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| **World Meteorological Organization****Commission for Instruments and Methods of Observation OPAG on Remote-Sensing Technologies****Inter-Programme Expert Team on Operational Weather Radars**Tokyo, Japan, 13-16 March 2017 | **CIMO/OPAG-RST/IPET-OWR-1/Doc. 5.1**  |
| Submitted by:Daniel Michelson, Canada22.02.2017**Version 1** |

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# IPET-OWR Draft work plan

### SUMMARY

This document provides the draft work plan for IPET-OWR, as circulated on 23 January 2017.

### DECISIONS/ACTIONS REQUIRED: For information, discussion, and potentially recommendations for additions and changes.

### ISSUES TO BE DISCUSSED:

1. Does any work plan task require modification?
2. Are any additional tasks required?
3. We need to add names to tasks?

**Work plan of the Inter-Programme Expert Team on Operational Weather Radars (2016-2019)**CIMO-16, X.X

(ET-OWR deals with **all aspects** of operational weather radar under the ToR below.)

(Version: Draft 1.3, 20 January 2017)

| **No.** | **Task description** | **Person responsible** | **Action** | **Deliverable** | **Deadline for delivery** | **Status****[%]** | **Comments** |
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| **1.** | IPET managementAddresses ToRs 8, 9 | Michelson, Secretariat | 1. Organize the activities of the IPET into a Work Plan
2. Review and revise the Work Plan as necessary.
3. Report on issues, activities and progress to CIMO and CBS
 | 1. Work Plan
2. Work Plan Review and Revision
3. Reports to CIMO-MG, CBS-MG and ICT-IOS
 | 1. Jan 2017
2. Draft plan: Feb 2017;
3. Upon request; to CIMO annually
 |  | To be approved by the IPET members and CIMO MG. |
| **2.** | Survey of Members requirementsAddresses ToR 8 | MichelsonSecretariat | 1. Survey the Members aimed to obtain requirements for WMO assistance, guidance, etc. on OWR, and the status of the Members’ operational radars
2. Analyse survey replies
3. Review at IPET-OWR-1 and adjust work plan accordingly
 | 1. Survey
2. Survey report
3. Updated work plan
 | 1. Jan 2017
2. Mar 2017
3. Mar 2017
 |  | Short and concise survey. |
| **3.** | Regulatory Material, advice and guidance to WMO’s MembersAddresses ToR 1a-b, 2, 3 | TBD | 1. Draft new and revised RM for WIGOS and ensure consistency of the documents
2. Benefitting from the progress achieved by ET-ORST, and based on outputs from No. 6 below, develop and propose guidance material addressing the issues stated in ToR 1a, considering requirements of data users. Initially, proposed main areas of work, assuming the deployment of operational polarimetric radar technology, are:
	1. Compiling and assessing user requirements, drawing on existing surveys as much as possible
	2. While convenient to assume a well-calibrated radar, recommending methods for monitoring calibration status and stability should be addressed.
	3. Recommendations on Quality Control (QC) practices, focussing on target/problem classification and correction
	4. Recommendations on Quantitative Precipitation Estimation (QPE), focussing on polarimetric retrievals, VPR-based methods, and statistical adjustment methods based on surface observations.
	5. Recommendations on weather-radar compositing that exploit the improvements from QC and QPE.
	6. Quality Assurance (QA). For each step in QC, QPE, and compositing, recommend methods by which the performance of the algorithms applied, and accuracy of the results, may be monitored.
 | 1. Draft updates to WMO No. 8, 488, 544 and/or 1160
2. Guidance material:
	1. Compiled user requirements
	2. High-level document on weather radar, network design and applications
	3. Weather radar best practices guide
 | 1. Dec 2017 (No. 8: CIMO Guide)
	1. May 2017
	2. Jun 2017
	3. Initial draft: Dec 2017
 | 2b. 70 | Carried over from ET-SBO (for WMO-No. 544 and 1160, approved by CBS-16), draft RM (Action 1) may be considered completed, but there may be follow-up requests.Hence, the bulk of this task addresses guidance (Action 2).Division of Action 2 work to be done at the kickoff, Mar 2017.Deadlines indicate first versions. Deadlines for subsequent document versions will emerge from the work plan review. |
| **4.** | Weather radar data exchangeAddresses ToR 1a-b, 2 | TBD | 1. Conclude work started in TT-WRDE on the creation of proposed standard weather-radar data representation
2. Propose weather-radar data exchange methods
3. Develop associated guidance material and provide for integration under Task No. 3.
 | 1. Data representation:
	1. Information model
	2. Data model
	3. File format representation
2. Data exchange protocol(s) and mechanism(s)
3. Guidance material
 | * 1. Jan 2017
	2. Mar 2017
	3. Mar 2017
1. Dec 2017
 |  | Current status as of CBS-16: data representation well organized by TT-WRDE, with work in advanced stage of preparation.Data exchange remains TBD. |
| **5.** | Liaison with Weather radar database (WRDB)Addresses ToR 7 | Tukey (Sireci)Members | 1. Liaise with TSMS, and provide advice on structure/organization of WRDB, supporting the Members and WIGOS.
2. Facilitate Members contacts with the WRDB to help the WRDB stay up-to-date.
 | 1. Recommendations on potential WRDB enhancements
2. Updated WRDB and report
 | Upon request |  | WRDB is updated by TSMS. IPET liaises with TSMS.This is a placeholder, without specific foreseen recommendations or WRDB updates. |
| **6.**  | Weather radar quality control and quantitative precipitation estimation intercomparisonAddresses ToR 1a | TBD | 1. Conduct (participate in) an intercomparison in which weather-radar QC and QPE practices, with a priority on those identified under No. 3 above, are trialed and benchmarked according to agreed-upon performance metrics.
2. Prototype weather-radar data exchange using outputs from No. 4 above on data representation and data-exchange mechanisms and protocols.
 | 1. Documented evidence on QC and QPE practices with which advice and guidance to Members can be revised.
2. Real-time weather-radar data exchange using proposed WMO standards.
 | Data: Feb-Mar 2018Intercomparison: Dec 2018 |  | This is the spirit of RQQI.Assumes linkage with ICE-POP (PyeongChang 2018 winter Olympic Games) for site(s), instrumentation and data. |
| **7.** | International and regional collaboration - ISOAddresses ToR 6 | GabellaJoe | 1. Participate in the formulation of a joint ISO-WMO weather-radar standard
2. Liaise with/consult IPET members on the review of the committee draft (and other drafts, as appropriate)
 | 1. ISO-WMO weather-radar standard
2. Inform IPET on progress and seek IPET views on ISO standard committee draft (CD)
 | According to the ISO process |  | At least two phases of the joint work with ISO are envisaged.  |
| **8.** | International and regional collaboration - conferencesAddresses ToR 6 | TBD | 1. Present relevant outcomes of IPET at international radar conferences, if appropriate.
2. Synthesize outcomes of international radar conferences for the benefit of the team members and WMO.
3. Organisation of WMO international conferences on meteorological radar systems in collaboration with AMS and/or ERAD, Asian Radar Conf. (or a special session on global data exchange, etc. at these conferences)
 | 1. Presentations at international conferences
2. Document summarizing outcomes of international conference
3. (Co-)hosting international weather-radar conference(s)
 | 1. Asian Radar Conf. 2017
2. Report on AMS 38th Conference on Radar Meteorology (2017, Chicago)
3. Report on ERAD 2018, Utrecht, NL
4. AMS 29th Conference on Radar Meteorology (2019)
5. (ERAD 2020)
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| **9.**  | PolicyAddresses ToRs 4, 6, and 7 | TBD | 1. Contribute input to SG-RFC, strengthening the liaison with international organizations (ITU, EUMETFREQ, others), with the objective to protect frequency bands that are used for (operational) weather radar.
2. Monitor the use of frequency bands used for (operational) weather radar, gathering information on cases of interference.
3. Formulate, preferably together with other organizations, a sustainable policy for wind-turbine proximity to weather radars
 | 1. Provide input to SG-RFC
2. Case log of RFI events
3. Weather-radar and wind turbine statement or policy
 | 1. Upon request
2. IPET-OWR-2 or conference
3. Dec 2017
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| **10.** | Emerging technologiesAddresses ToR 5 | TBD | Review and report on potential operational developing and emerging weather radar research and technologies, including collaborative and adaptive data collection methods. | 1. Report(s)
2. Update of the CIMO Guide
 | 1. Jun 2017
2. Dec 2017
 |  | E.g. solid state transmitters, phased array antennas, low cost X-band radars.Benefit from ET-ORST results. |
| **11.** | Capacity development and trainingAddresses ToR 1c | TBD | 1. Coordination of/assistance with international training courses, e.g. TSMS (Turkey) and KMA (South Korea)
2. Conduct an inventory of (open) software for exchanging and processing weather-radar data
3. Development of competencies on weather radar
 | 1. Contributions to curricula, speakers and schedule for weather-radar training courses
2. Report on (open) software inventory
3. Examples of using weather-radar data processing software including interactive exercises
4. Advise on need for weather radar competencies
 | 1. Based on outcome of liaison
2. Dec 2017
3. ERAD 2018
4. Based on outcome of liaison and No. 2
 |  | 1. Liaising with EUMETCAL, TSMS, and KMA
2. Software solutions based on the [Open Radar Virtual Machine](https://openradar.github.io/)
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### Terms of Reference for WMO Inter-Programme Expert Team on Operational Weather Radars

Within the WIGOS framework, under the governance of CIMO and the joint guidance of CIMO and CBS, act as the WMO primary working group on operational weather radars (S, C and X band) with responsibility to:

(1) Develop and propose regulatory and guidance material on:

(a) Standardization of, and regulations and guidance on, systems requirements and specifications, quality control, maintenance and operation, data processing algorithms, data products and data quality monitoring, weather radar composites, and scanning strategies;

(b) Response to requirements of data users; and

(c) Training and capacity development.

(2) Contribute to development of methods, models and formats for the international exchange of weather radar data and metadata.

(3) Provide advice on network design.

(4) Provide guidance on radio-frequency allocation and protection.

(5) Review and report on potential operational developing and emerging weather radar research and technologies.

(6) Collaborate with other international and regional organizations on relevant matters, particularly including international standards organizations and research bodies and associations.

(7) Collaborate with and respond to the requests of WMO constituent bodies, as appropriate.

(8) Develop and document proposals for the activities of the Inter-Programme Expert Team.

(9) Report on issues, activities and progress to CIMO and CBS.

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