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| **World Meteorological Organization**  **COMMISSION FOR BASIC SYSTEMS**  **Expert Team on Centre Audit/Certification** 18-20 October 2017, Darmstadt, Germany | **ET-CAC2017/Final Report** |
| Submitted by: Secretariat  08.11.2017 |

# Final Report from the 2017 meeting of the Expert Team on Centre Audit/Certification

## Opening of meeting

1. The meeting opened at 13:05, 18-Oct-2017.
2. The Chair welcomed all participants to the first meeting of the Expert Team for Centre Audit/Certification. He noted that previous incarnations of this team were responsible for auditing and certifying WIS Centres, adding that the scope of ET-CAC now includes audit and certification of all types of WMO Centres. The Chair drew particular attention to the new requirements from ICAO to audit space weather centres.
3. On behalf of the Director-General of EUMETSAT the meeting host, Lothar Wolf, welcomes participants of ET-CAC2017 to EUMETSAT.
4. The Chair initiated a tour-de-table, inviting participants to introduce themselves and provide a short resume of their experience with WIS Centres and auditing.
5. The participants of ET-CAC2017 are listed in Appendix 2: Meeting participants.

### Working arrangements

1. All participants confirmed that the following schedule was acceptable (all times in CEST):

* Wednesday 18-October: 13:00 to 17:30
* Thursday 19-October: 09:00 to 17:30
* Friday 20-October: 09:00 to 15:00
* Lunch at approximately 12:30, for around an hour.
* Tea & coffee breaks at approximately 10:30 and 15:00.

### Approval of agenda

1. The agenda (see APPENDIX 3: Agenda) was approved.
2. The Chair noted that there would be external participants joining at agreed times for specific topics: Andrea Duflaut, head of EUMETSAT Quality Assurance Management, plus C/AEM and SO/AEM from the Secretariat.

### Meeting background

1. Resolution 51 (Cg-16) [12] conditionally designated those WIS centres listed in Table 4 of the annex that resolution for a limited duration, subject to demonstration of the pre-operational compliance requirements of the Commission for Basic Systems (CBS). Resolution 31 (Cg-17) [2] extended the conditional designation of those WIS centres listed in Table 3 of the annex to that resolution until the sixteenth session of CBS.
2. Resolution 7 (EC-69) [13] endorsed the WIS centres listed in Table 1 and Table 2 of the Annex to Recommendation 14 (CBS-16) [12] as compliant with the Technical Specifications laid out in the Manual on WIS (WMO No. 1060) [3].
3. However, there are several WIS centres that remain only conditionally designated. Recommendation 14 (CBS-16) [11] requested CBS Management Group to consider whether it would be appropriate to ask Executive Council to further extend the conditional designation of centres. No request was made on behalf of CBS to the sixty-ninth session of Executive Council in such regard. Therefore, those WIS centres remaining only conditionally designated will be removed from Table 2 of Appendix B of the Manual on WIS unless urgent demonstration of the operational compliance procedures can be achieved.
4. Furthermore, as per the audit schedule for Global Information System Centres (GISCs) specified in the Manual on WIS §2.5 Rolling Review of WIS centres, most GISCs are overdue their interim audits (for dates of GISC audits, refer to: ICT-ISS-2014 final report [10] Table 1 Status of GISC Audits).
5. The sixteenth session of CBS Management Group (paragraphs §73 and §141 of the final report [14] refer) recognised that a team in quality auditing could serve all CBS centre registrations rather than being limited to WIS centres, including the audit procedures being implemented by the amendments to the Manual on GDPFS.
6. Additionally, in paragraph §3 of their letter (ref. AN 10/1-IND/17/11 dated 9 June 2017), ICAO invite WMO to assist in the designation of space weather information providers by assessing each potential candidate centre through site visits and audits.
7. This meeting of ET-CAC will progress the following items from the OPAG-ISS Work Plan (the final report of the seventeenth session of CBS Management Group [15] refers)

* ET-CAC01 Establish an overall adapted audit process
* ET-CAC02 Run GISCs certification process
* ET-CAC03 Coordinate DCPCs and NCs certification

### Meeting objectives

1. Begin development of an adapted audit and certification process to support all WMO programmes and Technical Commissions;
2. Provide training to members of ET-CAC such that they are able to discharge their duties as auditors of WMO centres; and
3. Plan and schedule completion of GISC interim audits and outstanding audits for WIS centres that remain conditionally designated.

## Team structure

1. The Chair noted that for audit to be successful, there must be a degree of separation between the auditor and the Centre being audited. For this important reason, ET-CAC team members are from diverse geographical locations.
2. Furthermore, the Chair noted that previously when WIS was in its initial operational phases, the only expertise about WIS Centres came from the set of global centres themselves - a small community. As a result, it was difficult to ensure complete independence between auditor and the Centre being audited.
3. However, since the WIS has been operational for some years, a wider group of individuals understand how WIS Centres should operate, meaning that a there are a larger group of potential auditors to use. This is reflected in the more diverse membership of ET-CAC.
4. All members of ET-CAC are expected to contribute towards the audit of WMO Centres.
5. Core members of ET-CAC have additional responsibilities: both developing the audit procedures and associated guidance materials, plus the coordination and scheduling of the audits themselves.

## Review of ET-CAC Terms of Reference

1. ET-CAC reviewed their [Terms of Reference](http://www.wmo.int/pages/prog/www/CBS/Lists_WorkGroups/CBS/opag%20iss/et-cac/tors) (ToR), as specified in Annex 1 to Decision 33 (CBS-16) (see Appendix 4: ET-CAC Terms of Reference).
2. Referring to the Meeting background (which highlights the need to provide audit procedures for all CBS centre registrations and candidate ICAO space weather information providers), ET-CAC noted that their ToR only refer to WIS Centres.
3. The Chair highlighted that there are clear instructions to ET-CAC to extend the ToR.
4. As set out in the Meeting background, the scope of ET-CAC is extended from WIS Centres to cover all types of WMO Centres.
5. Recommend to OPAG-ISS that the ET-CAC ToR is amended as per Appendix 5: Proposed new Terms of reference for the Expert Team on Centre Audit/Certification.
6. Point (A-i) from the existing ToR has been removed and is no longer covered in the proposed terms of reference. As required by the new provisions for Quality Management (WMO-No. 49 Volume I. [1] Part VII – as amended in Resolution 20 (EC-69) [13]), ET-CAC is responsible for conducting audits but the responsibility to validate and monitor conformance remains with the system owner (e.g. for WIS, this is the Expert Team on WIS Centres – the responsible body designated by the Commission for Basic Systems) who should request audits as per their Quality Management System.
7. The authority for ET-CAC to conduct audits derives from *Part VII Quality Management* of WMO-No. 49 Volume I. [1].
8. The Chair noted that the proposed ToR clearly defines the root of authority for ET-CAC as the new *Part VII Quality Management* of WMO-No. 49 Volume I. [1].
9. New ToR with approval from president CBS and authority derived from Basic Documents No. 2 provides a clear mandate for ET-CAC to operate; bringing credibility to future audits.
10. ET-CAC agreed that with the changes to the ToR, the formal instruction to audit WIS Centres is no longer clear. The Manual on WIS provides a statement of governance about how audits should be undertaken, but it does not instruct ET-CAC to undertake those audits.
11. Recommend to OPAG-ISS that, for approval by president CBS, ET-WISC draft a formal instruction to ET-CAC requesting the audit of WIS Centres according to the regulation defined in the Manual on WIS.
12. ET-CAC to prepare a guidance note for system owners describing what information should be included in a formal audit instruction – e.g. compliance criteria, reporting lines, audit frequency, list of centres to be audited etc.

## Existing audit resources

1. ET-CAC assessed the resources listed in the following sections for applicability in forthcoming audits.

### WMO Quality Management Framework (QMF)

1. Dimitar Ivanov, WMO C/AEM, is responsible for the WMO Quality Management Framework. Not a QMS practitioner himself, his role is to coordinate the quality management activities within WMO with support from certified QMS auditors.
2. Dimitar provided a short overview of the WMO Qualitfy Management Framework ([presentation](http://wis.wmo.int/file=3733)):
   1. WMO Quality Management Framework, as defined in Resolution 7 (Cg-17) – WMO Quality Management Framework [2], is predicated on ISO 9001:2015, it is applicable to all types and sizes of organisations from International Programmes to small NMHS. Furthermore, it aims to streamline the quality management activities of different programmes and technical commissions
   2. November 2012, ICAO upgraded its QMS requirement from a recommended practice to a standard practice; this drove a significant investment in development of QMS and capacity building, with the goal for providers of meteorological services to international civil aviation to achieve ISO 9001 certification.
   3. There is an active community of QMS professionals supporting the aviation requirement, using an invitation only Yammer group[[1]](#footnote-1) as the tool for information sharing within that community of practice: the WMO QM Forum.
   4. Within the WMO Strategic Plan, the Quality Management Framework (QMF) is seen as a key enabler.
   5. WMO Technical Regulations, WMO-No. 49, Volume II – Meteorological Services for International Air Navigation [18], requires use of a Quality Management System in support of meteorological service provision for international civil aviation. Use of ISO 9001 is recommended but not essential.
   6. Currently, there is no explicit linkage from Manual on WIS (WMO-No. 1060) [3] to Quality Management assertions
   7. The Guide to the implementation of a Quality Management System for NMHS (WMO-No. 1100) [19] is in the process of being updated to reflect change to ISO 9001:2015 [20]. This update is anticipated to be published in December 2017, providing both an overview of ISO9001:2015 and a detailed discussion on the clauses of that standard. It also includes information about internal and external audits within the procedure for implementing a QMS (see chart on pp58-59), which are further elaborated in §6.11, §6.12, §6.13 and §6.14 (pp67-70).
   8. The latest updates to the WMO Quality Framework include:
      1. Policy Statement, see Annex to Resolution 19 (EC-69) [13]
      2. Provisions for Quality Management within WMO-No. 49, Volume I, Part VII, see Resolution 20 (EC-69) [13]; noting that implementation of a QMS is still a recommended practice, rather than mandatory. It is applicable to WMO Centres hosting a global or regional function.
   9. The WMO QMF requires an organisation-wide approach - covering Members, Programmes, Technical Commissions and Secretariat. See Decision 76 (EC-68) – WMO Quality Management Framework – Organization-wide approach [21].

### Regulatory material for WIS Centre audits

1. The following documents include provisions relevant to the audit of WIS Centres:
   1. Basic Documents No. 2 (WMO-No. 49) Volume I. Part V. Qualifications and competencies of personnel involved in the provision of meteorological (weather and climate) and hydrological services: §1.4 Personnel supporting the WMO Information System. [1][[2]](#footnote-2)
   2. Manual on WIS (WMO-No. 1060) Part I. Organization and responsibilities: §1.8 Competencies of personnel. [3]
   3. Manual on WIS (WMO-No. 1060) Part II. Designation procedures for WIS Centres. [3]
   4. Manual on WIS (WMO-No. 1060) Appendix E. WMO Information System competencies. [3]
   5. Guide to WIS (WMO-No. 1061) Part I. Organization and responsibilities: §1.8 Competencies of personnel. [4]
   6. Guide to WIS (WMO-No. 1061) Part II. Designation procedures for WIS Centres. [4]
   7. Guide to WIS (WMO-No. 1061) Part VI. Operational guidance: §6.6 Procedure for rolling review of WIS Centres. [4]
   8. Guide to WIS (WMO-No. 1061) Appendix B. WIS Technical Specifications – Use cases. [4]
   9. Guide to WIS (WMO-No. 1061) Appendix C. WIS demonstration test cases. [4]
   10. Guide to WIS (WMO-No. 1061) Appendix D. Annex to paragraph 6.6.2. [4]

### Audit materials from previous phase of WIS Centre audits

1. The following materials were developed in support of the pre-designation audits for GISCs and DCPCs:
   1. [GISC audit template](http://wis.wmo.int/file=3711) [5]
   2. [GISC audit report (blank)](http://wis.wmo.int/file=3712) [6] (a [sample report](http://wis.wmo.int/file=3713) [7], redacted, is provided as an example)
   3. [WIS demonstration process, procedures and guidelines](http://wis.wmo.int/file=3722) [8]
   4. [WIS compliance technical specifications V1](http://wis.wmo.int/file=3723) [9]

### Tools used by ET-CAC

1. The Chair described the on-line tools used by TT-CAC during the previous audit cycle:
   1. Public team pages (WIS wiki)[[3]](#footnote-3)
   2. Restricted access ET-GDDP team pages (WIS wiki)[[4]](#footnote-4)
   3. ET-CAC certification Trello board[[5]](#footnote-5), listing audits “to do”, those being done, and those completed plus supporting information. The Trello card provides checklist of what is required within the audit procedure
   4. Online form for WIS Centre nomination[[6]](#footnote-6); with the questions and criteria drawn from the Guide to WIS. This form is completed prior to WIS Centre nomination as part of the pre-audit activity. From the audit, a recommendation concerning the Centre is then made and passed to president CBS for designation.
   5. Audit schedule (WIS wiki)[[7]](#footnote-7) – needs updating
2. Assistance in using these tools can be requested from Secretariat or the ET-CAC Chair.
3. Continue to use Trello, WIS wiki and WIS Centre database to support WIS Centre audit.
4. Secretariat to ensure that all ET-CAC members have necessary accesses and permissions to use these tools.

Post meeting note:

Dave Thomas, WMO C/ITS, stated that the WIS Centre Candidate DB is on an obsolete server and needs to be moved. The long-term plan is to put this information into the new WMO Country Profile DB alongside all the other country information. However, this is some way off in terms of being ready. In the interim. C/ITS suggests use of a “tracker” in the WIS wiki to collect the necessary information using a Web-form. This will be significantly easier to maintain.

As the CPDB becomes ready, the WIS wiki tracker, and the information on Trello, should be migrated to the new CPDB platform.

C/ITS also added that the most important element in the WIS Centre Candidate DB is the attached results from the tests.

## General working principles

### Audit principles

1. Andrea Duflaut, EUMETSAT Head of Quality Assurance Management, presented[[8]](#footnote-8) on audit principles as defined by ISO 19011:2011 – Guidelines for auditing management systems.
2. A new version of this ISO standard is anticipated to be published next year (ISO/DIS 19011:2018e) introducing an additional principle. However, the material in the existing ISO standard remains entirely relevant.
3. ISO 19011 sets out seven principles for audit. A brief description of each of these principles (based on the presentation and verbal complement) is provided below:
   1. Principle 1: Integrity
      1. Demonstration of competence is a key point- there is no mandatory qualification for an auditor, but it is considered important within EUMETSAT to undertake external audit training - just a three-day course.
      2. There are two areas of competence. First, the audit process itself; the technique of auditing. This can be learned with external training. Second, having technical / domain knowledge required to engage with the subject matter and undertake an value-added audit.
      3. EUMETSAT always has a minimum of two auditors; to cover both these areas of competence, but also because one person in the audit can take notes while the other person asks the questions.
      4. The inclusion of subject matter experts means that the audited Centre should benefit from the audit - because the auditor understands the subject matter and can ask intelligent question; e.g. that the audit is not just a box-ticking exercise.
   2. Principle 2: Fair presentation
      1. Report truthfully and accurately, using objective, timely, clear and complete communication. Time pressures often make this challenging. As a result, EUMETSAT suggest that an audit interview should not be less than 90 minutes. If more time is required in an interview, agree to extend by mutual agreement, or schedule a follow up session.
   3. Principle 3: Due professional care
      1. It is the task of the auditor to \_try\_ to understand.
      2. Do not focus on finding non-conformities. Instead, focus on trying to \_find\_ conformities. Confirm that things are correct, as well as highlighting where improvements can be made. Be positive in your engagement: what \_is\_ working.
      3. Be clear about the audit process; e.g. by ensuring that all people to be interviewed attend an opening meeting that explains what is going to happen, the process and the intent. Likewise, have a closing meeting where everyone involved can be debriefed.
   4. Principle 4: Confidentiality
      1. Exercise with discretion and ensure security of information. For example, when an audit is complete, return information resources to the audited Centre. Do not use information gathered in an audit for any other purpose.
   5. Principle 5: Independence
      1. Ensure impartiality and objectivity to avoid conflict of interest. There is now some flexibility in how to meet this requirement - it used to be that one MUST not audit their own area. But this can be problematic for smaller organisations. Not a problem for EUMETSAT where they have approximately 17 or 18 auditors to call on.
   6. Principle 6: Evidence-based approach
      1. Be systematic in your approach, consistently questioning and asking for examples of [compliance] - ask people to show you how they conform. An audit cannot be an exhaustive check - it only provides spot checks. Define the sampling regime appropriate to the task.
   7. Principle 7: Risk-based approach (new for DIS/ISO 19011:2018e)
      1. Principle 7 places an emphasis on professional judgement to determine which topics and issues may introduce the highest risk to the system being audited.
      2. This risk-based approach is common to ISO 9001 Quality Management and ISO 27001 IT Security. Typically, you will be looking for the Centre to demonstrate that they think about risks (e.g. that they have a risk register) and have procedures in place to manage them.
      3. One of the key things about a risk-based audit, compared to the traditional process-based approach, is that you need to think about how those [functions] fit within a wider supply chain. Taking a broader view, from underlying ICT infrastructure resilience, to ensuring that the people involved have the necessary competencies.
      4. It is important for the auditor to use their domain expertise to assess where risks might lay - but only the Centre being audited will know the details of their own infrastructure and operations. The auditor should use their expertise to begin the dialogue, and proceed from there. The auditor should soon be able to determine whether the persons being interviewed demonstrate an understanding of how such risks should be managed.

### Practical advice

1. Andrea Duflaut provided some practical advice on conducting audits based on her own experience as an auditor:
   1. Provide the audit schedule and the high-level purpose ahead of the audit, but do not share the specific questions prior to the interview, unless it is a standard check list.
   2. Auditing in two steps can be useful -e.g. request documentation for off-site review to be provided up front to determine if a centre is ready for audit. But be clear to have a closing meeting after the initial “review” step - and another opening meeting at the beginning of the second “audit” step. The “review” step enables the auditor to arrive \_prepared\_ to conduct the audit.
   3. Off-site “review” can be useful to prepare for an audit. However, communication is key to successful audit, so be wary of trying to complete an offsite audit or review where there is insufficient understanding. It is the job of the auditor to try to understand the Centre.
   4. An audit should be book-ended by an opening meeting and closing meeting - where everyone involved in the audit is invited.
   5. The opening meeting should provide an overview of the audit process - and be clear that the audit is not a test of individuals, it is looking at the performance of the whole centre (process, or system etc.) - and that the audit presents opportunity to improve performance. The audit is there to add value [to the organisation being audited] - it is not there to find fault.
   6. While conflicts of interest (between auditor and centre) should be avoided where possible, the opening meeting should be the time where any conflicts of interests are declared - if these arise later, then it calls the value of the entire audit into question. It is the opportunity for the auditor to present their credentials.
   7. The last day of an audit MUST include a closing meeting, in which you should leave the centre with a good idea of how they have performed and be clear on any outstanding issues. The closing meeting should list & classify the audit findings (e.g. issues / non-conformances) - even if only as bullet points. If issues are not mentioned in the closing meeting, then you must not include them as part of the official report. Consequently, make sure you have time to consolidate your findings after the final interview to prepare for the closing meeting.
   8. The official Audit Report can be written offsite - but it must be provided in a timely manner to ensure that the audit has value.
   9. Start with the management session directly after the opening meeting. By starting with management, you obtain permission from them to enquire further within the organisation.
   10. If auditing processes, refer to the Plan-Do-Check-Act workflow recommended by ISO 9001 for Quality Management Systems. Recommend starting with the Check and Act parts (e.g. focusing on the outcome) and trace back to planning to see how the management environment influences the process execution.
   11. One tends to get more value from a short interview session with a [single] dedicated person, than having interviews with three or more people as there is often insufficient time to ask all the questions to a larger group.

### Discussion

1. Impartiality, independence and professionalism are essential when undertaking audits of any organization or system. Consequently, it is necessary to ensure that there are no conflicts of interest relating to the audit.
2. Although the WMO community is well connected, assigning auditors based in a different Region to audit a centre is an effective way to mitigate concerns about personal conflicts of interest.
3. However, the Chair noted the lack of clear separation in previous WISC Centre audits between auditor, Task Team on Centre Audit and Certification (TT-CAC) [[9]](#footnote-9), and system owner, Expert Team on WIS Centres (ET-WISC), introduced potential conflict of interest at an organizational level – see paragraph 55 below. Although ET-WISC will have conducted itself in a professional manner when setting assessment criteria for WIS Centres, the independence of the audit was questionable; e.g. if the same body was responsible for both setting criteria and assessing against those criteria, that body could potentially design criteria that unfairly discriminated.
4. In line with best audit practices and ISO 9001, it is highly recommended that the audit team are provided with assessment criteria by the “system owner”, thus ensuring that the audit team have no influence over the criteria with which they are auditing.
5. The Chair simply stated “ET-CAC doesn’t set the rules”; ET-CAC is responsible for defining the framework in which those rules can be evaluated and then conducting audits in accordance with that framework.
6. In the case of WIS, ET-WISC, as the responsible body designated by the Commission for Basic Systems (CBS), is the “system owner” for WIS.
7. Recommend to OPAG-ISS that it is ET-WISC that need to develop the WIS Centre assessment criteria against which ET-CAC will then audit WIS Centres.
8. Recommend to OPAG-ISS that ET-WISC amend their terms of reference to include development and operation of a QMS for WIS- including use of external audit [by ET-CAC] for validating compliance with agreed practices and standards
9. As stated in paragraph 59 below the assessment criteria used in previous WIS Centre audits was generally technical in nature. Once again, in line with audit best practice, audit criteria should look at procedural and management factors rather than technical. For example, in the case of cyber security, an audit should seek evidence that cyber security is being effectively managed, but not undertake any ‘penetration tests’ itself – good cyber security procedures will ensure that penetration tests, and other mechanisms, are undertaken and that the evidence of those tests will be available to review.
10. Audits should not seek to find ‘broken pieces’ – the aim of an audit to determine whether the subject of the audit understands the requirements and has the appropriate practices in place to effectively deliver against those requirements. For example, an effective Quality Management System should support continuous improvement by incorporate the phases plan, do, check and act [to improve or maintain performance] into procedures.
11. Ideally assessment criteria should be provided in the form of a maturity model[[10]](#footnote-10) that will support continuous improvement.
12. In this way, an audit should provide value to the subject of the audit by helping them to understand how they can improve their performance – even when they are already compliant with the base-level of performance.
13. Audits should not begin with an expectation of finding non-compliance, e.g. with guidance on criteria for non-compliance. Auditors will be provided with guidance about how to determine the maturity of a centre with regards to particular disciplines.
14. Ultimately, the findings of an audit, as presented in the audit report, will lead to a recommendation whether a centre can be designated – or, in the case of an existing centre, whether the designation continues or is revoked. It is for this reason that it is essential that audits are seen as impartial and have the appropriate authorities in place.
15. ET-CAC anticipate the criteria used to assess a new centre to differ from the criteria used to assess a centre that has been operational for some time and successfully passed previous audits. For example, audit of a new centre may be required to verification of capability, while an audit of an existing centre may focus on continuous improvement.
16. ET-CAC should employ different approaches for designation of new centres and the reaffirmation of the designation of an existing centre.
17. The risk-based approach (outlined in ISO/DIS 19011:2018e) should be adopted in the new audit framework.
18. A new generalized audit framework will be developed; adopting a risk-based approach, providing clarity on the authority for the audit and ensuring adequate separation between the owner of the “system” and the auditors.

## Provision of background information from previous audit cycles

1. The Expert Team on WIS Centres (ET-WISC) is recognized by the Commission for Basic Systems (CBS) as the responsible body for the WMO Information System (WIS).
2. The Task Team on Centre Audit and Certification (TT-CAC) was responsible for conducting audits on WIS Centres. As a sub-team of the ET-WISC there was not clear separation between the audit team, TT-CAC, and the “owner” of the system being audited, ET-WISC. In hindsight and referring to the principles of ISO 9001 Quality Management, this lack of clear separation between auditor and system owner may be considered to undermine the authority of the audit framework.
3. The previously agreed audit regime for WIS Centres[[11]](#footnote-11), as defined in the Guide to WIS (WMO-No. 1061) [4], specified:
   1. On-site audit for Global Information System Centres (GISCs), conducted by TT-CAC;
   2. Remote audit for Data Collection and Production Centres (DCPCs), conducted by that Centre’s affiliated GISC, coordinated by and with support from TT-CAC; and
   3. Audit for National Centres being the responsibility of the relevant PR.
4. GISC and DCPC audits are complemented by an online questionnaire[[12]](#footnote-12) and remote testing. In the case of GISC audit, the responses to the questionnaire are used by the on-site audit team to focus their assessment.
5. Remote testing was undertaken during a fixed period advised by the audit team. The specific times of tests within that period were not given.
6. The assessment criteria used in WIS Centre audits were generally of a technical nature allowing objective assessment of whether Centres were compliant with the WIS Technical Specifications.
7. Topics for assessment, but not the specific questions themselves, were available to the centre being audited (see [GISC audit template](http://wis.wmo.int/file=3711) [5]).
8. Auditors sought to include recommendations in their report about how WIS Centres may improve their performance.
9. ET-CAC, via the OPAG-ISS, provided a recommended concerning the designation of a centre to the president CBS who is responsible for deciding whether to designate a centre or not. The audit itself is not a pass/fail certification.
10. Provisions were in place to manage situations where centres were considered to be under performing. For example, re-audit in 3, 6, 9 months, giving centres time to address the issues.

### Lessons learned

1. The following aspects were considered effective during the pre-designation audits for GISCs:
   1. Geographic diversity (e.g. ensuring that auditors do not audit centres in their region) has proven to be an effective mechanism in ensuring the necessary impartiality of audit teams.
   2. Two-person audit teams.
   3. Lead auditor has previous audit experience.
   4. Providing supporting information and documentation prior to a site audit ensures that the audit team can perform the audit quickly and efficiently with minimum disruption to the centre being audited.
   5. 2-day on-site audits: allowing the local team time to resolve issues prior to the audit closure following the initial day of assessment. Conducting a site-audit in two days is a heavy workload for the auditors, the duration of the audit must be balanced against the disruption to operations of the centre being audited.
   6. Back-to-back audits of two centres in the same region where long-haul travel was required to bring in the audit team reduced both financial cost to the audited centres and reduced the overall time commitment from the auditors.
   7. Beginning audits by interviewing the PR to determine the organisational commitment to fulfilling the obligations of a WIS Centre.
2. Members of ET-CAC will lead audits on all WMO Centres; auditors should have participated in a WMO Centre audit with another experienced member of ET-CAC before they take the role of lead auditor.
3. At least two auditors will participate in a WMO Centre audit.
4. On site audits will continue to be two-days in duration
5. Audits will be conducted following an invitation from the Centre to be audited
6. As mentioned in paragraph 43 above is best to separate the responsibilities for the specification of the assessment criteria and the application of those criteria in audit. ET-CAC is no longer a sub-team of ET-WISC, which will help with the separation of responsibilities.
   1. ET-CAC define the audit procedure.
   2. ET-WISC define the assessment criteria against which WIS Centres shall be audited.
   3. ET-CAC operate independently to audit WIS Centres in accordance with audit procedure using the assessment criteria defined by ET-WISC.
7. Recommend to OPAG-ISS that ET-WISC define the assessment criteria for WIS Centres, using a risk-based approach, against which WIS Centres shall be audited.

### Review of audit practices from previous WIS Centre audits vs. ISO 19011 audit principles

1. The practices of previous WIS Centre audits were well matched with the ISO 19011 principles - except for Principle 7 “risk based approach” which is new.
2. Experience suggests that on-site audit must be a minimum of two days - although it is hard work to complete during that duration. However, one must also recognise that the audit is conducted at the centre’s expense (travel & subsistence) and that it takes time out of the centre’s normal business. So, there is a need to balance thoroughness of audit with the interruption to normal business.
3. Topics for assessment, but not the specific questions themselves, were available to the centre being audited (see [GISC audit template](http://wis.wmo.int/file=3711) [5]). The audit is not trying to find fault, so does not need to operate in secret. The functions of a WIS Centre and the criteria that are used to judge them must be public and well known - so that WIS Centres can deliver effectively against their requirement. The checklist was provided to help auditors cover all the necessary areas - but does not include the specific questions that might be tailored for the audit of a particular centre.
4. Adopting a risk-based approach is new. This will be a key focus in developing the new audit framework and the assessment criteria. The risk-based approach considers that a centre can always improve using a maturity-model to judge performance.

## Audit requirements for candidate space weather centres

1. The Chair reminded the meeting that the scope of ET-CAC now includes audit and certification of all types of Centres - including the space weather centres that ICAO has invited WMO to assess.
2. Greg Brock, WMO SO/AEM (Secretariat), introduced the requirement for audit of space weather centres (presentation[[13]](#footnote-13)):
   1. WMO supports ICAO in defining the requirements and standards for meteorological services to international civil aviation.
   2. ICAO provisions concerning space weather will be applicable from November 2018.
   3. ICAO has invited WMO undertake site assessments and audits of candidate space weather service providers.
   4. Timelines are tight; driven by ICAOs schedule for introduction of new space weather provisions into ICAO Annex 3 (WMO No. 49, Volume II)
   5. ICAO must designate space weather centres by June 2018. To be clear - WMO provide recommendations only; it is ICAO that designate these space weather centres.
   6. The Task Team on Aviation (TT-AVI), part of the Inter-Programme Team on Space Weather Information Systems and Services (IPT-SWeISS), provides the focal point for meeting ICAO’s requirement.
   7. ICAO’s initial consultation is complete, indicating that around 18 States have self-nominated to provide space weather services; it is likely that some States will withdraw and several States in Europe will establish a consortium.
   8. Expect 9 on site audits to be required.
   9. TT-AVI have developed “Audit procedure and reporting templates” [16] (respecting much of WIS Centre audit procedures) and the “working methodology and schedule” [17]
   10. ICAO have defined audit criteria that it expects WMO to audit against; TT-AVI have developed a specification by which compliance can be assessed.
   11. Expectation for space weather audit teams: 6 subject matter experts (from TT-AVI, some of whom have a scientific background and no audit experience) and 6 audit experts (from ET-CAC)
   12. To maintain impartiality and independence, WMO does not expect an auditor to conduct an audit in their own country or region.
   13. Each audit will require some off-site preparation, on-site assessment, and post-audit reporting activities.
   14. Site audit are anticipated to take 2-days; with back-to-back audits being scheduled where possible (e.g. USA and Canada)
   15. Travel and subsistence for audit team will be covered by the centre being audited
   16. WMO must report to ICAO on the results of the site assessments and audits in March 2018. There does not appear to be any flexibility to extend this work.
   17. A provisional timeline is provided on Slide 13 of the [presentation](http://wis.wmo.int/file=3710))
   18. ICAO are meeting in early November to finalise the amendments to ICAO Annex 3. There is a small risk that the provisions relating to space weather may be considered too immature to proceed - in which case the implementation would be delayed. There is also a chance that while the provisions may be sufficiently mature, the implementation timeline may be extended. However, at present, plan for the currently specified timeline.
3. Survey Monkey has been used for the self-assessment questionnaire[[14]](#footnote-14).
4. A space weather audit/SME coordination session (WebEx) is scheduled for 26 October 2017 to further develop the approach that will be used to audit candidate space weather centres. Members of ET-CAC are welcome to attend.
5. The Chair indicated that the timeline is challenging - given that it is already October and ICAO need the audits and assessments of perhaps 9 centres to be completed by March.
6. To ease time pressures, audits in different regions could be conducted in parallel – the audits do not need to be sequential. Where two or more centres are in the same region, back-to-back audits may be scheduled.
7. Certification of auditors is desirable rather than essential. However, it is important that WMO can demonstrate to prospective space weather centres being audited that the audit team have the necessary credentials and experience.
8. Given the number of anticipated site audits the short period of time, and the expectation that ET-CAC will provide the “audit expert” for each on-site audit, key next steps include co-opting additional qualified auditors into ET-CAC. Two members from the Expert Team on QMS were identified (Bryan BOASE, AU, and Gerold FLETZER, AT) to assist. MetService offered expertize from one of their qualified auditors (Shane BIDOIS, NZ).
9. Co-opt experienced auditors as new associate members of ET-CAC to expedite the space weather auditing.
10. Audit teams for space weather centre audits will comprise a lead auditor from ET-CAC and a subject matter expert (with expertise relating to space weather) from TT-AVI.
11. The Secretariat indicated that there should be no problem in adding new members to ET-CAC provided that PRs of those experts authorize those nominations.
12. TT-AVI have already developed a reasonably mature specification for the space weather assessment criteria – derived from the requirements specified by ICAO. (see [Audit procedures and reporting templates for space weather centres](http://wis.wmo.int/file=3726) [16]). These criteria are not yet finalized and will be further reviewed during the coordination session planned for 26 October.
13. The [Audit procedures and reporting templates for space weather centres](http://wis.wmo.int/file=3726) [16] are based on the WIS Centre audit procedures, updated to reflect an ISO 9001:2015 approach. They have tailored to meet the short-term ICAO need over the next 6-months. These “interim” procedures may serve as a useful basis for the generalized audit framework to be developed by ET-CAC, recognizing that future audit requirements emerging from ICAO, e.g. 2019 onward, would seek to use that generalized audit procedure.
14. Audits of space weather centres to March 2018 will be conform to an interim audit process framework proposed by TT-AVI
15. WMO is still awaiting final notification from ICAO regarding the centres to be audited. Within the European consortium, the expectation is that only the lead centre will require an on-site audit. Best expectation is that there will be 9 on-site audits.
16. ET-CAC noted their general lack of expertize with respect to space weather. ICAO are due to finalise and publish the Manual on Space Weather which should be informative on this subject.

Post meeting note:

On 2-November 2017, the Air Navigation Commission (ANC) of ICAO undertook its final review of the proposed amendment to *ICAO Annex 3 – Meteorological Service for International Air Navigation* which contained the standards and recommended practices on space weather. The ANC accepted all of the proposals but with modifications in a few places. The timeline for space weather site assessments and audits remains UNCHANGED

The candidate space weather centres requiring on-site audit are now confirmed:

* RA I: South Africa,
* RA II: China, Japan
* RA III: Brazil
* RA IV: Canada, USA
* RA V: Australia
* RA VI: France, Russia, PECASUS consortium (Finland – lead centre, Austria, Belgium, Cyprus, Germany, Italy, Netherlands, Poland, UK)

10 site audits required before end of Feb 2018

## ISO 9001:2015 focus

1. TT-CAC was not able to mandate the use of ISO 9001 within previous WIS Centre audit cycles. However, WMO-No. 49 Volume I General Meteorological Standards and Recommended Practices [1] has been amended to include a new Part VII Quality Management (see Resolution 20 (EC-69) [13]). In particular, the new provisions include:

* 1.1 General
  + 1.1.1 Members should ensure that their organizations responsible for the provision of meteorological, hydrological, climatological or other environmental services establish and implement a properly organized quality management system /QMS) […]
* 1.2 WMO international centres and facilities
  + 1.2.1Members undertaking to host global and/or regional centres and/or facilities on behalf of WMO Programmes should establish and implement a QMS which covers the entire scope of services for which the centre and/or facility has been designated.
* 1.3 Establishing a Quality Management System
  + 1.3.1 The QMS established in accordance with [these provisions] should:

1. Monitor, measure, analyze and evaluate the QMS through a rigorous audit schedule and regular reviews by management

* 1.4 Recognition of compliance of a Quality Management System
  + 1.4.1 A QMS established in accordance with [these provisions] should be in conformity with the current International Organization for Standardization (ISO) 9001 *Quality management systems – Requirements* (ISO 9001) standard.
  + 1.4.2 Demonstration of compliance of the quality system applied should be by audit.

1. ET-CAC concur that there is now a clear statement that requires use of ISO 9001 (currently ISO 9001:2015) within the audit framework.
2. Lothar Wolf provided an overview of ISO 9001:2015 and some useful freely available resources for QMS practitioners:
   1. [ISO 9001:2015 Overview](http://wis.wmo.int/file=3730) [26]
   2. [ISO 9001:2015 How to use it](https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/iso_9001-2015_-_how_to_use_it.pdf) [22]
   3. [Moving from ISO 9001:2008 to ISO 9001:2015](https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/iso_9001_-_moving_from_2008_to_2015.pdf) [23]
   4. [ISO 9001:2015 Versus ISO 9001:2008 (EUMETSAT Assessment)](http://wis.wmo.int/file=3734) [27]
3. ISO 9001:2015 is far more concerned about people than techniques; e.g. how the process or system brings benefits to the user or customer.
4. One of the key changes from 2008 to 2015 version of the standard is the focus on end-to-end supply chain and taking a risk-based approach.
5. The Chair noted that the clauses of ISO 9001:2015 should be consistently recognisable at all centres operating a QMS; the audit framework to be developed by ET-CAC should seek to verify the existence of these areas (e.g. Clause5–Leadership, Clause6–Planning, Clause7–Support, Clause8–Operation, Clause9–Performance evaluation and Clause10–Improvement).
6. However, given that Centres are not required to operate ISO 9001, only that they are operating a Quality Management System, the audit framework should be flexible enough to accommodate a generalised QMS, ISO 9001:2008 and ISO 9001:2015. Members of ET-CAC should be familiar with the principles of both the 2015 and 2008 version of ISO 9001 so that they can conduct audits at a variety of Centres.
7. While it is useful to understand the full details of the ISO standard, it is the principles that are important. Information on these principles is freely available online.
8. An overview of the standard is provided on the [ISO 9001 Quality Management home-page](https://www.iso.org/iso-9001-quality-management.html) [24]. Freely available sections of the ISO 9001 standard are available from the ISO “online browsing platform[[15]](#footnote-15)”: [ISO 9001:2015 preview](https://www.iso.org/obp/ui/#iso:std:iso:9001:ed-5:v1:en) [25]
9. Secretariat to determine whether WMO can provide full copy of ISO 9001:2015 to members of ET-CAC in support of their work.

## Assessment of current audit status within WIS

1. The current status of GISC audits was reviewed (see Appendix 5: Proposed new Terms of reference for the Expert Team on Centre Audit/Certification). Audit teams were assigned for the next round of GISC audits, considering the need for new members of ET-CAC to undertake an audit with an experienced auditor before they can lead a GISC audit themselves. Dates for these audits depend on the approval of the new audit framework and assessment criteria.
2. The outstanding pre-designation audits for DCPCs, as listed on the ET-CAC certification Trello Board[[16]](#footnote-16), were reviewed. Where coordination of these audits was assigned to experts who are no longer members of ET-CAC, these responsibilities was re-assigned.

## Work plan

1. Overall, there are four key tasks for ET-CAC:
   1. Define the general audit procedure
   2. Provide guidance to ‘system owners’ concerning the development of criteria using risk-based assessment of competency and maturity model approach
   3. Manage and coordinate the audits
   4. Conduct the audits (for WIS Centres and candidate space weather centres) and report
2. The formal approval of the revised audit framework and new assessment criteria is a key milestone for ET-CAC. The re-audit of GISCs cannot resume until approval has been given.

### Timeline for submissions to the Seventieth session of Executive Council (EC-70) and the Eighteenth World Meteorological Congress (Cg-18)

1. Jeremy Tandy, WMO SSO/WIS, provided a short [presentation](http://wis.wmo.int/file=3761) on the procedure for approving amendments to technical regulation, including the timelines required for submissions to EC-70 and Cg-18.

### ET-CAC01 Establish an overall adapted audit process

1. ET-CAC aim to develop a new generalized audit framework applicable to audit and evaluation of all types of centres: WMO Framework for Audit and Evaluation of International Operational Facilities.
2. The audit framework should:
   1. Clearly indicate from where the audit framework derives its authority.
   2. Adopt a risk-based approach as recommended in ISO/DIS 19011:2018e and allow “topic specific” assessment criteria to be inserted into the generalized framework.
   3. Include provisions on how to approach situations where centres are assessed as underperforming. For example, re-audit in 3, 6, 9 months to give Centres time to address the issues.
   4. Balance the assessment of the technical requirements and capabilities required to be designated as an operational centre against assessment of the centre’s quality management system. QMS is a necessary aspect for effective delivery of the technical requirements and capabilities – but assessment of the QMS itself is not the core task.
3. Lothar WOLF, as input to the audit framework documentation, provide a provide a process diagram that outlines the governance and authority for ET-CAC to conduct audits of operational centres (for review by ET-CAC)
4. ET-CAC are looking for ET-WISC and TT-AVI to provide, for WIS Centres and space weather centres respectively, objective assessment criteria compatible with a risk based approach; e.g. to define the maturity model(s) applied for the functional areas and to define the minimal acceptable level of performance in each of those functional areas.
5. TT-AVI have already begun to develop their assessment criteria, and due to the limited timescale, audit of candidate space weather centres will adopt an “interim approach”.
6. Development of new assessment criteria for WIS Centres will be discussed with ET-WISC during the Joint ET-WISC/ET-CTS meeting, scheduled for 13-17 November 2017. Members of ET-CAC present in that meeting should seek to ensure that there is appropriate functional coverage is provided for audit criteria and that there is a professional and impartial approach to the development of the criteria.

### ET-CAC02 Run GISCs certification process

1. ET-CAC agreed that no new GISC audits should occur based on existing audit framework and criteria. The new procedures and criteria must be developed and approved before the audit of GISCs can be resumed.
2. GISC audits will be based on the new procedures
3. Given that the interim audits of GISCs are overdue - and the full GISC audits are almost due again, ET-CAC resolved to “reset the clock” on GISC audits and begin afresh according to the newly developed audit principles and assessment criteria which clearly derive their authority from WMO-No. 49 Part VII. Quality Management.
4. ET-CAC aim to re-audit all GISCs before the eighteenth session of Congress (Cg-18) in May 2019. Although this schedule will be tight (see Outline schedule) ET-CAC anticipate that many of the delays experienced during the initial round of GISC audits will not occur this time: GISCs have already demonstrated compliance once therefore ET-CAC do not need to wait for new systems to be implemented nor accommodate unanticipated delays in GISC implementation schedules.
5. GISC audit cycle will be reset - beginning again with on-site audits from 2018; provisional schedule from May 2018-April 2019
6. For GISC audits to be resumed under the revised audit regime the technical regulation, the Manual on WIS (WMO-No. 1060) and the Guide to WIS (WMO-No. 1061) will need to be amended to reflect the revised audit framework and assessment criteria. These amendments, and the new audit framework itself, will require formal approval.
7. Regulation 43 states that:

“Recommendations of working groups shall have no status within the [World Meteorological] Organization until they have been approved by the responsible constituent body. [...]”

1. In the case of ET-CAC, the responsible constituent body is CBS, which is not scheduled to meet until after Cg-18. Clearly, waiting until after Cg-18 would introduce a significant delay, so alternative approval mechanisms need to be used.
2. The aspiration of ET-CAC is that the president CBS will be able to approve the changes to the audit framework as ET-CAC do not consider these changes to introduce any new costs to Members. Regulation 44 states:

“In the case of a recommendation made by a working group between sessions of the responsible constituent body, either in session of a working group or by correspondence, the president of that body may, as an exceptional measure, approve the recommendation on behalf of the constituent body when the matter is, in his opinion, urgent, and does not appear to imply new obligations on Members. He may then submit this recommendation for adoption by the Executive Council or to the President of the [World Meteorological] Organization for action in accordance with Regulation 9 (5).”

Post meeting note:

During ET-CAC2017, it was thought that approval of the president CBS would be sufficient. However, on closer inspection of Regulation 44, it clearly states that the president must then submit this recommendation to Executive Council or the President. EC-70 is scheduled for June 2017, meaning that the earliest that audits of GISCs could be scheduled will be June 2017 (and more likely July 2017). However, the goal is to complete GISC re-audits prior to Cg-18, necessitating a more compressed schedule. ET-CAC may benefit from establishing early dialogue with PRs where GISCs operate to help minimize the period between EC-70 and the resumption of GISC audits.

Post meeting note:

Dave Thomas, WMO C/ITS, noted that GISC audits do cost Members money and, therefore, may not fall within the scope of Regulation 44. He suggested engagement with all the GISCs through TT-GISC to get their endorsement given the expectation of cost associated with the additional onsite audit. Once informal endorsement is received, PRs should be contacted seeking their formal endorsement of the change, again noting the anticipated additional cost.

1. ET-CAC noted that, as the delegated body responsible for WIS, ET-WISC will be responsible for developing the assessment criteria against which WIS Centre compliance will be judged. ET-CAC intend to support ET-WISC in developing these criteria such that they fit with the “risk-based approach” recommended by ISO 9001:2015. Looking ahead to the changes anticipated from the implementation of the WIS 2.0 strategy, ET-CAC recommend that the new WIS Centre assessment criteria are developed in regards to the current technology and functions, but with a consideration about how these criteria could be made robust to change.
2. Recommend to OPAG-ISS that before audits of GISCs resume, a formal instruction from president CBS, or ET-WISC as their delegate, is provided.
3. ET-CAC to prepare a guidance note for system owners describing what information should be included in a formal audit instruction – e.g. compliance criteria, reporting lines, audit frequency, list of centres to be audited etc.
4. The expectation is that centres will nominate a time-window during which audit should occur through their PR. ET-CAC should then endeavour to respond in that period. However, the Chair also noted that WIS Centres will set the audit schedule - but they may change it. ET-CAC members will need to be flexible both in audit schedule and, potentially, who conducts the audits.
5. Although the time-scales for new audit can be determined today, audit teams were allocated for specific GISCs, considering the need for new members of ET-CAC to undertake an audit with an experienced auditor before they are able to lead a GISC audit themselves.
6. ET-CAC noted that Weiqing Qu, Lothar Wolf and Kevin Alder have experience of delivering GISC audits, and agreed that their experience with previously audited GISCs (e.g. they may be able to leverage the rapport with management generated during the previous audit) would likely be beneficial during the re-audit. Where possible, they were allocated to audit GISCs they had previously audited. Furthermore, ET-CAC noted that placing people from international organisations (such as EUMETSAT) can be useful in terms of geopolitical issues as they do not have regional bias.
7. GISC audit assignments are provided in Appendix 6: GISC audit status and proposed audit team.
8. The meeting participants all felt that they had developed a reasonable understanding of the context and principles relating to audit of WMO Centres. However, there was common agreement that an understanding of the revised checklists, report templates and guidance material for audit of GISC Centres was essential to complete their readiness as auditors of WIS Centres.

### ET-CAC03 Coordinate DCPCs and NCs certification

1. The outstanding pre-designation audits for DCPCs were reviewed. In consultation with team members present, the outstanding pre-designation audits for DCPCs on the [Trello board](https://trello.com/b/RZd4hwfA/et-cac-certification) were reviewed and, where necessary, reassigned. The Trello board was updated accordingly, noting that the audit of DCPCs is the responsibility of the Centre’s affiliated GISC and the ET-CAC member coordinates the necessary activity.
2. ET-CAC agreed that, to be consistent with those DCPC pre-designation audits already completed, completion of the outstanding DCPC pre-designation audits will use the existing procedures.
3. Pre-designation audits for DCPCs will continue using the existing criteria and process

### Candidate space weather centre audits

1. Expectations regarding audit of space weather centres are that approximately 9 2-day, on-site audits will be completed by end-February 2018. 6 audit experts are requested from ET-CAC.
2. ET-CAC can provide the following qualified persons:
   1. Kevin Alder, Lothar Wolf and Weiqing Qu – all have expertise from previous WIS Centre audits
   2. Thorsten Büsselberg performs audits in DWD within their QMS and also has necessary experience.
   3. MetService have nominated Shane Bidois as an Associate Member of ET-CAC, another qualified auditor.
   4. Fatima Bensaid has audit experience from previous work with ET-QMS.
   5. Tentatively, Bryan Boase and Gerold Fletzer, also from ET-QMS, may also be available pending nomination to ET-CAC.
3. Secretariat to coordinate nomination of Bryan Boase and Gerold Fletzer as Associate Members of ET-CAC.
4. ET-CAC will support TT-AVI preparing the report to ICAO from audit of candidate space weather service providers; the report shall be provided no-later than March 2018 to meet ICAOs timeline.
5. Meeting participants indicated that while largely content with respect to auditing WIS Centres there was some nervousness about auditing space weather centres due to lack of familiarity with the subject matter. The last concern will be mitigated by ensuring that the audit team visiting candidate space weather centres will comprise an audit expert and a space weather expert.

Post meeting note:

Prior to the round of space weather audits beginning, the Secretariat will organise a technical briefing on space weather and the impacts within the aviation sector for members of ET-CAC. The aim is to ensure that ET-CAC members have sufficient insight on relevant technical matters to conduct themselves as the lead auditor of a space weather centre, supported by a space weather expert.

### Outline schedule

1. ET-CAC will convene monthly WebEx meetings to ensure that the tempo of work is maintained.
2. Rough schedule: WIS Centre audits
   1. 23-October to 10 November 2017: develop guidance on development of assessment criteria for a risk based approach
   2. 13-17 November 2017: Joint meeting of ET-WISC, ET-CTS and TT-GISC
   3. 20-November 2017 to 12-January 2018: develop new draft regulation / procedures and support ET-WISC in development of new risk-based assessment criteria for GISCs
   4. December 2018: provide formal notification to relevant PRs that ET-CAC anticipate, pending approvals, re-auditing GISCs to be scheduled between June 2018 and April 2019
   5. 16-18 January 2018: present draft regulation / procedures and new risk-based assessment criteria for GISC audit to ICT-ISS for endorsement
   6. 22-January to 23-March 2018: develop guidance material and checklists for GISC audits
   7. March 2018: QMS training scheduled by Secretariat
   8. 26-29 March 2018: present draft regulation / procedures, new risk-based assessment criteria for GISCs and associated guidance material and checklists to CBS TECO and endorsement by president CBS
   9. April-June 2018: prepare relevant papers for Executive Council and engage with PRs where GISCs operate to advise them of resumption of GISC audits
   10. April-May 2018: hold a pre-audit coordination session - face-to-face ET-CAC meeting, tentatively hosted by MetService in Wellington, NZ.
   11. June 2018: amendments to technical regulation approved by EC-70
   12. June 2018 to April 2019: re-audit 15 GISCs
   13. May 2019: report to Cg-18
3. Rough schedule: candidate space weather centre audits
   1. 26 October 2017: space weather audit/SME coordination session
   2. November 2017 to February 2018: audit ten candidate space weather centres
   3. February 2018 to March 2018: prepare report for ICAO on findings from audits
   4. March 2018: provide report to ICAO
4. Appendix 7: ET-CAC work plan (draft) provides a more detailed work plan.

## Deliverables

1. Deliverables identified in the draft work plan (see Appendix 7: ET-CAC work plan (draft)) are listed below:
   1. [6-Nov-2017] Guidance document for “system owners” (e.g. ET-WISC) describing how to develop assessment criteria using a risk-based approach.
   2. [30-Nov-2017] All outstanding DCPC pre-designation audits assigned a ET-CAC coordinator.
   3. [9-Jan-2018] Revised audit framework ready for review by ICT-ISS.
   4. [12-Mar-2018] Guidance materials for revised GISC audit.
   5. [Mar-2018] Audit of candidate space weather information providers complete.
   6. [Apr-2019] Pre-designation audits for DCPCs and re-audit of GISCs complete.

## Recommendations and decisions

1. See Appendix 1: Action and Decision Summary.

## Any other business

### Quality Management and audit training

1. Meeting participants also indicated their desire to improve knowledge and capabilities relating to quality management and auditing; particularly relating to application of the ISO 9001:2015 standard.
2. While there is no mandatory requirement for auditors to have certification, it may help to give credibility to the audit process. For example, if challenged on site during an audit, an auditor being able to assert their experience by referring to audit certification / qualification is likely to help.
3. Certification of auditors, through officially recognized training, is recommended - but not considered essential; the credentials of auditors must include an appropriate level of experience to conduct an audit in a professional manner.
4. Improving knowledge and capabilities through peer-learning is programmed into the revised GISC audit plan. Each WIS Centre audit will be undertaken by a team of two auditors, one of whom must have previous experience. Accordingly, when the second member of the audit team is a newcomer to ET-CAC with little practical experience of conducting audits, the on-site audit provides an opportunity for mentoring.
5. The Secretariat is planning a training event on ISO 9001:2015 Quality Management in March 2018 - noting that audit is just one element within the broader topic of quality management system. The workshop aims to provide general training on ISO 9001:2015 and explain the difference between ISO 9001:2008 and ISO 9001:2015. The workshop will be a “train the trainers” style of event, with an intended audience of 20 or so QMS professionals. The location is yet to be decided.
6. Given the priority of undertaking professional audits of WMO Centres, the Secretariat will endeavour to find the budget to support training activities necessary for building expertise in audit.
7. The Secretariat is also content, at request from ET-CAC, to facilitate Web-based training or briefing sessions enabling the team’s experienced auditors to educate newcomers.
8. In addition to training coordinated by Secretariat, members of ET-CAC were encouraged to investigate training opportunities through professional activities within their home organization; e.g. training on ISO 9001 and auditing from an accredited training provider leading to some form of professional certification. Such training would likely benefit both WMO and the home organization.

## Closure of the meeting

1. The meeting closed at 15:00, 20-Oct-2017.
2. The Chair thanked all participants for their valued contributions and noted the excellent progress made during ET-CAC2017 toward delivering against the work plan.

## References

[1] Basic Documents No. 2. Technical Regulations, Volume I: General Meteorological Standards and Recommended Practices (WMO-No. 49) ([2015 edition, updated in 2016](https://library.wmo.int/opac/doc_num.php?explnum_id=3129))

[2] Seventeenth World Meteorological Congress, Abridged final report with resolutions ([WMO-No. 1157](https://library.wmo.int/opac/doc_num.php?explnum_id=3138))

[3] Manual on WIS (WMO-No. 1060) ([2015 edition, updated in 2017](https://library.wmo.int/opac/doc_num.php?explnum_id=3699))

[4] Guide to WIS (WMO-No. 1061) ([2015 edition, updated in 2017](https://library.wmo.int/opac/doc_num.php?explnum_id=4004))

[5] [GISC audit template](http://wis.wmo.int/file=3711)

[6] [GISC audit report (blank)](http://wis.wmo.int/file=3712)

[7] [Anonymous (redacted) sample GISC audit report](http://wis.wmo.int/file=3713)

[8] [WIS demonstration process, procedures and guidelines](http://wis.wmo.int/file=3722)

[9] [WIS compliance technical specifications V1](http://wis.wmo.int/file=3723)

[10] [ICT-ISS final report](http://wis.wmo.int/file=1099)

[11] Commission for Basic Systems – Sixteenth session: Abridged final report with resolutions, decisions and recommendations ([WMO-No. 1183](https://library.wmo.int/opac/doc_num.php?explnum_id=3505))

[12] Sixteenth World Meteorological Congress, Abridged final report with resolutions ([WMO-No. 1077](https://library.wmo.int/opac/doc_num.php?explnum_id=3429))

[13] Executive Council – Sixty-ninth session: Abridged final report with resolutions and decisions ([WMO-No. 1196](https://library.wmo.int/opac/doc_num.php?explnum_id=3645))

[14] CBS Management Group – Sixteenth session: [final report](http://wis.wmo.int/file=2345)

[15] CBS Management Group – Seventeenth session: [final report](https://wis.wmo.int/file=3545)

[16] Audit procedures and reporting templates for space weather centres ([draft](http://wis.wmo.int/file=3726))

[17] Methodology and schedule for site assessments of space weather centres ([draft](http://wis.wmo.int/file=3727))

[18] Basic Documents No. 2. Technical Regulations, Volume II: Meteorological Services for International Air Navigation (WMO No. 49-2) ([2016 edition](https://library.wmo.int/opac/doc_num.php?explnum_id=3691))

[19] Guide to the implementation of a Quality Management System for NMHS (WMO-No. 1100) ([2013 edition](http://library.wmo.int/pmb_ged/wmo_1100_en.pdf))

[20] Guide to the implementation of a Quality Management System for NMHS (WMO-No. 1100) ([draft 2017 edition](http://wis.wmo.int/file=3714))

[21] Executive Council – Sixty-eighth session: Abridged final report with resolutions and decisions ([WMO-No. 1168](https://library.wmo.int/opac/doc_num.php?explnum_id=3166))

[22] ISO 9001:2015 How to use it <https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/iso_9001-2015_-_how_to_use_it.pdf>

[23] Moving from ISO 9001:2008 to ISO 9001:2015 <https://www.iso.org/files/live/sites/isoorg/files/archive/pdf/en/iso_9001_-_moving_from_2008_to_2015.pdf>

[24] ISO 9001 home-page <https://www.iso.org/iso-9001-quality-management.html>

[25] ISO 9001:2015 preview <https://www.iso.org/obp/ui/#iso:std:iso:9001:ed-5:v1:en>

[26] ISO 9001:2015 Overview ([presentation](http://wis.wmo.int/file=3730))

[27] ISO 9001:2015 Versus ISO 9001:2008 (EUMETSAT Assessment) ([presentation](http://wis.wmo.int/file=3734))

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# Appendix 1: Action and Decision Summary

## Actions

[**A1** ET-CAC to prepare a guidance note for system owners describing what information should be included in a formal audit instruction – e.g. compliance criteria, reporting lines, audit frequency, list of centres to be audited etc.](#_Toc498183696)

[**A2** Secretariat to ensure that all ET-CAC members have necessary accesses and permissions to use these tools.](#_Toc498183697)

[**A3** Secretariat to determine whether WMO can provide full copy of ISO 9001:2015 to members of ET-CAC in support of their work.](#_Toc498183698)

[**A4** Lothar WOLF, as input to the audit framework documentation, provide a provide a process diagram that outlines the governance and authority for ET-CAC to conduct audits of operational centres (for review by ET-CAC)](#_Toc498183699)

[**A5** ET-CAC to prepare a guidance note for system owners describing what information should be included in a formal audit instruction – e.g. compliance criteria, reporting lines, audit frequency, list of centres to be audited etc.](#_Toc498183700)

[**A6** Secretariat to coordinate nomination of Bryan Boase and Gerold Fletzer as Associate Members of ET-CAC.](#_Toc498183701)

## Decisions

[**D1** Core members of ET-CAC have additional responsibilities: both developing the audit procedures and associated guidance materials, plus the coordination and scheduling of the audits themselves.](#_Toc498183702)

[**D2** As set out in the Meeting background, the scope of ET-CAC is extended from WIS Centres to cover all types of WMO Centres.](#_Toc498183703)

[**D3** Recommend to OPAG-ISS that the ET-CAC ToR is amended as per Appendix 5: Proposed new Terms of reference for the Expert Team on Centre Audit/Certification.](#_Toc498183704)

[**D4** The authority for ET-CAC to conduct audits derives from *Part VII Quality Management* of WMO-No. 49 Volume I. [1].](#_Toc498183705)

[**D5** Recommend to OPAG-ISS that, for approval by president CBS, ET-WISC draft a formal instruction to ET-CAC requesting the audit of WIS Centres according to the regulation defined in the Manual on WIS.](#_Toc498183706)

[**D6** Continue to use Trello, WIS wiki and WIS Centre database to support WIS Centre audit.](#_Toc498183707)

[**D7** Recommend to OPAG-ISS that it is ET-WISC that need to develop the WIS Centre assessment criteria against which ET-CAC will then audit WIS Centres.](#_Toc498183708)

[**D8** Recommend to OPAG-ISS that ET-WISC amend their terms of reference to include development and operation of a QMS for WIS- including use of external audit [by ET-CAC] for validating compliance with agreed practices and standards](#_Toc498183709)

[**D9** ET-CAC should employ different approaches for designation of new centres and the reaffirmation of the designation of an existing centre.](#_Toc498183710)

[**D10** The risk-based approach (outlined in ISO/DIS 19011:2018e) should be adopted in the new audit framework.](#_Toc498183711)

[**D11** A new generalized audit framework will be developed; adopting a risk-based approach, providing clarity on the authority for the audit and ensuring adequate separation between the owner of the “system” and the auditors.](#_Toc498183712)

[**D12** Members of ET-CAC will lead audits on all WMO Centres; auditors should have participated in a WMO Centre audit with another experienced member of ET-CAC before they take the role of lead auditor.](#_Toc498183713)

[**D13** At least two auditors will participate in a WMO Centre audit.](#_Toc498183714)

[**D14** On site audits will continue to be two-days in duration](#_Toc498183715)

[**D15** Audits will be conducted following an invitation from the Centre to be audited](#_Toc498183716)

[**D16** Recommend to OPAG-ISS that ET-WISC define the assessment criteria for WIS Centres, using a risk-based approach, against which WIS Centres shall be audited.](#_Toc498183717)

[**D17** Co-opt experienced auditors as new associate members of ET-CAC to expedite the space weather auditing.](#_Toc498183718)

[**D18** Audit teams for space weather centre audits will comprise a lead auditor from ET-CAC and a subject matter expert (with expertise relating to space weather) from TT-AVI.](#_Toc498183719)

[**D19** Audits of space weather centres to March 2018 will be conform to an interim audit process framework proposed by TT-AVI](#_Toc498183720)

[**D20** GISC audits will be based on the new procedures](#_Toc498183721)

[**D21** GISC audit cycle will be reset - beginning again with on-site audits from 2018; provisional schedule from May 2018-April 2019](#_Toc498183722)

[**D22** Recommend to OPAG-ISS that before audits of GISCs resume, a formal instruction from president CBS, or ET-WISC as their delegate, is provided.](#_Toc498183723)

[**D23** Pre-designation audits for DCPCs will continue using the existing criteria and process](#_Toc498183724)

[**D24** ET-CAC will support TT-AVI preparing the report to ICAO from audit of candidate space weather service providers; the report shall be provided no-later than March 2018 to meet ICAOs timeline.](#_Toc498183725)

[**D25** ET-CAC will convene monthly WebEx meetings to ensure that the tempo of work is maintained.](#_Toc498183726)

[**D26** Certification of auditors, through officially recognized training, is recommended - but not considered essential; the credentials of auditors must include an appropriate level of experience to conduct an audit in a professional manner.](#_Toc498183727)

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# Appendix 2: Meeting participants

Experts

* Kevin Alder NZ Chair
* Lothar Wolf EUMETSAT Co-chair and meeting host
* Jacques Anquetil FRANCE
* Daniele Biron ITALY TT-AVI, Remote participant
* Eugene Burger US JCOMM
* Thorsten Büsselberg GERMANY
* Andrea Duflaut EUMETSAT Invited expert
* Mark Francis UK
* Kenji Kosuge JAPAN
* Weiqing Qu AUSTRALIA
* Tobias Spears CANADA
* Sungsoo Do KOREA
* Kai Wirt GERMANY

Secretariat

* Greg Brock SO/AEM
* Dimitar Ivanov C/AEM
* Jeremy Tandy SSO/WIS

# APPENDIX 3: Agenda

1. Opening of meeting
2. Team structure

The who is who, the geographic diversity, roles and responsibilities

1. Review of ET-CAC Terms of Reference

Clarification and explanation of what is meant by the TOR, what is expected, what is the impact of this in terms of work load

1. Existing audit resources

Provision and explanation of already existing documentation including outline which we want to tailor, evolve, definition of new documentation

1. Provision of background information from previous audit cycles

What was done, lessons learnt, elements for improvement, elements we wish to keep

1. General working principles

Code of conduct of our group, reporting, Confidentiality, Impartiality, meetings, documentation pool, means of communication, interfaces to other ETs and outside of ISS

1. Audit requirements for candidate space weather centres
2. ISO9001:2015 focus

Explanation what that means compared to past audits, provision of a ISO9001:2015 training document

1. Assessment of current audit status within WIS
2. Work plan

Definition of a first work plan, identification of the main time drivers and mile stones and distribution of first tasks across the team, Schedule, key Events, CBS-TECO (2018)

1. Deliverables
2. Recommendations and Decisions
3. Any other business
4. Closure of meeting

# Appendix 4: ET-CAC Terms of Reference

The Terms of Reference for the Expert Team on Centre Audit/Certification are defined in Annex 1 to Decision 33 (CBS-16) [11]

## Expert Team on Centre Audit/Certification (ET-CAC)

1. Operate the procedures for technical endorsement of WIS Centres and advise CBS on centres’ level of technical compliance with standards and procedures:
   1. Validate and monitor the conformance of WIS Centres’ interfaces to the agreed specifications and practices;
   2. Coordinate and organize demonstrations of capabilities of candidate WIS centres as required, including onsite audits of GISCs;
2. Make recommendations to ICT-ISS regarding continuous improvement of the procedures for certification and periodic assessment of WIS centres;
3. Advise ICT-ISS on systematic issues identified during certification and assessment activities.

# Appendix 5: Proposed new Terms of reference for the Expert Team on Centre Audit/Certification

1. Develop and maintain an audit framework for the assessment of WMO Centres based on the WMO provisions for Quality Management (WMO-No. 49, Part VII) and ISO 9001:2015 - the WMO Framework for Audit and Evaluation of International Operational Facilities
2. Provide guidance to system and process owners regarding on the specification of assessment criteria based on a risk-based approach for inclusion within the audit framework
3. Coordinate and schedule audits of operational centres in response to instructions from CBS, other relevant WMO bodies and other cooperating international organizations
4. In collaboration with nominated subject matter experts, conduct audit of operational centres, in accordance with the audit framework
5. Review audit activities to identify opportunities for improvements in audit procedures and their implementation, reporting to OPAG-ISS

# Appendix 6: GISC audit status and proposed audit team

The table below indicates proposed audit teams for the next round of GISC audits, taking into account the need for new members of ET-CAC to undertake an audit with an experienced auditor before they are able to lead a GISC audit themselves.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Centre** | **Audit Date** | **Previous Team** | **Proposed Team (Subject to change)** |  |
| GISC Tokyo | Aug 2010 | FR/EC | Thorsten/Jacques |  |
| GISC Beijing | Aug 2010 | FR/EC | Weiqing/Eugene |  |
| GISC Offenbach | Sep 2010 | JP /CN | Weiqing/Kenji |  |
| GISC Toulouse | May 2011 | JP / AU | Kevin/ Tobias |  |
| GISC Exeter | May 2011 | JP / AU | Kevin/Tobias |  |
| GISC Seoul | May 2012 | FR / EM | Lothar/Jacques |  |
| GISC Melbourne | Jun 2012 | FR / EM | Sungsoo/Tobias |  |
| GISC Brazil | Apr 2013 | EM / NZ | Kevin/Mark |  |
| GISC Tehran | May 2013 | DE/ CN | Kevin/Weiqing |  |
| GISC Jeddah | April 2013 | EM/ NZ | Lothar/Eugene |  |
| GISC Moscow | May 2013 | EM / KR | Lothar/Mark |  |
| GISC Pretoria | April 2014 | AU / NZ | Kevin/Jacques |  |
| GISC New Dehli | Sept 2013 | EM / DE | TBA/Sungsoo |  |
| GISC Washington | April 2013 | NZ / KR | Mark/Kenji |  |
| GISC Casablanca | May 2015 | NZ / KR | Weiqing/Sungsoo |  |
|  |  |  |  |  |

# Appendix 7: ET-CAC work plan (draft)

Key:

Meeting

Deliverable

Oct 2017

* Ad-hoc meeting with TT-AVI to discuss space weather audits, 26th October – 0630UTC or 1130UTC.
* ET-CAC begins review of Audit Framework (see draft doc prepared by TT-AVI).
* Develop guidance document for ET-WISC meeting in Nov 17 on the ‘risk-based’ audit approach, including domain-specific information. WebEx to review document before finalisation. Due 6 Nov 2017
* Access to team members to online resources.

Nov 2017

* To be confirmed - commence Space Weather Audits (runs through to March 2018).
* Combined meeting with ET-WISC, ET-CTS, TT-GISC 13 – 17 Nov. to determine new audit criteria.
* Commence development of audit regulatory material – “Audit Framework for WMO Centres”.
* DCPC Audits: ET-CAC team members assigned to coordinate audits with GISCs (via Trello) using the current audit provisions (ongoing….). Due 30 Nov 2017.
* ET-CAC WEBEX – tentative date 30 Nov 2017?

Dec 2017

* WebEx – update of status of ICT-ISS deliverables. Week of Dec 11th.
* Review of any space weather audits conducted.

Jan 2018

* 9 January : Finalised ICT-ISS Deliverables: “Audit Framework for WMO Centres”
* 16-19 Jan ICT-ISS Meeting, Geneva – presentation of new audit guidelines.
* Develop general audit guidance materials for centres and auditors; audit workbooks and checklists, changes to Trello templates and checklists, and reporting templates.
* Update questionnaire in the online form / WIS Centre database etc. as required.
* Notification to GISC centres of provisional audit schedule for budgetary planning purposes.
* ET-CAC WEBEX?

Feb 2018

* Continued development of audit guidance material.
* ET-CAC WebEx (tentative)

Mar 2018

* Deliverable: Audit Guidance Material: 12 March.
* ET-CAC participation in Space Weather audits completed. TT-AVI to report to ICAO.
* CBS TECO and CBS-MG Meeting, Geneva, 26-29 March 2018.
* Approval at CBS-MG by p-CBS of audit regulatory material and guidance documents (assuming no new provisions on members). Note: If not approved, next opportunity for approval is EC-70 in June.
* ET-CAC WEBEX – review of Space Weather Audits.
* QMS ‘Train the Trainer’ for NMHSs, Geneva, date to be advised. Assume some ET-CAC members will attend.

Apr 2018

* To be confirmed: 2nd meeting of ET-CAC, Wellington.
* GISC audits commence
* Regular WEBEXs to exchange audit experiences

Jun 2018 – Apr 2019 (revised post-meeting)

* GISC audits
* GISC audit results and requests to the p-CBS of centres’ endorsement.
* Regular WEBEXs to exchange audit experiences

Apr 2019

* All GISC Audits completed (date at which all audits need to be completed to be confirmed with Chair ICT-ISS).

May 2019

* Congress 2019 – WIS Centre audits and certifications presented to Cg-19.

1. Instructions for accessing the WMO QM Forum and other useful resources pertaining to quality management can be found here: <http://www.bom.gov.au/wmo/quality_management.shtml> [↑](#footnote-ref-1)
2. See also: Annex 1 to Resolution 32 (Cg-17) Introducing WIS Competencies to the Technical Regulations (WMO-No. 49), Volume I [2] [↑](#footnote-ref-2)
3. <https://wis.wmo.int/page=TT-CAC> [↑](#footnote-ref-3)
4. <https://wis.wmo.int/page=ET-GDDP> [↑](#footnote-ref-4)
5. <https://trello.com/b/RZd4hwfA/et-cac-certification> [↑](#footnote-ref-5)
6. <http://www-db.wmo.int/WIS/centres/candidates.asp> [↑](#footnote-ref-6)
7. <https://wis.wmo.int/page=et-gddp-audits> [↑](#footnote-ref-7)
8. <http://wis.wmo.int/file=3724> [↑](#footnote-ref-8)
9. TT-CAC was the precursor team to ET-CAC. [↑](#footnote-ref-9)
10. A definition of ‘maturity mode’ is available on Wikipedia: <https://en.wikipedia.org/wiki/Maturity_model> [↑](#footnote-ref-10)
11. An overview of the different types of WIS Centres is provided in the Guide to WIS (WMO-No. 1061) Part I. Organization and responsibilities: §1.3 Interaction among WIS Centres [4]. [↑](#footnote-ref-11)
12. The WIS Centre Database is accessed at the following URL: <http://www-db.wmo.int/WIS/centres/candidates.asp> [↑](#footnote-ref-12)
13. <http://wis.wmo.int/file=3710> [↑](#footnote-ref-13)
14. Space weather information providers self-assessment questionnaire : <https://www.surveymonkey.com/r/VSDVJS3> [↑](#footnote-ref-14)
15. <http://www.iso.org/obp> [↑](#footnote-ref-15)
16. <https://trello.com/b/RZd4hwfA/et-cac-certification> [↑](#footnote-ref-16)