NERA (Vienna, November 2011) on possible modelling guidance on radioactive clouds for aviation interests.

 ACTION 16: Chair and RSMCs

Modelling guidance for radioactive clouds

DUE DATE: dependent on action 15

Continue to explore possible ways to provide modelling guidance.

1.4 The developments that have place since the Buenos Aires meeting are given in section 2 and their impact on these actions are covered in section 3.

**2. DEVELOPMENTS SINCE THE LAST ET-ERA MEETING**

*Note: Many of the documents referenced below are on a user/password protected ICAO website and are available on request.*

  2.1 November 2015: The IACRNE, at its 25th regular meeting, created the IACRNE Task Group (TG) on the *Development of Criteria to Support the Issuance of SIGMET in Case of a Release of Radioactive Material into the Atmosphere* with objective to “*develop criteria (quantitative or qualitative) to support the issuance of SIGMET in case of a release of radioactive material into the atmosphere and operational intervention levels (OILs) to determine if any response action is warranted for potentially affected aircraft.*”

 2.2 January 2016: The TG, composed of representatives from IAEA, ICAO and the WMO, begins its work.

2.3 May 2017: The TG submits its report (see [MISD2-SN2101\_RRM\_ Appendix A](https://portal.icao.int/METP/MISD/MISD3%20Meeting%20Documents/MISD3-SN2101_RRM%20(IACRNE%20SIGMET%20Task%20Group%20Report)%20(Appendix%20A).pdf)).

 2.4 July 2017: The TG’s report is presented at the MISD-3 RRM meeting (see [MISD3-SN2101\_RRM](https://portal.icao.int/METP/MISD/MISD3%20Meeting%20Documents/MISD3-SN2101_RRM%20(IACRNE%20SIGMET%20Task%20Group%20Report).pdf)). The key points are:

 1) Dose and plume projection tools are not considered suitable to define the radioactive cloud SIGMET for reasons detailed in the report.

2) *The radioactive cloud SIGMET can be adequately defined by a cylinder covering all flight levels and with a fixed radius (i.e. not time dependent) of up to 30 km*\*. This corresponds to IAEA emergency planning zones, but applied to aviation, and is based on very conservation assumptions:

— The radius that IAEA uses to define the “urgent protective action zone” at the surface (typically 30 km) is based on a worst-case scenario where a large amount of radioactivity is released over a 10 hr period and the corresponding predetermined estimates of the health hazard (i.e. calculated before the NPP is built, based on the characteristics of the reactor).

— The health hazard is determined from modelling calculations of the total dose (cloud shine, inhalation and ground shine) received in the first seven days after the start of the release ([IAEA Safety Standards Series No. GSR Part 7](https://www-pub.iaea.org/books/iaeabooks/10905/preparedness-and-response-for-a-nuclear-or-radiological-emergency)) and the very conservative assumption that the most sensitive person (young child) is breathing the radioactive material directly throughout the duration of the 10-hour release.

\* This must not be interpreted to mean that radioactive material is not transported outside of the 30 km radius. Obviously, it is but from a health perspective (total dose), it is not a danger for the passengers of the aircraft.

3) An important consequential impact of the report is that phases 2 and 3, on the use of source term estimates and ATDM to calculate airborne radioactivity concentrations and/or doses, are no longer needed in the *Concept of Operations for Radioactive Material Information Services in Support of International Air Navigation*. From an international civil aviation perspective, there is therefore no justification for ICAO or WMO to pursue efforts or continue to inject resources on these.

 4) There are also important consequential impacts in regard to the radioactive cloud SIGMET in Annex 3.

2.5 The MISD-3 meeting approved these and included them in the report. Some members did not agree and indicated that they would continue with ATDM development for aviation. Paragraph 3.2.1.1 in the [MISR-3 RRM report](https://portal.icao.int/METP/MISD/Reports/MISD3%20RRM%20Report%20FINAL%2020171105.pdf) summarizes it nicely: *“The meeting was reminded that the MET Panel had asked for the IACRNE report and the meeting understood that the reasonable response is for the MET Panel to abide by information in the report when considering changes to ICAO’s provisions of MET information. But the meeting understood that it is within the rights of States to continue to improve modelling efforts or to close airspace (i.e., danger area) in the event of a radiation release* “.

2.6 May 2018: MISD-4 RRM meeting. Following the MISD-3 RRM decisions, a proposal to always use and only use (i.e. no other option) a fixed radius cylinder for all radioactive cloud SIGMET\*\* was accepted by the meeting (see paper [MISD4-SN2103\_RRM](https://portal.icao.int/METP/MISD/MISD4%20Combined%20Documents/MISD4-SN2103_RRM%20(Ammendment%20to%20Annex-3%20Concerning%20Changes%20to%20Radioactive%20Cloud%20SIGMET)_Final.pdf) and the [MISD-4 report](https://portal.icao.int/METP/MISD/Reports/METP_MISD4_Combined_Meeting_Report_FINAL_REV1.pdf)) and will be submitted to the next meeting of the METP in September 2018. The meeting also decided that a major revision of the *Concept of Operations for Radioactive Material Information Services in Support of International Air Navigation* should be undertaken based on the decisions taken at MISD-3.

2.7 10 to 14 September 2018: The METP-4 meeting accepted the proposed amendment to the radioactive cloud SIGMET in Annex 3 (see paper [METP4-WP2101](https://portal.icao.int/METP/METP4%20Documents/METP4-WP2101_Amendment_to_Annex3_concerning_radioactive_cloud_SIGMET.pdf)). It will be included in the draft Amendment 79 to Annex 3 applicable in November 2020.

\*\* An option to use a cylinder with fixed radius for the radioactive cloud SIGMET was added to the SIGMET template in the latest version of Annex 3, that includes Amendment 78. Note 24 of the template says: ''Only for SIGMET messages for radioactive cloud. When detailed information on the release is not available, a radius of up to 30 kilometres (or 16 nautical miles) from the source may be applied; and a vertical extent from the surface (SFC) to the upper limit of the flight information region/upper flight information region (FIR/UIR) or control area (CTA) is to be applied. *[Applicable 7 November 2019]*''.

**3. CONCLUSION**

3.1 Action 15 in paragraph 1.3 is completed. The IACRNE Task Group report has answered all the questions raised by the ET-ERA.

3.2 Action 16 in paragraph 1.3 is closed. It was conditional on the outcome of Action 15. It is no longer needed given the recommendations in the IACRNE Task Group report that dose and plume projection tools not be used as guidance for the radioactive cloud SIGMET.