



**World Meteorological Organization**

**COMMISSION FOR BASIC SYSTEMS**

**OPEN PROGRAMME AREA GROUP ON INTEGRATED OBSERVING SYSTEMS**

**Expert Team on Surface Based Observations**

**Third Session**

**20 - 23 June, Geneva Switzerland**

**FINAL REPORT**

**(Updated with minor corrections, 27 September, 2017)**

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## **MEETING AGENDA**

### **1. Session Opening**

- 1.1. Adoption of the Agenda
- 1.2. Work Arrangements for the Session

### **2. Report of the Chairperson**

- 2.1. ET-SBO Progress Last CBS Inter-Sessional Period
- 2.2. Outcomes from the CBS Session
- 2.3. Current ToR
- 2.4. Ongoing Tasks
- 2.5. Work Plan 2017-2020

### **3. WIGOS Pre-Operational Phase**

- 3.1. Introduction to WIGOS
- 3.2. ET-SBO Contribution to the WIGOS Pre-Operational Phase

### **4. Team Member Identified National and Regional Issues**

### **5. Outcomes From CBS**

- 5.1. Observations Encoding Issues
- 5.2. Development of Regulatory and Guidance Materials
- 5.3. Study on Upper Air Network Optimisation

### **6. Work Plan Review and Planning**

- 6.1. Review of Work Plan and ToR
- 6.2. Ongoing Activities
- 6.3. New Activities
- 6.4. Group Planning Sessions
- 6.5. Finalisation of the Work Plan

### **7. Any Other Business**

### **8. Session Closure**

## **EXECUTIVE SUMMARY**

The 3rd Session of the Commission for Basic Systems (CBS) Expert Team on Surface Based Observations (ET-SBO) was held over 20 to 23 June, 2017 at WMO headquarters, Geneva Switzerland. The meeting was led by the chair of the team, Mr Stuart Goldstraw, United Kingdom, and was the first meeting of the expert team following the sixteenth session of the Commission for Basic Systems, which elected to re-form the team for the current inter-sessional period of the commission.

While the session had a focus on the planning and scheduling of tasks and activities from the ongoing tasks of the team, it was also an opportunity for the team to be guided by wider priorities and requirements of both the commission and the high-priority WMO activities associated with the WMO Integrated Observing System (WIGOS) Planning for the Pre-operational Phase, which had been adopted by the seventeenth session of WMO Congress (Cg-17, 2015). As a result, some new tasks were proposed to be added to the work plan of the team.

The meeting determined that the high priority activities for the team to address included: continuing to monitor and report on the progress of the implementation of the actions of the CBS Implementation Plan for the Evolution of the GOS (EGOS-IP), particularly focusing on the optimisation of the upper-air network; contributing to the conceptual development and implementation of the WIGOS Regional Basic Observing Network (RBON) and the Vision for WIGOS for 2040; further development of guidance materials supporting Member implementation and operation of WIGOS, OSCAR/Surface and relevant observing networks, including AWS; and a contribution to the development of the WIGOS Data Quality Monitoring System for the land surface-based component of the Global Observing System.

The team agreed to meet regularly by teleconference following the session in order to finalise the updated work plan for the team and then collaborate on particular work activities and tasks as necessary.

The actions from the meeting and the updated work plan are provided in the report within annexes III and IV respectively.

## **GENERAL SUMMARY**

### **1. Session Opening**

The 3<sup>rd</sup> Session of the Commission for Basic Systems (CBS) Expert Team on Surface Based Observations (ET-SBO) commenced at 9am on 20 June 2017 at WMO headquarters, Geneva Switzerland and was opened by the chair of the team, Mr Stuart Goldstraw, United Kingdom. The meeting was addressed by Mr Fernando Belda, Director of the Observing and Information Systems Department who welcomed the team members to WMO. Mr Belda briefly spoke on the importance of this meeting of ET-SBO, providing the opportunity to finalise and commence the work plan of the team near the beginning of the CBS inter-sessional period.

Mr Belda emphasised the important role the team had to play in the development of WIGOS in its Pre-operational phase, with contributions in various areas, including the implementation and management oversight of OSCAR/Surface, the development of WIGOS guidance material to support the existing regulatory material, the definition of the Regional Basic Observing Network (RBON) and also the development of the WIGOS Data Quality Monitoring System for the Global Observing System specific components of WIGOS. Additionally, the team would continue to further ongoing tasks, which included the study on the benefits of optimising the global radiosonde network and the development of WIGOS guidance material to support the existing regulatory material.

Mr Dean Lockett, WMO Secretariat, provided the participants with a brief presentation and some background on WMO, CBS and the Open Programme Area Group on Integrated Observing Systems (OPAG-IOS), in which the ET-SBO was established. The team members were urged to commit to at least one role in the work program of ET-SBO in order to ensure the successful accomplishment of the important tasks that the team had been requested to undertake by the commission.

#### **1.1. Adoption of the Agenda**

- 1.1.1. The agenda for the session was agreed and adopted by the meeting as above under Meeting Agenda.

#### **1.2. Work Arrangements for the Session**

- 1.2.1. The Chair described the proposed work arrangements and schedule for the meeting, which was conducted both in plenary and in several group sessions as summarised in this report.

### **2. Report of the Chairperson**

#### **2.1. ET-SBO Progress during the last CBS Inter-Sessional Period**

- 2.1.1. Mr Goldstraw outlined to the meeting the progress that the Expert Team (ET) has made on its work plan during the last inter-sessional period in which the first and second meetings of the team were held. This included:
  - 1) The first session of ET-SBO was held in Geneva in July 2013 and the second in Tokyo in October 2015, the latter being a joint session with the CIMO Expert Team on Operational Remote Sensing Technologies. Whilst holding joint meetings with CIMO Expert Teams was seen as an advantage, the challenge remained ensuring the agenda was valid for both Expert Teams. Therefore careful forward planning of meetings will be necessary to ensure any future joint sessions meet the needs of both Expert Teams.

- 2) The establishment of the CBS Task Team on Weather Radar Data Exchange, which was a recommendation and later outcome of the ET-SBO workshop on WRDE held in Exeter in which eventually led to the establishment of the CIMO Inter-Programme Expert Team on Operational Weather Radars (IPET-OWR). These teams had greatly advanced the work on the development of a standard for international exchange of weather radar data. The importance of this work for the future enhancement of the Global Observing System is understood by all and whilst ET-SBO will no longer have responsibility for the delivery of Weather Radar related activities, a close working relationship with IPET-OWR was expected.
- 3) The initial conceptual development of the WIGOS Data Quality Monitoring System (WDQMS) and the establishment of its wider development as a component of the WIGOS Plan for the Pre-operational Phase (W-PPP) and a designated priority of WIGOS by Congress. ET-SBO helped coordinate the first two workshops on data quality monitoring and incident management in December 2014 and December 2015.
- 4) The development of new regulations on AWS, Radar Wind Profilers (RWP) and weather radars that was approved by CBS for the updated Manual on the GOS but which also are consistent with the future integration of these observing systems under WIGOS and the RBON.
- 5) The work undertaken together with CIMO to make operational the WMO Radar Database in collaboration with the Turkish State Meteorological Service. This has led to the establishment of a formalised operational process for maintenance of the WRD metadata, which currently is the source of metadata for OSCAR/Surface. The coordination of the WRD is now the responsibility of the CIMO/IPET-OWR.
- 6) The development of a plan relating to a study on the possible reconfiguration of the radiosonde network in order to better optimise the upper-air network and better support applications, including but not limited to Numerical Weather Prediction (NWP). This is related to action G10 within the CBS Implementation Plan for Evolution of the GOS (EGOS-IP).
- 7) The completion of the questionnaire on the introduction and operational use of Radar Wind Profilers by Members and the publication of the results as a WIGOS Technical Report<sup>1</sup>.
- 8) Some expert input into the development of OSCAR/Surface, in particular in relation to RWP and weather radars and their capability to meet user requirements under the WMO Rolling Review of Requirements.

## **2.2. Outcomes from the CBS Session**

- 2.2.1. Based on some of the work programme items outlined above, the ET was responsible for several decisions and recommendations to CBS that were successfully approved or endorsed by CBS during its 16th Session (CBS-16, November 2016) and later ratified by the WMO Executive Council during its 69<sup>th</sup> session (EC-69, May 2017). In particular:
  - CBS and EC approved the proposed updates to the Manual on the GOS and the Guide to the GOS, which included the regulations on AWS, RWP and weather radar; and
  - CBS and EC endorsed the recommendation, CBS 5.4.1(3)/3 — Study to be undertaken to analyse options for optimization of the upper-air observations programme of the GOS.

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<sup>1</sup> [http://library.wmo.int/opac/index.php?lvl=notice\\_display&id=16117](http://library.wmo.int/opac/index.php?lvl=notice_display&id=16117)

- 2.2.2. The major emphasis coming from CBS-XVI was the need to urgently focus on the tasks required to make WIGOS fully operational by 2020. Therefore the majority of tasks undertaken by ET-SBO in the coming period will be in response to this priority.

### **2.3. Current ToR**

- 2.3.1. The Chair outlined the approved Terms of Reference of the ET and described to the meeting how these related to the approved work plan and the related tasks that the team was currently expected to undertake and coordinate. In addition to the tasks that were ongoing from the previous inter-sessional period, some new tasks would be added to the work plan based on contributing to the WIGOS PPP and also from new issues raised both before and during the ET session.
- 2.3.2. When adding new tasks to the work plan it will be essential to ensure they are linked to the ToR for ET-SBO. This will be important as whilst the tasks may be valid, the test against ToR will ensure the tasks are assigned to the correct Expert Team within the OPAG-IOS structure.

### **2.4. Ongoing Tasks**

- 2.4.1. The Chair informed the team that the critical ongoing tasks for the team would be:
- 1) Review of the EGOS-IP and reporting against agreed actions for which the ET is responsible;
  - 2) Development of guidance material as a contribution to the Guide to WIGOS, in particular for: provision, maintenance and use of WIGOS Station Identifiers for those components of the GOS that ET-SBO is principally responsible for; AWS operation; and supporting materials related to the new GOS regulations;
  - 3) Advancement of the task on upper-air network optimisation, related to Action G10 in the EGOS-IP;
  - 4) Support for the development of the Vision for WIGOS at 2040;
  - 5) Support the development of the concept of the RBON; and
  - 6) Continued support to the other activities of IPET-OSDE, including the monitoring of the actions of the EGOS-IP.

### **2.5. Work Plan 2017-2020**

- 2.5.1. The meeting was introduced to the work plan of the ET that was approved by CBS-16 and would be elaborated and updated as an outcome of the session under item 6. This would include the elaboration of existing, ongoing tasks and the addition of new tasks, such as the review and development of regulatory material and guidance on the RBON; the oversight of the quality of the land surface-based component of the OSCAR/Surface metadata, various tasks associated with data representation, support for development of the WDQMS and others that might be agreed during the meeting.
- 2.5.2. It was noted that whilst there are many tasks to undertake, the resources available to the Expert Team are finite and so all tasks must be considered in the context of the resources available.

#### ***Guidance from the OPAG Chair and Co-Chair***

- 2.5.3. Mr Jochen Dibbern, Co-chair of the OPAG-IOS, presented document 2(2) to the meeting, providing the team with some high-level guidance on expectations of the

commission for the ET and its role in making a contribution to the CBS strategic priorities. This included:

- The evolution of WIGOS towards the 2040 Vision, with RBON implementation and consideration of bringing benefits of WIGOS implementation;
  - Information management, and the development and implementation of WIS 2.0 in support of the wide basic systems requirements, and its interoperability with other systems;
  - Emerging data issues and new technologies, opportunities and threats;
  - Governance with: (i) increased focus from research to operations, (ii) increased focus on service delivery and the required competency framework to support it, (iii) clarification of the role of the Regional Associations in the implementation of the CBS work programme, and (iv) enhanced partnerships and clarifying the role of the private sector for the Weather/Water/Climate Enterprise;
  - Seamless GDPFS development with strong emphasis on implementing recent research developments and supporting technologies (e.g. WIS 2.0);
  - Capacity Development and continued work on identifying the socio economic benefits of NMHSs; and
  - Increased focus on quality management.
- 2.5.4. Mr Dibbern suggested that some of these priorities were already integrated into the work plan of the ET and that the delivery of the WIGOS PPP remained the single most important focus for the OPAG-IOS. In particular, focus should be upon the continued phasing out of the Manual on the Global Observing System based on its integration within the WIGOS regulatory material and establishment of the RBON concept.
- 2.5.5. The meeting was informed that EC-69 did not support the holding of an Extraordinary Session of CBS in 2018 and that the CBS Management Group was currently discussing and determining how recommendations and decisions developed by CBS over the coming inter-sessional period might be brought forward to EC-70 (2018) and Congress (Cg-XVIII, 2019) ahead of the next CBS session.
- 2.5.6. The meeting discussed the contribution of ET-SBO to the 2040 Vision and it was agreed that the team would be requested to undertake a review of the appendix to the draft text of the vision for the surface-based component of WIGOS, focusing particularly on those observing systems that were relevant to expertise of the ET. This review would be requested to be completed before the end of July 2017 to be incorporated into the draft being developed and coordinated by ICT-IOS.

### **3. WIGOS Pre-Operational Phase**

#### **3.1. Introduction to WIGOS**

- 3.1.1. Mr Lars Peter Riishojgaard made a presentation to the meeting introducing WIGOS and the WIGOS Plan for the Pre-operational Phase (PPP), which contained 5 priority areas:
- 1) WIGOS Regulatory Material, supplemented with necessary guidance material
  - 2) WIGOS Information Resource, including the Observing Systems Capabilities analysis and Review tool (OSCAR), especially OSCAR/Surface
  - 3) WIGOS Data Quality Monitoring System (WDQMS)



- 4) Regional Structure; Regional WIGOS Centers
  - 5) National WIGOS Implementation, coordination and governance mechanisms
- 3.1.2. The meeting was informed that the development of OSCAR/Surface and the WIGOS Data Quality Monitoring System (WDQMS) were the two most important technical elements of the WIGOS PPP, with both of strategic importance to WMO. This was because the OSCAR/Surface provides a quantitative, comprehensive online description of all observing platforms and stations of WIGOS, while the WDQMS is the primary WIGOS performance measuring tool. Therefore, the contribution of ET-SBO to the WIGOS PPP should focus most on these elements. This point reinforced the importance of WIGOS in the work plan of ET-SBO.

### **3.2. ET-SBO Contribution to the WIGOS Pre-Operational Phase**

- 3.2.1. The Chair made a presentation to the meeting describing how the team would be expected to contribute to the development of WIGOS in the Pre-operational Phase, including:
- 1) National Implementation - Contributing to the development and highlighting of best practice in observing system operation.
  - 2) Development of regulatory material- the ET would assist in the review of important regulatory material such as RBON, more directly contribute to the development of other material such as guidance on AWS and RWP and also help coordinate the integration of GOS regulatory materials into the Manual and Guide to WIGOS.
  - 3) WIR – the ET would continue to assist in the development and review of the functionality of OSCAR/Surface, including the development of methodologies and practices to ensure the quality of metadata, for those elements that fall within the remit of ET-SBO.
  - 4) WDQMS – ET-SBO would provide assistance and expertise in the development of the WDQMS framework and requirements for the land surface-based component of the GOS.
  - 5) Regional Centres – ET-SBO would contribute to the definition of the functions of WRCs, particularly relating to the development of the WDQMS and the management of OSCAR/Surface, for those elements that fall within the remit of ET-SBO.
- 3.2.2. The meeting agreed that ET-SBO retained a task and role to ensure the quality of metadata related to land surface-based sites and, whilst it was agreed that WRCs would ultimately have responsibility for the management and monitoring of the metadata, ET-SBO should play a role in developing methodologies and procedures for this functionality. A breakout group would assess the scope of this task and propose plans for undertaking this task as a new component of the work plan.
- 3.2.3. It was also pointed out that there were continuing and new emerging issues related to the transition to BUFR process and other data representation issues and there appeared to be no systematic process for reporting and acting upon such issues. It was agreed that the Incident Management System component of the WDQMS should accommodate such a requirement and functionality and that data users should be able to report issues.

## **4. Team Member Identified National and Regional Issues**

### ***Region I***

- 4.1.1. Mr Henry Karanja, Kenya, made a presentation to the meeting on the national and regional issues affecting the surface-based land observing systems in Africa, some of

which had been identified as a result of the WIGOS Data Quality Monitoring demonstration project in Region I, which started in July 2016 and is due to end in June 2017. The project identified various issues and incidents and are among those listed below.

- 4.1.2. Under the WIGOS PPP, the Kenya Meteorological department (KMD) was hosting a series of workshops with other national stakeholders on environmental observations for which the main objective is to develop collaborative methods in weather and climate observations. The workshops were also expected to establish methods and practices for sharing both observations and metadata. So far, KMD has held three workshops, with additional workshops planned to involve other counties in the region.
- 4.1.3. The following were deemed to be the critical issues currently affecting the implementation of national observing networks in Region 1:
  - Difficulty in rectifying technical issues and replacing instruments located in remote places.
  - Inadequate human capacity, mainly due to staff retirement and natural attrition without replacement.
  - Inadequate funding leading to difficulties in the maintenance of existing stations, their modernization and the wider expansion of observing networks to more fully meet user requirements.
  - Data losses associated both with the difficulty in meeting communications costs associated with the operation of automated observing systems and with their unreliability.
  - Lack of adequate security in some sites leading to loss of the parts e.g. solar panels and some metallic parts sold as scrap metal.
  - Inadequate calibration facilities, for example, there is no calibration standard for wind in Kenya. The Regional Instrument Center is still yet to establish collaboration with the national standards institution for establishment of traceability of measurements. The calibration laboratory also requires accreditation as a calibration laboratory by the national accreditation body.
- 4.1.4. The above issues are consistent with those identified at the 16th session of WMO Regional Association I held in Praia from 3-9th February 2015, which additionally identified some of the key challenges across the region as:
  - Limited number of appropriately qualified personnel
  - Insufficient budgetary allocation to NMHSs
  - Limited political support for NHMSs
  - Inadequacy of Quality Management System (QMS) implementation
  - Need for national data exchange policies to support international data sharing
  - Inadequate leadership and management skills within NMHSs
  - Lack of adequate weather radar network
  - Gaps in observation networks

- 4.1.5. The meeting was informed that, while there were 4 designated RICs in Africa, only 3 were currently operational.
- 4.1.6. The session agreed that there appeared to be either a lack of a formal process for alerting data users and other Members to observing system network issues, or else Members were not aware of these practices and/or not making use of them.
- 4.1.7. The broad range of issues identified in the report highlighted the need for a number of initiatives to be undertaken to support improvements in RAI. It was agreed the work plan for ET-SBO should focus its limited resources on those activities that would have the greatest impact and the greatest chance of success.

### ***Region II***

- 4.1.8. Ms Pei Chong, China, provided a presentation to the meeting on issues that had been raised among Region II members as summarised below.
- 4.1.9. A clear and standardised classification of surface-based observing networks, stations and systems with specific definitions was urgently needed. There was a high level framework of component defined under WIGOS, but this needed to be elaborated with clear descriptions
- 4.1.10. In conjunction with the OSCAR metadata database, the baseline of metadata required better definition. Pilot project might be established to encourage more efficient and better practices to update requirements. Metadata were not updated frequently enough.
- 4.1.11. Tiered operational standards needed to be developed so that Members can provide data from systems with varying capability and data quality, for which technical regulations and guidance materials were required to be developed.
- 4.1.12. Radio-Frequency interference and threats to spectrum allocation was an issue for remote sensing networks, like weather radars and also threatens radiosonde systems.
- 4.1.13. WMO could potentially be more proactive in strengthening environmental protection and monitoring with meteorological observing networks, by collaborating with Members to establish agreements to provide support for their continued and expanded operation. The centennial stations recognition programme was a good example of a system that acts to assist Members in strengthening their argument to protect and continue to support their observations networks.
- 4.1.14. A serious lack of international traceability of meteorological observations was identified in Region II. Lack of appropriately calibrated instruments and maintenance support are also universally an issue.
- 4.1.15. Data quality control methods needed to be improved and more training materials are needed in support of this activity.
- 4.1.16. Efficient coordination and communication practices between Region II Members are deficient and likely contributed to inefficiencies in network design and operation.
- 4.1.17. Members required more detailed information and instructions on requirements for meeting WMO and ISO standards on quality management.

### ***Region III***

- 4.1.18. Mr Gaston Torres, Chile, provided a presentation to the meeting on issues that had been raised among Region III members as summarised below.
  - Lack of financial resources in many countries to be able to support observing networks.
  - Lack of sufficient quality control of observations.
  - Many countries were in need of training in order to develop capabilities in network management and data quality management.

- In Chile and Brazil, many organizations were operating automatic weather stations that might contribute data under WIGOS, however there was a need to provide support to such entities to be able to provide the data in WMO standard format (BUFR).
- Many countries lack the technical capability to be able to develop applications to support provision of data in BUFR and it was recommended that WMO might provide training and support to increase compliance in the region in this area.
- A survey on OSCAR knowledge and use had been conducted which indicated that Members believed that the interface was not user-friendly, there was insufficient support for languages other than English and there was a lack of knowledge of the meaning of metadata fields. It was recommended that training and workshops should be provided to address these issues.
- The establishment of a Regional WIGOS Centre supporting quality monitoring would likely lead to improvements in data quality in Region III.
- Instrument calibration and measurement traceability was a big issues for the region that required addressing more systematically.

#### **Region IV**

- 4.1.19. Mr Chet Schmitt, USA, provided a presentation remotely by videoconferencing to the meeting on issues that had been raised among Region IV members.
- 4.1.20. During late May and early June of 2017, points of contact and subject matter experts were surveyed concerning the primary issues and challenges facing surface observations. Feedback was also received from Canada, Mexico, Costa Rica, the Dominican Republic and the British Caribbean Territories and, together with input from the USA, the three main challenges that were reported were: 1) finding and maintaining suitable observation sites which meet siting standards; 2) sensor obsolescence and 3) the issues associated with modernization of telecommunications networks used by observation networks.
- 4.1.21. More specifically, the following detailed issues were raised:
- Sites at airports where observations are traditionally made were harder to retain due to lack of space, encroaching infrastructure compromising observations quality and representativeness and high costs.
  - Older automated networks that had relied on analog communications required upgrading to support digital communications and protocols.
  - Other issues and challenges that were cited include budgetary issues, personnel/staffing issues, policies related to land use agreements, as well as difficulties with automated frozen precipitation measurements (the U.S. and Canada).

#### **Region V**

- 4.1.22. Mr Karl Monnik, Australia, provided a presentation to the meeting on issues that had been raised among Region V members as summarised below.
- 4.1.23. At both the national and regional levels, Members were attempting to address the requirements relating to the implementation of WIGOS, which was to some extent being coordinated and assisted by the RA V Working Group on Infrastructure and its Task Team on WIGOS. These groups were trying to meeting on a monthly basis.
- 4.1.24. It was expected that the Regional WIGOS Centres could most effectively assist Members in the provision of support and functions associated with metadata provision and management and quality monitoring and incident management. A related WIGOS regional workshop would be held in Singapore in October 2017.

- 4.1.25. Many countries in the region were island nations and had limited technical capacity in some areas, including communications. It was expected that WIGOS might provide support and assistance to such members in facilitating wider sharing and provision of observational data. An example was the Solomon Islands which was upgrading their HF communications network but would require support and assistance to be able to provide their data in BUFR format.
- 4.1.26. Both Australia and New Zealand were involved in capacity development initiatives that assisted other regional members to improve their observing networks, data quality and the provision of data on the GTS. Such initiatives might be extended and built-on to further enhance observing system capabilities in the region, given resource availability and investment.

## **Region VI**

### *WIGOS Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP)*

- 4.1.27. Ms Tanja Kleinert, Germany, provided a presentation to the meeting on issues that had been raised among Region VI members as summarised below.
- 4.1.28. The WIGOS Implementation Plan for the Evolution of Global Observing Systems (EGOS-IP) outlines key activities to be undertaken during the period 2012 to 2025 aiming at maintaining and developing all WMO component observing systems. According to EGOS-IP many surface-based observing systems could be made more efficient by processing and exchanging all hourly data globally which can be used in global applications and by promoting the global exchange of even sub-hourly data in support of relevant application areas. To ensure the successful implementation of WIGOS support to Members is required to be able to take actions towards more open data policy, collaboration with national third parties (e.g. also crowd sourcing and Internet of Things) and enabling the global data delivery of all kind of observation types.

### *Harmonization of different observation systems and methods*

- 4.1.29. The benefits of harmonizing different observation systems and methods within a composite observing system are well known and form the basis for the development of the concept of the RBON network, leading to a more cost-effective and efficient production of observations supporting a range of application areas and data users. In such a composite system, one 'site' can be part of several networks and produce several observation values via the same telecommunication system and data handling procedures (database). To foster such harmonization, guidance for the actual action steps to achieve the goal are required. Different reporting practices lead to issues in data usage and potentially wrong interpretation of the reports (e.g. when reporting wind gusts different threshold values and time periods are considered, snow depth reporting of "Missing value" has different meaning as "no snow"). Hence, guidance material is essential to ensure standardized reporting practices on a global scale.

### *Migration from Traditional Alphanumeric Codes (TAC) to Table Driven Code Forms (TDCF/BUFR)*

- 4.1.30. The migration from Traditional Alphanumeric Codes (TAC) to Table Driven Code Forms (TDCF/BUFR) in RA VI is still ongoing. Not all Members provide BUFR bulletins fully from their surface land stations or radiosonde stations yet. There are still open issues e.g. Members providing less BUFR bulletins compared to SYNOP, converting BUFR from TAC TEMP parts or providing TEMP-BUFR and HR BUFR in parallel. Especially in regards to marine data the migration to BUFR is still ongoing. Argo reports in TESAC format will stop in 2018 which fosters the need to use BUFR. Enhanced communication and support between WMO and among Members is required to ensure a smooth transition to BUFR globally.

### *OSCAR/Surface metadata information*

4.1.31. Although Members already review and update station metadata in particular concerning surface land stations the effort to integrate metadata from radar wind profilers and weather radars into the database needs to be continued. Members should be encouraged to provide even more networks information into OSCAR/Surface but unfortunately it is often unclear to Members which station types shall be or can be listed in OSCAR/Surface (e.g. 3rd party stations) and how to handle 'new/old' observation parameters like state of the ground, icing, lightning, remote observations. Hence, further guidance and training on OSCAR/Surface and required entries is seen to be essential. Often differences in station metadata information uploaded to OSCAR/Surface and encoded in BUFR bulletins occur. Members should be fostered to update and review OSCAR/Surface frequently and to make sure metadata correlate with BUFR encoding.

#### *Introduction of WIGOS identifiers*

4.1.32. WIGOS identifiers have been officially introduced in May 2017. Unfortunately no implementation plan has been communicated to cover the transition phase. Members globally have to be in the position to read and process BUFR Master Table 28 and the new sequence for WIGOS identifiers. If members cannot read e.g. BUFR SYNOP bulletins containing WIGOS identifier the data is lost for them. Hence, a nuisance for almost all stages of the NWP process will be encountered. It would be beneficial for all Members if a time schedule for the transition as well as working examples of bulletins could be provided.

#### *Quality and homogeneity of data*

4.1.33. The change from manual to automatic observation production made good progress in Region VI. The technological development is a continuous process. The life cycle of instruments and observing systems has to be taken into account and guidance for testing procedures, implementing new systems and documenting would be very beneficial for Members. Furthermore, standardization of quality flagging for AWS data is required to provide users with similar code figures for the different steps of quality control and the quality of the data.

#### **Other Issues Raised**

4.1.34. The meeting agreed that there were several issues relating to the encoding of high frequency radiosonde data that urgently needed addressing and coordinating to ensure that Members endeavoured to provide such data in conformity with requirements. In particular members should be encouraged and supported to provide such data directly from raw radiosonde soundings, rather than re-encoding TEMP messages.

4.1.35. The definition and requirements for reporting station location and height were not being consistently followed by Members and possibly need clarification in the WIGOS technical regulations.

4.1.36. There was a clear need for more and improved guidance on metadata definition and provision.

4.1.37. Station classification with respect to WMO Applications Areas should be addressed in the regulatory materials, including support for network design.

4.1.38. ET-SBO should raise with CBS and CIMO the matter of the perceived need for better support for calibration and traceability requirements of Members in several regions.

4.1.39. ET-SBO should raise with CBS the matter of a perceived need for training of Members in the areas of quality management and WIGOS implementation, particularly in relation to metadata management.

4.1.40. It was agreed that the issues raised under this agenda item should be summarised and a report with recommendations made to ICT-IOIS by the Chair.

## **5. Outcomes From CBS**

Mr Stuart Goldstraw presented the team with the outcomes and/or issues arising from the previous CBS session (CBS-16, November 2016).

### **5.1. Observations Encoding Issues**

5.1.1. The meeting was informed that there were a number of issues relating to the encoding of surface-based observations that the team might have a role in addressing. In particular:

1. While it was addressed at CBS as an important issue, based on feedback from data users and experts, there was still clearly a problem with the process of the transition from Traditional Alpha-numeric Codes (TAC) to BUFR which was creating an increased workload and problems for data users. Essentially it appears that despite regulatory and guidance material on the methodology to be taken when introducing observations in BUFR not all Members are following this material;
2. WMO and CBS had been made aware of the issue relating to a possible requirement to address the encoding of radiosonde descent information, at the instigation of Germany;
3. Transition to use of WIGOS Station Identifier (WSI) – there may be a need for ET-SBO to instigate the provision of guidance material clarifying how to use and implement WSIs and provide them within encoded observations.
4. BUFR encoding of high-resolution (HR) radiosonde data – data users were reporting a number of problem with BUFR encoded HR radiosonde data often stemming from the conversion of TEMP TAC messages (Parts A, B, C &D);
5. Source of humidity measurement message metadata – Members are not able to provide required metadata within BUFR messages and there appeared to be a need to add more instrument details to OSCAR/surface and ensure such information was provided, particularly when important for data user applications;
6. Change management and notification procedures – some data users had advised that they are not being made aware of impending changes to provision of data by Members and that there appeared to be no clear process or procedures for such notification;
7. Metadata for station and instrument elevation – it is now becoming standard for elevation to be determined by GPS. GPS systems usually provide height relative to a reference ellipsoid whereas meteorologists require values relative to the geoid (sea level), and the difference between them is up to 100 m. There is a need for guidance/training on this point and a recommended conversion method.

5.1.2. It was agreed that these matters should be addressed by a breakout group later during the session with the aim to determine how they might be best resolved by CBS. The results of the deliberations of the Breakout Group 4 are provided within Annex II.

### **5.2. Development of Regulatory and Guidance Materials**

5.2.1. Mr Goldstraw outlined the progress that the expert team had made on the development of regulatory material for the Manual on the GOS over the last inter-session period. In particular the team had developed and, in collaboration with the WIGOS Editorial Board, refined new regulations for automatic weather stations (AWS), radar wind profilers (RWP) and weather radars that had recently been approved by CBS (CBS-16) and the Executive Council (EC-69) to be integrated into the Manual on

the GOS (EC-69, Resolution 5.1(2)/3 — Revised Manual on the Global Observing System (WMO-No. 544) and Guide to the Global Observing System (WMO-No. 488)).

- 5.2.2. The meeting discussed the various requirements relating to regulatory and guidance material development and maintenance, including the more urgent requirements relating to WIGOS metadata management and the integration of the Manual and Guide to the GOS into the Manual on WIGOS, expected by 2019. The meeting agreed that a breakout group would later in the session discuss the matter of the team's commitment to this aspect of the work plan and develop a plan and timeline for the agreed activities to be undertaken. The results of the deliberation of Breakout Group 5 are provided within [Annex II](#).

### **5.3. Study on Upper Air Network Optimisation**

- 5.3.1. Mr Tim Oakley, United Kingdom, addressed the meeting on the ongoing activity of the expert team to undertake a study and analysis of the possibilities associated with the potential reconfiguration of the Regional Basic Synoptic Network (RBSN) upper-air radiosonde network reporting schedule. This activity is related to action G10 of the CBS Implementation Plan for Evolution of the Global Observing Systems (EGOS-IP). Mr Oakley made the following points in relation to the activity:

- The task had been endorsed by both CBS and EC and should therefore be considered a high priority activity for ET-SBO
- While radiosonde soundings remain a significant contributor to upper-air observations and continue to have a significant impact on NWP systems, some NMHSs have developed a composite upper-air observing system comprised of several additional observing systems including AMDAR, radar wind profilers, and other ground-based remote sensing systems, such as Weather Radar and GNSS derived observations.
- Some NMHSs have already adapted their radiosonde programmes to be more flexible and adaptable to various factors including weather situation and resource availability, and it is expected that such practice will become more prevalent.
- WMO technical regulations therefore do not reflect either the current or the future situation in regard to the operation of radiosonde networks and ET-SBO should advise on the options to support changes in the regulatory and guidance framework to support these changing operational practices.

- 5.3.2. The meeting agreed that this matter should be discussed and plans developed and refined within a breakout group later in the session. The results of the deliberation of Breakout Group 1 are provided within Annex II.

## **6. Work Plan Review and Planning**

### **6.1. Review of Work Plan and ToR**

- 6.1.1. The Chairperson provided the team with an overview of both the approved work plan and the Terms of Reference of ET-SBO and outlined his thoughts and suggestions on which activities and where and how the team might best commit its time resources based on the priorities of the commission and on the expertise available within the team membership.

### **6.2. Ongoing Activities**

- 6.2.1. It was agreed that the following activities, ongoing from the previous inter-sessional period, should be continued:



- Provision of required specific advice and assistance in the development of OSCAR/Surface and the management of related observing systems metadata.
- Developing new guidance associated with the newly approved regulations that were developed by the team, particularly focusing on AWS and RWP.
- As directed by ICT-IOS and the Inter-Programme Expert Team on Observing System Design and Evolution (IPET-OSDE), monitoring of progress in the implementation by Members of the relevant actions of the EGOS-IP.
- Delivery of the study and analysis of the potential reconfiguration of the upper-air radiosonde network (see item 5.3).

### **6.3. New Activities**

6.3.1. It was agreed that the following new activities should be undertaken by the ET:

- Assist in the development of procedures and processes for the management and monitoring of OSCAR/Surface metadata associated with land surface-based observing systems of the GOS.
- Assist in the development of new guidance for Members relating to the relevant aspects of OSCAR/Surface and metadata management for the land surface-based observing systems of the GOS.

6.3.2. The team expected also to undertake some additional actions based on some of the issues raised during the session under items 3 and 4 and the outcomes of the breakout groups that were to be undertaken (item 6.4).

#### ***GCOS Implementation Plan***

- 6.3.3. Mr Oakley briefly addressed the meeting on the document, The Global Observing System for Climate: Implementation Needs, which was approved and published in 2016, highlighting various aspects which might be of relevance to the ET-SBO. This included that the incidence of lightning had been added as a new Essential Climate Variable (ECV).
- 6.3.4. Noting that the ET-SBO currently lacked expertise in lightning observing system operation, it was agreed that the Chair would investigate possibilities to add such expertise to the team membership, including consulting with The Association of Hydro-Meteorological Equipment Industry (HMEI) on the possibility to provide an expert on lightning to the team.

#### ***GCOS Reference Upper-Air Network***

- 6.3.5. Mr Oakley also addressed the meeting on recent progress on the continuing implementation and development of the GCOS Reference Upper-Air Network (GRUAN), with the meeting agreeing that the ET-SBO might consider whether some of the working practices developed for GRUAN stations might be more widely applicable to both the GUAN and the upper-air stations of the RBSN.

### **6.4. Group Planning Sessions**

6.4.1. Over days 3 and 4 of the session, the meeting participants undertook initial discussions and planning for addressing several of the key ongoing and new activities that the team would undertake over the coming inter-session period as summarised in the table below. Items 1 to 6 were covered in 3 breakout sessions of 2 groups meeting in parallel, and items 7 and 8 were then discussed in plenary.

No.	Topic	Work Plan Task Relation
1	G10 Study on Upper-air network	10
2	Monitoring the quality of metadata in OSCAR/Surface	14
3	Defining the framework for the WDQMS for the Land/Surface component of the GOS.	12
4	Review and develop actions in relation to various encoding issues that have been raised.	
5	Regulatory and Guidance Materials development, including RBON, integration of Manual and Guide to GOS to WIGOS RM, Radiosonde, AWS and RWP guidance	4
6	Development of Guidance on AWS	5
7	ET-SBO Actions from the EGOS-IP	8
8	Review of Vision 2040	

6.4.2. The results of the Breakout Group work are provided within Annex II.

## 6.5. Finalisation of the Work Plan

6.5.1. Based on the deliberations of the meeting both in plenary and in breakout group sessions, the team agreed on the specific actions within [Annex III](#) and the proposed updated the work plan within Annex IV.

## 7. Any Other Business

7.1.1. No additional business was raised.

## 8. Session Closure

8.1.1. The session was closed mid-afternoon of the 23 June, 2017.

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## ANNEX II – REPORTS OF BREAKOUT SESSIONS

### Breakout Group 1 – G10 Study

No.	Topic	Work Plan Task Relation	Breakout Task/Deliverables	Group (Scribe)	Time	Room
1	G10 Study on Upper-air network	10	<ul style="list-style-type: none"> <li>Review plan presented to CBS (INF.11)</li> <li>Task Plan, Schedule, Who, Deliverables</li> </ul>	Tim, Bruce, Dom, Pei, Karl	Thu, 4pm Fri 9am	7L

- Do we need to do a determination of whether there is a capability, willingness by members to actually change radiosonde programs?
- Members might actually want the capability to do soundings based on other requirements such as weather situation.
  - Do a survey?
- China does 4 soundings per day, although only 2 are exchanged. These data might be used to run a data denial study to assess impact. Issues may be that China does not have a large ABO program.
- Related regulations might encompass:
  - One fixed night time sounding for climate purposes
  - Additional soundings to be targeted for national member decided purposes or applications that might include:
    - Harmonisation with ABO or other upper air information
    - Requirements for NWP
    - Targeting for weather monitoring or prediction
    - Operational purposes
  - While Members of course have a right and requirement to manager their resources, they should be discouraged from assuming that this means the (minimal) requirement is for 1 sounding per day only. This needs to be handled sensitively in the regulations.
- Consider additional YOPP observations available and additional observations being implemented by Finland.
- China undertaking an impact study from July 2017 to 2018 to test impact of RWP wrt radiosonde, radar and AMDAR. (request details from PC)
- China has been doing 0 and 12 but, over the past more than 3 years has been doing soundings at 6 and 14 (as required and when considered advantageous for weather) to better support the CMA requirements.
- Australia will run a 3-year FSO study that might be used as part of this study.

#### Agreed actions for ET-SBO work plan:

1. ET-SBO to work with ECMWF to provide improved/additional monitoring statistics for upper-air reports, so as to allow a more informed analysis of the potential overlap and complementary areas of the different technologies. (Tim Oakley to work with Bruce Ingleby, target date – Feb 2018).

2. Draft a questionnaire on the proposed upper-air network optimisation, to assess the WMO Members attitude towards the rescheduling of radiosonde launch times, any existing studies recent/planned at a National level and the potential benefits of the study. Initially the questionnaire would be distributed to a targeted set of Members. ( Tim Oakley to lead, target date for draft questionnaire Sept 2017, replies by Feb 2018)
3. Meeting of subset of ET-SBO to review (1) and (2) and draft a project proposal to assess the impact/benefit for the rescheduling of radiosonde launch times. (March 2018)

### OSCAR/Surface breakout group 2 – Metadata quality, 22 June 2017

No.	Topic	Work Plan Task Relation	Breakout Task/Deliverables
2	Monitoring the quality of metadata in OSCAR/Surface	14	<ul style="list-style-type: none"> <li>• Determine requirements and scope of activity</li> <li>• Task Plan, Schedule, Who, Deliverables</li> </ul>

#### Participants:

- Karl MONNIK
- Chong PEI
- Minna HUUSKONEN
- Dominique RUFFIEUX
- Chulwoon CHOI
- Etienne CHARPENTIER

The group identified the following issues. Many of the issues were not the responsibility of ET-SBO and other groups were suggested as responsible. Items in bold refer to ET-SBO.

1. How to encourage Members to update OSCAR and make sure metadata reflect reality of observing platforms
  - ⇒ Task for the Regional WIGOS Centres (RWC) to undertake
2. Complexity of what's required in OSCAR/Surface in terms of metadata content, is drawback preventing users to enter information. Need to do prioritization of fields to be entered. Some fields are critical and need to be filled if missing (e.g. calibration date).
  - ⇒ **ET-SBO can recommend levels of metadata for AWS and Radar Wind Profilers etc., and identify what's critical.**
3. Frequency of updating content
  - ⇒ Whenever there is a change with regard to the observing station, OSCAR/Surface shall be updated accordingly (deadline < 1 week). Changes at national level will most likely be made in one place, typically in the national database; so the machine-to-machine (M2M) interface must be developed and implemented to make sure that changes are automatically reflected in OSCAR/Surface. TT on OSCAR Development to specify the guidance material.
4. Discrepancies between VoIA and OSCAR/Surface content: assumptions were made when VoIA was imported in OSCAR/Surface in May 2016; NFPs need to be aware of the assumptions and then check and correct metadata as needed.
  - ⇒ OSCAR/Surface development Task Team need to document assumptions that were made (Secretariat to lead).

5. It is critical to put in place M2M interface at the national level.
  - ⇒ Task for the OSCAR/Surface development Task Team; including instructions for each Country
6. National Focal Point needs to delegate tasks to several people for specific types of networks (AWS, Upper Air, Weather Radars, Wind Profilers, etc.) but also at the regional level.
  - ⇒ OSCAR/Surface Guidance materials to be developed by the OSCAR/Surface development Task Team, and the WIGOS PO (initially) and RWCs to communicate and promote this.
7. WIGOS Metadata Standard does not perfectly align with the data model used at the national level. This implies undertaking developments to translate the national model into the WIGOS metadata standard for the M2M interface with OSCAR/Surface. Different terminology/vocabularies may also be used in national databases. Correspondence between vocabularies must be developed. Countries starting from scratch can directly start from the WIGOS metadata standard. Countries can also broaden their data model to comply with WMS but also to have national requirements considered.
  - ⇒ NFPs to be alerted about such requirements, which is national task under guidance of RWCs.
8. OSCAR/Surface interface, and code tables, ought to be translated in WMO languages, noting that the people involved in updating metadata will often be staff who are less likely in being proficient in English.
  - ⇒ OSCAR/Surface development Task Team and WIGOS PO to consider such requirement, and identify required resources to undertake such developments.
9. Automatic real-time quality control is needed and we need to define what QC checks ought to be made. More elaborate delayed mode QC checks ought also to be made; standard queries need to be developed to allow WRCs to check content and investigate suspicious cases. Some typical errors discovered based on Secretariat current experience of monitoring OSCAR and communicating with the focal points can be avoided, and recommendations ought to be made.
  - ⇒ **OSCAR/Surface development Task Team to propose what QC checks to make with assistance from Secretariat and ET-SBO for AWS, Radar Wind Profilers, etc.**
10. Metadata specific or required for some Application Areas; some other metadata may not be necessary for other Application Areas. Some best practices may have to be developed and recommended.
  - ⇒ Task Team on OSCAR/Surface Development to propose technical solution making it simple for the user of OSCAR/Surface (e.g. AA is defined as part of Data Series, and some fields may be hidden depending on what AA(s) is/are chosen by the user).
11. Required accuracy of metadata need to be proposed (e.g. position, height ...)
  - ⇒ **ET-SBO can advise TT-WMD on the accuracy of lat, long elevation and dates (nearest day, month, year or unknown) for our systems (aws etc). There is also metadata which is restricted to national use (e.g. military facilities, commercial) which should not be sent to OSCAR/surface.** TT-WMD to ask IPET-OSDE (RRR) for required accuracy of key metadata for different application areas.
12. While Members are maintaining national databases of metadata, there is a need to communicate on importance of collecting global metadata and making them available to OSCAR/Surface. Some Members actually are not aware of OSCAR.
  - ⇒ Secretariat and Regional WIGOS Centres to consider.



13. How to enforce submission of metadata by Members into OSCAR: assessing level of compliance, producing "traffic light" diagrams, and send reports to the Permanent Representatives. There is a role for the WRCs also in this regard to remind Members of their obligations.
  - ⇒ Secretariat and Regional WIGOS Centres to consider
14. Variety of types of metadata: WIGOS, WIS , Vol. C1 : some cross checks are needed for consistency and for adding missing stations in OSCAR.
  - ⇒ OSCAR/Surface development Task Team can identify inconsistencies, and these need to be reported to ICG-WIGOS for further action with appropriate responsible bodies.
  - ⇒ Secretariat to invite NFPs to check WDQMS output and identify the stations in the Country for which there are issues in terms of WIGOS metadata in OSCAR/Surface (e.g. stations reporting on GTS but which do not appear in OSCAR/Surface)
15. How to deal with metadata for services provided by private companies and third parties (e.g. lightning detection).
  - ⇒ **ET-SBO to provide advice on what is an acceptable level of metadata for private companies.**
16. Lightning detection also uses multiple sensors for providing observations which are not located where the sensors are installed.
  - ⇒ **ET-SBO to develop advice on the best way to describe the metadata for a specific network such as the lightning detection network.**
17. We could develop example metadata sets for each of the systems ET-SBO is responsible for (AWS, land stations, Wind Profilers, Lightning Detectors, Radio sondes ...). Example of AWS available for "MELBOURNE (OLYMPIC PARK) (Australia)" and "CAMBORNE (United Kingdom (the))"
  - ⇒ **ET-SBO should help in this exercise e.g. AWS in different geographic locations with different instruments connected to it, Radar Wind Profiler (e.g. PAYERN), Radio Sonde (e.g. CAMBORNE, PAYERN).**

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### Breakout Group 3 – Monitoring the quality of metadata in OSCAR/Surface

No.	Topic	Work Plan Task Relation	Breakout Task/Deliverables	Group (Scribe)	Time	Room
3	Defining the framework for the WDQMS for the Land/Surface component of the GOS.	12	<ul style="list-style-type: none"> <li>• Review work plan of TT-WDQMS</li> <li>• Determine scope of task</li> <li>• Task Plan, Schedule, Who, Deliverables</li> </ul>	[Tanja], Henry, (Dean), Tim, Stuart, Bruce	Thu, 9am Thu, 11am	7L

#### Initial Scope:

1. Define the framework of the WDQMS for the Surface-based Land Component of the GOS.
2. Review and define the requirements and criteria for monitoring of observing system variables for availability and/or quality.

#### Observing Systems:

- Radiosonde

- Temperature
- Wind
- Humidity
- Manual and AWS surface-based land observations of:
  - Temperature
  - Pressure
  - Wind
  - Humidity

Tasks:

1. Use TK's WDQMS document as a basis for development and definition of the WDQMS-SBL-GOS with aim to present to CBS TECO (March 2018)
  - a. Develop a structure of RWCs and GWCs
  - b. Develop functions to be undertaken by WCs
  - c. Develop ToRs for WCs
2. Develop draft regulatory material for the WDQMS-SBL-GOS for the Manual on WIGOS and Guide to WIGOS in collaboration with the TT-WDQMS (December 2017) and WIGOS-EB (September 2017) and CBS.
  - a. Propose regulation elements to be included in the Manual on WIGOS Chapter 2 and 3 (via ICG-WIGOS)
  - b. Develop regulations to be included in the Manual on WIGOS Chapter 5 relating to the GOS (via CBS)
  - c. Integrate guidance material developed in Task 1 into the Guide to WIGOS. (via CBS)

Timeline and who:

- Initial outline for Task 1 by Sep 2017 (DL, TK)
- Proposed changes associated with Task 2 to be available to TT-WDQMS by Dec 2017. (SG, TK, HK)

**ET-SBO-3 Breakout Group 4, Encoding Issues**

No.	Topic	Work Plan Task Relation	Breakout Task/Deliverables	Group (Scribe)	Time	Room
4	Review and develop actions in relation to various encoding issues that have been raised.		<ul style="list-style-type: none"> <li>● Review Stuart's presentation on issues</li> <li>● Task Plan, Schedule, Who, Deliverables</li> </ul>	Bruce, (Dean), Minna, [Tanja]	Thu 2pm	0L08

The list of issues captured so far are:

**Pre-meeting discussions**

Issue: General migration from TAC to BUFR creating increased workload and problems for data users; Suggested Action: .....

- General issues are to be addressed by the CBS Task Team on Transition to BUFR

**Issue: Radiosonde Descending Data encoding – open question;** Suggested Action: Review latest status of proposal and generate Regulations & Guidance to support operational implementation.

**During general discussions in meeting**

**Issue: WIGOS ID clarification; Suggested action: Develop enhanced guidance material clarifying how to implement the new ID mechanism with more worked examples.**

- There is confusion among members regarding how to assign WIDs, e.g. Israel has incorrectly implemented WIDs in BUFR/SYNOP
- NWPCs are concerned that there is little information/planning available on how and when WIDs will be implemented.
- The Manual on WIGOS material in Attachment 2.1 is not clear. Guidance is required.
- Mapping to old/existing station is clear but there may be issues with new stations.
- Action:
  - Develop enhanced guidance material clarifying how to implement the new ID mechanism with more worked examples.
  - Develop and circulate plan and timeline for implementation of WIDs.

Issue: BUFR encoding of TAC R/S messages (Parts A, B, C &D); Suggested action: Work with IPET CM to re-inforce existing guidance

Issue: Source of humidity measurement to be captured in metadata / message; Suggested **Action:** Remind members of Metadata standard provisions for measurement type information

**Issue: Understanding the timeframe for changes; Suggested Action: Work with IPET CM to improve guidance to members and establish improved Regional engagement.**

- How are members meant to advise about changes to provision of data on the GTS?
- We have/had:
  - NOTAMs
  - METNOs
  - WWW Operational Newsletters
- Somebody (Secretariat/ET-SBO) to do an analysis of these tools and their related regulations and guidance on use and determine if they are adequate (if used correctly) and if they are being used correctly. Also determine any gaps that WIGOS might potentially fill (e.g. use of the DQMS IMS to fulfill a change management functionality).
- Regulations and guidance to be added to the WIGOS Manual and Guide that more clearly define requirements of members to use the tools for advising changes to obs system practices, particularly regarding data exchange.

**Issue: GPS Height & Sea Level;**

There is increasing use of GPS height provided for station height, which references station height to the wrong reference frame. This leads to large errors in height/pressure level determination of observations for NWP and other users.

- The more specific requirements are given only in the Attachment on the Metadata Standard in Table X, which specifies reference for height to MSL. The requirements for position are specified with reference to the Geodetic system (EGM96).

- The specification of the station reference level or height should be against the same Geodetic system also.
- **Action:** ET-SBO to:
  - coordinate with CIMO and WPO on improving RM to make it clearer on regulations and guidance in relation to calculation/derivation and provision of station reference height in messages and metadata.
  - Ensure OSCAR/Surface makes clear this requirement for provision of correct metadata by Members.
  - Request Secretariat to establish a communication with Members via letter to PRs and/or direct communication with WIGOS FPs regarding:
    - Familiarization with requirements
    - Requirements for metadata in OSCAR
    - Appropriate action for observing systems and/or message encoding systems.

**Additional Issue: Assignment of Radiosonde Type Nos for Encoding and OSCAR**

1. ECMWF are receiving radiosonde BUFR and TAC without assignment of radiosonde type, mainly in India and China and with the wrong assignment in some cases (i.e. using assignment numbers that had not been allocated for the type used).
2. Issue of new Radiosonde Type numbers is coordinated by the Rapporteur on Radiosondes (CIMO) but there has been a breakdown in procedures in that some new radiosonde systems became operational before being allocated a number. OSCAR/Surface should perhaps be taking on the function of being the primary source for such information within OSCAR code tables. The status of this is not known?

**Action:**

- Include issue in final report.
- Action: Secretariat to follow up on both issues with CIMO and the WPO to pursue action as appropriate.

**ET-SBO breakout group 5 on Regulatory Material, 22 June 2017**

No.	Topic	Work Plan Task Relation	Breakout Task/Deliverables	Group (Scribe)	Time	Room
5	Regulatory and Guidance Materials development, including RBON, integration of Manual and Guide to GOS to WIGOS RM, Radiosonde, AWS and RWP guidance	4	<ul style="list-style-type: none"> <li>• Task Plan, Schedule, Who, Deliverables</li> </ul>	Stuart, Minna, Dom, (Etienne)	Thu, 4pm Fri 9am	0L08 6L

**Participants:**

- Stuart GOLDSTRAW
- Gaston TORRES
- Chong PEI
- Minna HUUSKONEN
- Etienne CHARPENTIER
- Lars Peter RIISHOJGAARD

#### **6) RBON Regulatory Material (RM)**

Some key aspects to be considered for RBON:

1. Regulatory Material need to reflect Members' view and perspective, which is diverse. At the end RBON will be about what Members are ready to commit.
2. Requirements are global, and have been assessed and demonstrated (NWP "Impact" workshop).
3. Ras approve composition of the Networks; PRs will continue to sign up on composition of networks through the Ras.
4. Frequency of reporting of surface data (typically AWS, but not upper air. Weather radars): Go away from the Main and intermediate hours. Need to stress on at least hourly and preferably sub-hourly reporting requirement.
5. Enforce minimum density of the network if capability exists. Encourage higher density towards the breakthrough according to OSCAR/Requirements.
6. Third party stations can be part of RBON if they meet minimum requirements; this must be clarified in the new RM. This will involve MoU at national level with partner organization in order for the PR to be able to commit to sharing data in particular; this will be a national policy issue.
7. Requirement to make observations at least at standard times (e.g. synoptic times) versus at other times. Radio sondes are still tied to synoptic times. For climate monitoring and continuity, there is still need to maintain standard times.
8. Reporting of list of mandatory variables: requirement could be relaxed in order not to inadvertently exclude useful stations ? some guidance needed.

Secretariat is developing RM for RBON, and will request ET-SBO to review it. ET-SBO to provide a couple of pages of feedback before end of August 2017.

Editorial Board will meet in October to review RM. Regional Associations as they meet will review material as available at time of their Sessions.

Documents to be reviewed:

- RBON concept document approved by CBS-16
- WIGOS PO draft Technical Regulations on RBON based on concept paper

#### **2) Transfer of GOS RM and Guidance material to WIGOS**

1. WIGOS PO to provide ET-SBO with its proposal ASAP (June 2017)
2. C/OSD to discuss with Igor Zahumensky ASAP (June 2017)
3. EC-SBO to review WIGOS PO's proposal initially, and provide feedback to Secretariat (end Sept.). Opportunity for Chair ET-SBO to come to Geneva in September and discuss with Secretariat.
4. WIGOS EB to review proposal 31 Oct. – 3 Nov. 2017 (Chair: Russell Stringer). Consider having someone from ET-SBO to participate at the WIGOS EB meeting (action: Secr.).
5. EC-70 in 2018 to adopt proposed changes

Note: According to CIMO, there will be the need to review and update the Functional specifications for automatic weather stations as provided in the Guide to the Global Observing System, Part III, Appendix III.1.

#### **3) Commercial data (e.g. lightning)**

- ET-SBO to look at possible RM for such data (more long term task because we need to secure someone to do that task in 2018/2019 time frame) – links to GCOS identifying lighting as an ECV.

**4) Radar Wind Profiler guidance material**

- Dominique Ruffieux to lead this task with the goal of delivering material by 2019.

**Breakout Group 6, Development of Guidance on AWS**

No.	Topic	Work Plan Task Relation	Breakout Task/Deliverables	Group (Scribe)	Time	Room
6	Development of Guidance on AWS	5	<ul style="list-style-type: none"> <li>• Review new regulations in GOS to determine possible accompanying guidance</li> <li>• Task Plan, Schedule, Who, Deliverables</li> </ul>	Karl, Guo, [Chet], Gaston, Pei	Thu, 9am Thu, 2pm	7L

An all-encompassing Guide on AWS

Will the guide capture any 'manual' observing material.

Gaston – CIMO session noting the challenge of a wide variety of low cost to high cost AWS. Also noted AWS is not just the sensor but also the system and the communication component.

Having a standard data format for exchange would be beneficial – BUFR is too complex but a standard format would be beneficial.

Range of other issues relating to processing of data from 1 second samples to integrated products for users.

A simple AWS cannot codify in BUFR as this requires processing effort.

The problems that are heard from Members.

1) They cannot navigate the existing material – it is too widely spread. The virtual guide concept will help but navigating it will be the important point to address.

2) How do you identify requirements / generate specifications / procure equipment – guidance on this is not easily found.

The second point needs to be addressed as this will help many members.

Events this year –

7) AWS Workshop in RAI in ??

This will give us the table of contents that needs to be addressed from a Member's perspective.

2) ICAWS Conference in October 2017

This will give the latest perspective

Comments from Pei Chong – 1) in China we undertook an integrated design approach considering all technologies. 2) Timeliness of transfer of data from AWS in being improved – reduced to 1 minute collection. 3) Calibration being undertaken on site via mobile systems as well as sending equipment back to central calibration laboratories. Also undertaking cross technology integration of observational data to generate gridded observational products.

In CMA 55000 AWS – FSO used to select the 8000 baseline AWS for national requirements and remaining 47000 for local users.

New AWS architectural design to be presented in Offenbach in ICAWS. Using adaptable selection of sensors for the configuration so that not all AWS will be using the same instruments at every site. Reducing the cost of operation as not all sensors needed at any sites.

#s exchanged international ~400 AWS data.

Data communication choices / options an important piece of guidance to generate.

System design important as well as network design.

Karl – engagement with Members that have experience in this area will be important.

We first need to come up with a framework for the chapter / section headings. – review the existing AWS table of contents developed by Igor and discussed during session. This is a mature list that will be straightforward to review as Karl may have already given feedback.

Then review existing sources of information including existing guides. + more than just CIMO Part 2 Sec 2 + Guide to GOS etc + others to see the gaps. + Review matrix of existing documents that are already in existence.

It would also be good to map the regulatory material to this structure. To be known as 'Igor's table' here on in.

NIWA can help contribute as the LDC implementation was a robust approach, including the training & competences.

IMD could also contribute.

Discussion of WIGOS IDs returned to – Unique ID is a metadata key but may be used by some could be a meaningful ID.

### **Details of task plan**

- 8) Table of contents review (first task, lead – Karl; all to review Pei, Gaston & Chet to contribute; delivered by December 2017 following discussion at ICAWS)
- 2) Identifying existing sources for potential content (second task mostly following first task, lead – TBA before start of 2018 but possibly Igor, all to contribute, first half of 2018)
- 3) Select the existing sources to be included and undertake editorial alignment (third task follows on from task 2 but some overlap, lead – TBD start mid 2018 and run for years...)
- 4) Main problems that need to be solved need to be cataloged. Information to be obtained via survey and coordinated by Sec and workshops (fourth task, lead – Gaston, Sec Support and contribution from Karl & Pei, to be completed before Task 2 started. July to December 2017.)
- 9) Need to be clear about what is meant by AWS in the scope of the WIGOS Guide to AWS – what is an AWS. For example is a drifting buoy an AWS or a sea level station or a single parameter station. Are human observations included. (Fifth task, Lead – Karl and support from ET but signed off by ICG-WIGOS, complete by December 17 to submit to next ICG-WIGOS)

- 10) Agreed approach to publishing the material – accessing sources of information that already exist in WMO documentation (political sensitivity). (Sixth task, Lead – Karl support from Stuart, to be completed by Dec 2017 and submitted to ICG-WIGOS for approval)
- 11) Develop a publishing plan, in collaboration with Editorial Board (Seventh task, Lead – to be agreed, needed by mid 2018)

Possibility that Igor's content table could be set out to members to determine he 'what's missing' 'what they already have or willing to contribute' and 'what is important to them'

There is a skill in writing good questions and using survey monkey for auto analysis.

Using a sharing tool to populating the manual.

Resourcing – access to Igor's time and energy will be important.

Staged approach to delivery so a little and often is the preferred approach.  
A shorter document could be easier to translate than a longer one.

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**ANNEX III, ACTIONS FROM THE ET-SBO 3<sup>RD</sup> SESSION**

<b>No.</b>	<b>Agenda Item</b>	<b>Action</b>	<b>Who</b>	<b>Expected Completion</b>
1	2.5	ET-SBO to review the draft Vision for WIGOS for the Surface-based Component with respect to relevant areas of expertise and scope. Chair to provide feedback to Ch/ICT-IOS	ET-SBO members. Ch/ET-SBO	14 July 2017
2	3.2	ET-SBO to establish a task in the work plan to develop methodologies and procedures for assessing the metadata quality for land surface-based stations in OSCAR/Surface. Chair to update work plan based on planning of ET-SBO-3 breakout group.	ET-SBO, Ch/ET-SBO	Ongoing
3	3.2	Recommendation to be made to ICT-IOS that CBS should assess current practices and requirements, including regulations, related to the notification by Members to data users of changes to observing system networks and data provision.	Ch/ET-SBO	March 2018 (CBS-MG)
4	4	ET-SBO to escalate important issues raised under agenda item 4 to ICT-IOS and CBS for consideration.	Ch/ET-SBO	March 2018 (CBS-MG)
5	6.3	Chair to consult with The Association of Hydro-Meteorological Equipment Industry (HMEI) on the possibility to provide an expert on lightning to the team.	Ch/ET-SBO	November 2017
6	6.5	ET-SBO to hold monthly teleconferencing session to advance the work plan.	Ch/ET-SBO, Secretariat	Ongoing
7	6.5	Chair to update the work plan based on the discussions and decisions made during the session, to be included as an annex to the final report of the session.	Ch/ET-SBO, Secretariat	August 2017

**ANNEX IV – ET-SBO UPDATED WORK PLAN**

Version 1.1 September 2017, updated following ET-SBO-3

No.	Task	Deliverable/Activity	Due	Responsible	Status	Comment
1	Address requests for technical and other advice from ICG-WIGOS, it's associated WIGOS Task Teams and the WIGOS Project Office.	<p>Details to be determined but will relate to components of the GOS within the responsibility of ET-SBO.</p> <p>Details not yet added to this version of the work plan</p>	Ongoing	Task Leader: Stuart Goldstraw with support from all ET-SBO for the wide range of tasks expected.	Not yet started	Contributes to ToR #1
2	Support SG-RFC in the delivery of their tasks	Detailed activities to be defined by SG-RFC but to include a review of the 'Handbook' and issues relevant to WRC 2018 and 2021	Ongoing	Task Leader: Dominique Ruffieux, support from other ET-SBO Members with strong national radiofrequency spectrum backgrounds	Not yet started	<p>Outcome of SG-RFC meeting in January 2017 will inform this task</p> <p>Dominique has strong background in remote sensing so excellent choice. Contributes to ToR #1</p>

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No.	Task	Deliverable/Activity	Due	Responsible	Status	Comment
3	Support IPET-OSDE in the delivery of their tasks	<p>Detailed activities to be defined from IPET-OSDE but are likely to include engagement in IPET-OSDE led meetings and workshops</p> <p>First defined task is the need to review and where necessary align terminology across OSCAR/Requirements and OSCAR/Surface – with ET-SBO input in OSCAR/Surface where technology remit exists.</p>	Ongoing	Task Leader: Stuart Goldstraw. Support from a range of ET-SBO members expected, exactly who will be a function of the detailed tasks.	Not yet started	Review of actions from previous IPET-OSDE sessions is needed here. Note this is separate from task 8 below. Contributes to ToR #4.
4	Review and update regulatory material for systems within the scope of responsibility of ET-SBO	<p>Review Radiosonde system regulatory material in Manual on the GOS and Guide to the GOS and make recommendations to ET-SBO for revision</p> <p>Work with the WIGOS Editorial Board to develop material based on outcome of recommendations review by ET-SBO</p> <p>Review Radar Wind Profiler (RWP) guidance material and make recommendations to ET-SBO for existing material to be consolidated or new material to be developed</p> <p>Make recommendations for the development of guidance material to enable the sustained operation of the 'RBSN &amp; RBCN' for LDCs and .....</p>	<p>2017</p> <p>2018</p> <p>2017 &amp; 2018</p> <p>2017 to 2020</p>	Overall Task Leader Stuart Goldstraw but subject matter experts will lead each discrete task and supported by all ET-SBO Members.	Not yet started	<p>Regulatory material understood to be Manuals and Guides</p> <p>The final task is closely aligned with the expected work associated with International Conference on AWS in October 2017.</p> <p>Overall the direction of this task will be dominated by the advice of the WIGOS ED that meet in October 2017.</p> <p>Contributes to ToR#2</p>

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No.	Task	Deliverable/Activity	Due	Responsible	Status	Comment
5	<p>Support the development of the WIGOS Guide on AWS</p> <p>(Note: Additional details to be found in report of ET-SBO-3 report of breakout group.)</p>	<p>Review and pull together all existing WMO AWS material contained in reports of meetings, such as ET-AWS, existing guides, such as Guide to the GOS, and products from WIGOS Workshops into a single coherent set of documents</p> <p>Contribute to the editorial review of this material, in co-operation with the WIGOS EB in the development of the WIGOS Guide on AWS</p>	<p>2017</p> <p>2018 &amp; 2019</p>	<p>Task Leader: Karl Monnik; Support from other ET-SBO members expected.</p>	<p>Not yet started</p>	<p>Carry forward from previous intersessional period, also linked to conference on AWS in October 2017. Contributes to ToR #1 &amp; #2</p>
6	<p><i>Establish and manage observing systems information portal as a contribution to the WIR</i></p>	<p><i>Deliver portal content including FORUM, QM information &amp; Observing System Best Practice information</i></p> <p><i>Ensure content remains live and relevant</i></p>	<p><i>On hold until WMO Website refresh completed</i></p>	<p><i>To be determined once task is started.</i></p>	<p><i>Not yet started</i></p>	<p><i>This task requires clear assignment to ensure it is successful in the coming period however it cannot be started until website is refreshed. Closely aligned with other portal work. Contributes to ToR #6</i></p>
7	<p>Respond to requests for technical information and advice from members and users</p>	<p>The exact nature of deliverable and activity will depend upon requests</p> <p>Correct reporting of Radiosonde height by selecting correct reference geode being a good example.</p>	<p>Ongoing</p>	<p>Task Leader Gaston Torres supported by all ET-SBO Members,</p>	<p>Not yet started</p>	<p>An example of this has been highlighted by Bruce Ingleby and the incorrect vertical height reference when using GPS to provide station metadata. Many other examples of requests need to be tracked systematically. Contributes to ToR #6</p>

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No.	Task	Deliverable/Activity	Due	Responsible	Status	Comment
8	Review progress with EGOS-IP action implementation	Review EGOS-IP actions assigned to ET-SBO by IPET-OSDE for monitoring and report on the progress with task implementation through systematic gathering of evidence from Members and other sources	Before IPET-OSDE-3 and IPET-OSDE-4	Task Leader: Minna Huuskonen, supported by all ET-SBO members.	Not yet started	We will need to establish a regular reporting regime to ensure we contribute to the collective understanding of the progress made with EGOS-IP delivery.  Contributes to ToR#4
9	<i>Review EGOS-IP actions where CBS is identified as a contributing body and determine where ET-SBO can assist in their delivery</i>	<i>Review the EGOS-IP actions  Identify possible contributions and make recommendations to ICT-IOS</i>	2018  2020	<i>Task Leader: Stuart Goldstraw to new leader nominated</i>	Not yet started	<i>The EGOS-IP is undergoing a wider review as part of the IPET-OSDE lead update of the plan. However by 2020 there may be other actions ET-SBO can assist will the delivery.  Contributes to ToR #5</i>

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No.	Task	Deliverable/Activity	Due	Responsible	Status	Comment
10	Manage the delivery of the evaluation of changes to Radiosonde scheduling as defined by EGOP-IP action G10	<p>Complete Project Plan definition</p> <p>Identified Members willing to undertake revised ascent schedules and agree timeframe for schedule</p> <p>Engage Application Areas in the evaluation of the revised schedule</p> <p>Trigger revised ascent schedule and undertake evaluation of revised schedule</p> <p>Report results at NWP Impacts workshop and other suitable fora</p>	<p>Jan 2017</p> <p>2017</p> <p>2017</p> <p>2018 &amp; 2019</p> <p>2020</p>	<p>Task Leader: Tim Oakley to be supported by ET-SBO members with Radiosonde Network experiences</p>	<p>In progress</p>	<p>Next step is to revise the outline plan endorsed by CBS and then start the task.</p> <p>The exact nature of this task is being reconsidered</p> <p>Contributes to ToR #5</p>
11	Ensure that knowledge & best practice transfer from GRUAN to GOS R/S operations	<p>Engage with GRUAN community and attend GRUAN meetings.</p> <p>Make recommendations for changes in WIGOS GOS Annex regulations and guidance based on best practice identified in GRUAN operations</p>	<p>Ongoing – annual meetings arranged by GRUAN community</p>	<p>Task Leader: Tim Oakley</p>	<p>In progress</p>	<p>The GRUAN community are driving forward best practice in the operation of radiosonde systems and this task ensure the best practice to highlighted to the global radiosonde community to enable improvements in the GOS</p> <p>Contributes to ToR #6</p>

No.	Task	Deliverable/Activity	Due	Responsible	Status	Comment
12	Ensure the development of the ET-SBO specific components of the WIGOS Data Quality Monitoring System meets the needs of users	<p>Make recommendations on appropriate quality thresholds to be used in the WDQMS Evaluation Function for assigned observing capabilities of the GOS</p> <p>Contribute to the review of the structure of the WDQMS framework and generate GOS component specific guidance material on the operation of Evaluation and Incident Management Functions.</p> <p>Further tasks to be defined in early 2018 following the next ICG-WIGOS meeting.</p>	<p>Q4 2017</p> <p>Q4 2017</p> <p>Q1 2018</p>	Task Leader: Tanja Kleinert to be supported by all ET-SBO members	In progress	<p>Whilst Tanja is a member of both ET-SBO and TT-WDQMS it should be ET-SBO that defines the structures needed to support the ongoing management of the GOS components within ET-SBOs remit.</p> <p>A number of the questions that come up in TT-WDQMS can be answered by ET-SBO.</p> <p>Contributes to ToR #1</p>
13	Review OSCAR/Surface metadata technical structures in the context of specific metadata needs of the observing systems under the responsibility of ET-SBO	<p>Review of OSCAR/Surface technical structure and report capability description gaps, specifically for Radar Wind Profilers &amp; Radiosonde system needs, to TT-WMD</p> <p>Provide feedback to TT-WMD and OSCAR development team on proposed solutions to capability description gaps identified above</p>	<p>Autumn 2017</p> <p>2018</p>	Task Leader: Karl Monnik, to be supported by Dominique Ruffieux and Tim Oakley	Not yet started	<p>Whilst capability description gaps may exist for many systems there are some known issues with those for RWPs and R/S. May require active engagement with OSCAR Development Team</p> <p>Contributes to ToR #7</p>

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No.	Task	Deliverable/Activity	Due	Responsible	Status	Comment
14	<p>Develop methodologies for the analysis of OSCAR/Surface metadata content to determine its validity. (Note: Until the metadata content has been confirmed as correct it will be difficult to determine the true operational status of the GOS.)</p>	<p>Identify the areas of OSCAR/Surface metadata content that likely to be most prone to content error (such as location or observing schedule), in the context of ET-SBO systems</p> <p>Propose methodologies to assess the validity of the metadata entries deemed to be at most risk of error (such as comparison with Google Earth images for location error)</p> <p>Make recommendations for the improvement of the integrity of OSCAR/Surface content through the development of guidance material and content verification tools</p>	<p>2017</p> <p>2018</p> <p>2019</p>	<p>Task Leaders: Karl Monnik and Tanja Kleinert. Supported by ET-SBO will an interest in improving metadata quality.</p>	<p>Not yet started</p>	<p>There is a strong link between this task and the work of TT-WMD and TT-WDQMS as some of the outputs from TT-WDQMS tools may assist in the mechanisms developed here.</p> <p>It is envisaged that annual reports to ICG-WIGOS may be the best mechanism to keep this piece of work on track.</p> <p>Contributes to ToR #3</p>
15	<p>Reporting Progress to Chair of OPAG-IOS</p>	<p>Routine reports to ICT-IOS and attendance at ICT-IOS-10 &amp; -11 in Q1 of 2018 and Q2 of 2020 respectively.</p>	<p>Ongoing</p>	<p>Chair and Co-chair of ET-SBO + review of content by all ET-SBO members.</p>	<p>In progress</p>	<p>Reporting progress to and gaining direction from OPAG-IOS Chair requires regular engagement and so should be captured in the work plan.</p> <p>Contributes to ToR #8</p>



No.	Task	Deliverable/Activity	Due	Responsible	Status	Comment
16	Engage with other Technical Commissions and Observational Bodies to ensure emerging observational technologies and associated methods of observing relevant to ET-SBO work are reviewed and assessed in the context of readiness for operational deployment as part of WIGOS.	<p>Review other Technical Commission Work Plans, Conference and Meeting Schedules to maintain a high level of awareness.</p> <p>Engage as CBS Rep in the planning and delivery of the CIMO led International Conference on AWS.</p> <p>Other tasks to be identified by Task Leader.</p> <p>Reports to be generated by ET-SBO members on a regular basis.</p>	Ongoing	Task Leader: Pei Chong supported by all members of ET-SBO as appropriate. A lead for each main area of technology / observational specialism is expected. For example: Tim Oakley to lead in GRUAN relationships and information gathering.	Ongoing	One of the goals of ET-SBO is to learn from other communities and ensure best practice is brought to the operational environment as quickly and effectively as possible. Contributes to ToR #6.

Table 2: ET-SBO Core Membership Assignment

ET-SBO Member	Assigned Task Leader
Stuart Goldstraw	<b>1, 3, 4, (9), 15</b>
Pei Chong	15, 16
Karl Monnik	5, 13, 14
Gaston Torres	7
Minna Huuskonen	8
Tanja Kleinert	12, 14
Dominique Ruffieux	2
Tim Oakley	10, 11