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| **World Meteorological Organization****Commission for Instruments and Methods of Observation** **Planning Meeting for the 2021 Upper-air Intercomparison**Payerne, Switzerland, 19 – 21 February 2019 | **CIMO/UAI-Prep/INF. 5**  |
| Submitted by:The Secretariat15.02.2019 |

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# Guidelines for organizing instrument intercomparisons

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| **Summary and purpose of document**This document provides the guidelines for the organization of instrument intercomparisons that are published in the Guide to Meteorological Instruments and Methods of Observation, WMO-No.8. |

**Action proposed**

 The Meeting is invited to develop a detailed plan for the conduction of the intercomparison, that will include among others the main objectives, place, date and duration of the intercomparison, condition for participation, data acquisition, processing and analysis methodology, plans for the publication of results, intercomparison rules, and responsibilities of the host and participants. In doing so, the meeting is invited to take into account the guidelines and procedures provided in this document.

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**Appendices:** I Guidelines for Organizing Radiosonde Intercomparsions and for the establishment of test sites (WMO-No. 8, Part I, Chapter 12, Annex 12.C)

 II Procedures of WMO Global and Regional Intercomparisons of Instruments (Part IV, Chapter 4, Annex 4.A)

 III Guidelines for Organizing WMO Intercomparisons of Instruments (Part IV, Chapter 4, Annex 4.B)

Annex 12.C. Guidelines for organizing radiosonde intercomparisons and for the establishment of test sites[[1]](#footnote-1)

PART I – GUIDELINES FOR ORGANIZING RADIOSONDE INTERCOMPARISONS

1. Introduction

1.1 These guidelines assume that procedures that may be established by various test facilities are consistent with procedures established by other national and international organizations. They also assume that an Organizing Committee will be formed of participants (Members) interested in comparing radiosondes and that at least one non-participant will be included with ability to provide guidance for conducting the intercomparison. The involvement of an independent non-participant is important in order to avoid bias during the planning of the intercomparison. Consideration must also be given to whether radiosonde manufacturers’ personnel should actively participate or whether independent operational personnel of the host should prepare and launch such radiosondes.

1.2 All intercomparisons differ from each other to some extent; therefore, these guidelines are to be construed only as a generalized checklist of tasks needing to be accomplished. Modifications should be made by the Organizing Committee, as required, but the validity of the results and scientific evaluation should not be compromised.

1.3 Final reports of previous intercomparisons and organizational meeting reports of other Organizing Committees may serve as an example of the methods that can be adopted for the intercomparison. These previous reports should be maintained and made available by the WMO Secretariat.

2. Objectives of intercomparisons

2.1 The intercomparison objectives must be clear, must list what is expected from the intercomparisons and identify how results will be disseminated. The Organizing Committee is tasked to examine the achievements to be expected from the radiosonde intercomparison and to identify and anticipate any potential problem. The Organizing Committee’s role is to provide guidance, but it must also prepare clear and detailed statements of the main objectives and agree on the criteria to be used in evaluating the results. The Organizing Committee should also determine how best to guarantee the success of the intercomparison by drawing on background knowledge and accumulated experience from previous intercomparisons.

3. Place, date and duration of intercomparison

3.1 The host facility should provide to the Organizing Committee and to the participants a description of the proposed intercomparison site and facilities (locations, etc.), environmental and climatological conditions, and site topography. The host facility should also name a Project Leader or Project Manager who will be responsible for the day-to-day operation and act as the facility point of contact.

3.2 The Organizing Committee should visit the proposed site to determine the suitability of its facilities and to propose changes, as necessary. After the Organizing Committee agrees that the site and facilities are adequate, a site and environmental description should be prepared by the Project Leader for distribution to the participants. The Project Leader, who is familiar with his facility’s schedule, must decide the date for the start of the intercomparison, as well as its duration. A copy of this schedule shall be delivered to the Organizing Committee.

3.3 In addition to the starting date of the intercomparisons, the Project Leader should propose a date when his facility will be available for the installation of the participant’s equipment and arrange for connections to the data acquisition system. Time should be allowed for all of the participants to check and test equipment prior to starting the intercomparison and to allow additional time to familiarize the operators with the procedures of the host facility.

4. Participation

4.1 As required, the Project Leader and/or Organizing Committee should invite, through the Secretary-General of WMO, participation of Members. However, once participants are identified, the Project Leader should handle all further contacts.

4.2 The Project Leader should draft a detailed questionnaire to be sent by the Secretary-General to each participant in order to obtain information on each instrument type proposed to be intercompared. Participants are expected to provide information on their space, communication, unique hardware connection requirements, and software characteristics. They also should provide adequate documentation describing their ground and balloon-borne instrumentation.

4.3 It is important that participants provide information about their radiosonde calibration procedures against recognized standards. Although it is expected that operational radiosondes will be intercompared, this may not always be the case; new or research-type radiosondes may be considered for participation with the agreement of all of the participants, the Project Leader, and the Organizing Committee.

5. Responsibilities

5.1 Participants

5.1.1 The participants shall be responsible for the transportation of their own equipment and costs associated with this transportation.

5.1.2 The participants should install and remove their own equipment with the cognizance of the Project Leader. The host facility shall assist with unpacking and packing, as appropriate.

5.1.3 The participants shall provide all necessary accessories, mounting hardware for ground equipment, signal and power cables, spare parts and expendables unique to their system. The participants shall have available (in the event that assistance from the host facility should become necessary) detailed instructions and manuals needed for equipment installation, operation, maintenance and, if applicable, calibration.

5.1.4 The participants should sign the data protocol agreement of the intercomparison.

5.2 Host facility

5.2.1 The host facility should assist participants in the unpacking and installation of equipment as necessary, and provide storage capability to house items such as expendables, spare parts and manuals.

5.2.2 The host facility should provide auxiliary equipment as necessary, if available.

5.2.3 The host facility should assist the participants with connections to the host facility’s data acquisition equipment, as necessary.

5.2.4 The host shall insure that all legal obligations relating to upper-air measurements (for example, the host country’s aviation regulations and frequency utilization) are properly met.

5.2.5 The host facility may provide information on items such as accommodation, local transportation and daily logistics support, but is not obligated to subsidize costs associated with personnel accommodation.

6. Rules during the intercomparison

6.1 The Project Leader shall exercise control of all tests and will keep a record of each balloon launch, together with all the relevant information on the radiosondes used in the flight and the weather conditions.

6.2 Changes in equipment or software will be permitted with the cognizance and concurrence of the Project Leader. Notification to the other participants is necessary. The Project Leader shall maintain a log containing a record of all the equipment participating in the comparison and any changes that occur.

6.3 Minor repairs (for example, fuse replacement, etc.) not affecting instrumentation performance are allowed. The Project Leader should be made aware of these minor repairs and also submit the information to the record log.

6.4 Calibration checks and equipment servicing by participants requiring a specialist or specific equipment will be permitted after notification to the Project Leader.

6.5 Any problem that compromises the intercomparison results or the performance of any equipment shall be addressed by the Project Leader.

7. Data acquisition

7.1 The Organizing Committee should agree on appropriate data acquisition procedures such as measurement frequency, sampling intervals, data averaging, data reduction (this may be limited to an individual participant’s capability), data formats, real-time quality control, post-analysis quality control and data reports.

7.2 The initial international Organizing Committee shall decide on the data acquisition hardware and software for the test. This should be well tested before commencement of the intercomparison, and the use of an established processing package such as described in WMO (1996b) is to be preferred.

7.3 The time delay between observation and delivery of data to the Project Leader shall be established by the Project Leader and agreed by the participants. One hour after the end of the observation (balloon burst) should be considered adequate.

7.4 The responsibility for checking data prior to analysis, the quality control steps to follow, and delivery of the final data rests with the Project Leader.

7.5 Data storage media shall be the Project Leader’s decision after taking into consideration the capability of the host facility, but the media used to return final test data to participants may vary in accordance with each of the participant’s computer ability. The Project Leader should be cognizant of these requirements.

7.6 The Project Leader has responsibility for providing final data to all participants and, therefore, the host facility must be able to receive all individual data files from each participant.

8. Data processing and analysis

8.1 Data analysis

8.1.1 A framework for data analysis should be encouraged and decided upon even prior to beginning the actual intercomparison. This framework should be included as part of the experimental plan.

8.1.2 There must be agreement among the participants as to methods of data conversion, calibration and correction algorithms, terms and abbreviations, constants, and a comprehensive description of proposed statistical analysis methods. It is essential that the data processing be performed by experienced experts, nominated by WMO.

8.1.3 The Organizing Committee should verify the appropriateness of the analysis procedures selected.

8.1.4 The results of the intercomparisons should be reviewed by the Organizing Committee, who should consider the contents and recommendations given in the final report.

8.2 Data processing and database availability

8.2.1 All essential meteorological and environmental data shall be stored in a database for further use and analysis by the participants. The Project Leader shall exercise control of these data.

8.2.2 After completion of the intercomparison, the Project Leader shall provide a complete set of all of the participants’ data to each participant.

9. Final report of the intercomparison

9.1 The Project Leader shall prepare the draft final report which shall be submitted to the Organizing Committee and to the participating members for their comments and amendments. A time limit for reply should be specified.

9.2 Comments and amendments should be returned to the Project Leader with copies also going to the Organizing Committee.

9.3 When the amended draft final report is ready, it should be submitted to the Organizing Committee, who may wish to meet for discussions, if necessary, or who may agree to the final document.

9.4 After the Organizing Committee approves the final document for publication, it should be sent to the Secretariat for publication and distribution by WMO.

9.5 Reproduction for commercial purposes of any plots or tables from the final report should not be allowed without specific permission from WMO.

10. Final comments

10.1 The Organizing Committee may agree that intermediate results may be presented only by the Project Leader, and that participants may present limited data at technical conferences, except that their own test data may be used without limitation. Once the WMO Secretariat has scheduled the final report for publication, WMO shall make the data available to all Members who request them. The Members are then free to analyse the data and present the results at meetings and in publications.

Part II – GUIDELINES FOR THE ESTABLISHMENT OF TEST SITES

1. Introduction

1.1 In order to support the long-term stability of the global upper-air observing system, it is essential to retain the capability of performing quantitative radiosonde comparisons. Current and new operational radiosonde systems must be checked against references during flight on a regular basis. Members must ensure that a minimum number of test sites with the necessary infrastructure for performing radiosonde comparison tests are retained.

1.2 Experience with the series of WMO Radiosonde Intercomparisons since 1984 has shown that it is necessary to have a range of sites in order to compare the radiosondes over a variety of flight conditions.

1.3 Relative humidity sensor performance is particularly dependent on the conditions during a test, for example, the amount of cloud and rain encountered during ascents, or whether surface humidity is high or low.

1.4 Daytime temperature errors depend on the solar albedo, and hence the surface albedo and cloud cover. Thus, temperature errors found at coastal sites may differ significantly from continental sites. Infrared errors on temperature sensors will not only depend on surface conditions and cloud distribution, but also on atmospheric temperature. Thus, infrared temperature errors in the tropics (for instance near the tropopause) will be quite different from those at mid-latitudes.

1.5 The errors of many upper-wind observing systems depend on the distance the balloon travels from the launch site (and also the elevation of the balloon from the launch site). Thus, comparison tests must cover situations with weak upper winds and also strong upper winds.

2. Facilities required at locations

2.1 Locations suitable for testing should have enough buildings/office space to provide work areas to support the operations of at least four different systems.

2.2 The site should have good quality surface measurements of temperature, relative humidity, pressure and wind, measured near the radiosonde launch sites. Additional reference quality measurements of temperature, pressure and relative humidity would be beneficial.

2.3 The test site should have a method of providing absolute measurements of geopotential height during test flights (probably using a Global Positioning System (GPS) radiosonde capable of producing accurate heights).

2.4 The test site should have a well-established surface-based GPS sensor for measuring integrated water vapour, or ground-based radiometers and interferometers.

2.5 Cloud observing systems at the test site, such as laser ceilometers and cloud radars, are desirable.

2.6 Aerosol lidars and relative humidity lidars may also prove useful at the test site.

2.7 The site must be cleared by the national air traffic control authorities for launching larger balloons (3 000 g) with payloads of up to 5 kg. Balloon sheds must be able to cope with launching these large balloons.

3. Suggested geographical locations

3.1 In order to facilitate testing by the main manufacturers, it is suggested that test sites should be retained or established in mid-latitudes in North America, Europe and Asia. Ideally, each of these regions would have a minimum of two sites, one representing coastal (marine) conditions, and another representing conditions in a mid-continent location.

3.2 In addition, it is suggested that a minimum of two test locations should be identified in tropical locations, particularly for tests of relative humidity sensors.

3.3 If the main test sites noted above do not provide adequate samples of extreme conditions for relative humidity sensors (for example, very dry low-level conditions), it may be necessary to identify further test sites in an arid area, or where surface temperatures are very cold (below –30 °C in winter). It is possible that some of these could be selected from established GRUAN sites.

PART III – GUIDELINES FOR PROTOTYPE TESTING

1. Introduction

1.1 The major WMO radiosonde comparisons are organized about every 5 to 6 years, when a large group of manufacturers can benefit from a large-scale test, with systems that have already been through prototype testing. For new designs or for those manufacturers rectifying problems identified in the WMO radiosonde comparisons, there is a need to perform smaller, less expensive tests.

1.2 It is probably best for manufacturers trying to demonstrate that a problem has been resolved to have the tests done at one of the designated CIMO test sites.

1.3 On the other hand, the development and selection of new national radiosonde designs merits prototype testing at suitable national locations.

2. Recommended procedures

2.1 Testing to prove that problems have been rectified needs to be done to similar standards and methods used in the WMO radiosonde comparisons. This requires that any CIMO test site must have staff who are fully conversant with the procedures and techniques of the WMO radiosonde comparisons, and also requires the use of two radiosonde types of known good quality as working references/link radiosondes to the WMO radiosonde comparison results.

2.2 With national prototype testing it is essential to compare measurements with radiosondes flown together under one balloon. Ideally the radiosondes should be suspended in such a way that they are free to rotate in flight, as this is what happens on individual ascents. The radio-frequency performance of the new radiosonde needs to be good enough to ensure that the frequency does not drift and cause interference to the radiosonde with which it is being compared. Comparison of results should be performed as a function of time into flight, since it is unwise to assume that height/pressure assignments to temperature and relative humidity measurements have negligible errors. The number of initial test flights may be quite small since some initial errors are often large and can be quickly identified even by comparison with a lower quality national radiosonde.

2.3 However, once the aim is to improve the new national radiosonde design so that its measurement quality comes close to that of the high-quality radiosondes tested in the WMO Intercomparison of High Quality Radiosonde Systems, then it will be necessary to use one of the better quality radiosondes as a test reference. Always follow the manufacturer’s instructions when preparing the better quality radiosonde for the test flights. Testing must be performed both day and night, since the sonde errors for daytime temperatures need to be identified and at night the errors in relative humidity are often worse than in daytime.

2.4 Final prototype tests need to be performed at a time of year when the variation of relative humidity in the vertical and with time is high at all levels in the troposphere.

3. Archiving of results

3.1 Results of tests at CIMO test centres need to be forwarded to the relevant CIMO expert team for checking and display on the CIMO websites.

3.2 Once a new national development becomes mature, it would also be helpful for the future to forward comparison test results to the relevant CIMO expert team.

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Annex 4.A. Procedures of WMO global and regional intercomparisons of instruments

1. A WMO intercomparison of instruments and methods of observation shall be agreed upon by the WMO constituent body concerned so that it is recognized as a WMO intercomparison.

2. The Executive Council will consider the approval of the intercomparison and its inclusion in the programme and budget of WMO.

3. When there is an urgent need to carry out a specific intercomparison that was not considered at the session of a constituent body, the president of the relevant body may submit a corresponding proposal to the President of WMO for approval.

4. In good time before each intercomparison, the Secretary-General, in cooperation with the president of CIMO and possibly with presidents of other technical commissions or regional associations, or heads of programmes concerned, should make inquiries as to the willingness of one or more Members to act as a host country and as to the interest of Members in participating in the intercomparison.

5. When at least one Member has agreed to act as host country and a reasonable number of Members have expressed their interest in participating, an international organizing committee should be established by the president of CIMO in consultation with the heads of the constituent bodies concerned, if appropriate.

6. Before the intercomparison begins, the organizing committee should agree on its organization, for example, at least on the main objectives, place, date and duration of the intercomparison, conditions for participation, data acquisition, processing and analysis methodology, plans for the publication of results, intercomparison rules, and the responsibilities of the host(s) and the participants.

7. The host should nominate a project leader who will be responsible for the proper conduct of the intercomparison, the data analysis, and the preparation of a final report of the intercomparison as agreed upon by the organizing committee. The project leader will be a member ex officio of the organizing committee.

8. When the organizing committee has decided to carry out the intercomparison at sites in different host countries, each of these countries should designate a site manager. The responsibilities of the site managers and the overall project management will be specified by the organizing committee.

9. The Secretary-General is invited to announce the planned intercomparison to Members as soon as possible after the establishment of the organizing committee. The invitation should include information on the organization and rules of the intercomparison as agreed upon by the organizing committee. Participating Members should observe these rules.

10. All further communication between the host(s) and the participants concerning organizational matters will be handled by the project leader and possibly by the site managers unless other arrangements are specified by the organizing committee.

11. Meetings of the organizing committee during the period of the intercomparison could be arranged, if necessary.

12. After completion of the intercomparison, the organizing committee shall discuss and approve the main results of the data analysis of the intercomparison and shall make proposals for the utilization of the results within the meteorological community.

13. The final report of the intercomparison, prepared by the project leader and approved by the organizing committee, should be published in the WMO Instruments and Observing Methods Report series.

Annex 4.B. Guidelines for organizing WMO intercomparisons of instruments

1. Introduction

1.1 These guidelines are complementary to the procedures of WMO global and regional intercomparisons of meteorological instruments. They assume that an international organizing committee has been set up for the intercomparison and provide guidance to the organizing committee for its conduct. In particular, see Part I, Chapter 12, Annex 12.C.

1.2 However, since all intercomparisons differ to some extent from each other, these guidelines should be considered as a generalized checklist of tasks. They should be modified as situations so warrant, keeping in mind the fact that fairness and scientific validity should be the criteria that govern the conduct of WMO intercomparisons and evaluations.

1.3 Final reports of other WMO intercomparisons and the reports of meetings of organizing committees may serve as examples of the conduct of intercomparisons. These are available from the World Weather Watch Department of the WMO Secretariat.

2. Objectives of the intercomparison

The organizing committee should examine the achievements to be expected from the intercomparison and identify the particular problems that may be expected. It should prepare a clear and detailed statement of the main objectives of the intercomparison and agree on any criteria to be used in the evaluation of results. The organizing committee should also investigate how best to guarantee the success of the intercomparison, making use of the accumulated experience of former intercomparisons, as appropriate.

3. Place, date and duration

3.1 The host country should be requested by the Secretariat to provide the organizing committee with a description of the proposed intercomparison site and facilities (location(s), environmental and climatological conditions, major topographic features, and so forth). It should also nominate a project leader.[[2]](#footnote-2)

3.2 The organizing committee should examine the suitability of the proposed site and facilities, propose any necessary changes, and agree on the site and facilities to be used. A full site and environmental description should then be prepared by the project leader. The organizing committee, in consultation with the project leader, should decide on the date for the start and the duration of the intercomparison.

3.3 The project leader should propose a date by which the site and its facilities will be available for the installation of equipment and its connection to the data-acquisition system. The schedule should include a period of time to check and test equipment and to familiarize operators with operational and routine procedures.

4. Participation in the intercomparison

4.1 The organizing committee should consider technical and operational aspects, desirable features and preferences, restrictions, priorities, and descriptions of different instrument types for the intercomparison.

4.2 Normally, only instruments in operational use or instruments that are considered for operational use in the near future by Members should be admitted. It is the responsibility of the participating Members to calibrate their instruments against recognized standards before shipment and to provide appropriate calibration certificates. Participants may be requested to provide two identical instruments of each type in order to achieve more confidence in the data. However, this should not be a condition for participation.

4.3 The organizing committee should draft a detailed questionnaire in order to obtain the required information on each instrument proposed for the intercomparison. The project leader shall provide further details and complete this questionnaire as soon as possible. Participants will be requested to specify very clearly the hardware connections and software characteristics in their reply and to supply adequate documentation (a questionnaire checklist is available from the WMO Secretariat).

4.4 The chairperson of the organizing committee should then request:

(a) The Secretary-General to invite officially Members (who have expressed an interest) to participate in the intercomparison. The invitation shall include all necessary information on the rules of the intercomparison as prepared by the organizing committee and the project leader;

(b) The project leader to handle all further contact with participants.

5. Data acquisition

5.1 Equipment set-up

5.1.1 The organizing committee should evaluate a proposed layout of the instrument installation prepared by the project leader and agree on a layout of instruments for the intercomparison. Special attention should be paid to fair and proper siting and exposure of instruments, taking into account criteria and standards of WMO and other international organizations. The adopted siting and exposure criteria shall be documented.

5.1.2 Specific requests made by participants for equipment installation should be considered and approved, if acceptable, by the project leader on behalf of the organizing committee.

5.2 Standards and references

The host country should make every effort to include at least one reference instrument in the intercomparison. The calibration of this instrument should be traceable to national or international standards. A description and specification of the standard should be provided to the organizing committee. If no recognized standard or reference exists for the variable(s) to be measured, the organizing committee should agree on a method to determine a reference for the intercomparison.

5.3 Related observations and measurements

The organizing committee should agree on a list of meteorological and environmental variables that should be measured or observed at the intercomparison site during the whole intercomparison period. It should prepare a measuring programme for these and request the host country to execute this programme. The results of this programme should be recorded in a format suitable for the intercomparison analysis.

5.4 Data-acquisition system

5.4.1 Normally the host country should provide the necessary data-acquisition system capable of recording the required analogue, pulse and digital (serial and parallel) signals from all participating instruments. A description and a block diagram of the full measuring chain should be provided by the host country to the organizing committee. The organizing committee, in consultation with the project leader, should decide whether analogue chart records and visual readings from displays will be accepted in the intercomparison for analysis purposes or only for checking the operation.

5.4.2 The data-acquisition system hardware and software should be well tested before the comparison is started and measures should be taken to prevent gaps in the data record during the intercomparison period.

5.5 Data-acquisition methodology

The organizing committee should agree on appropriate data-acquisition procedures, such as frequency of measurement, data sampling, averaging, data reduction, data formats, real-time quality control, and so on. When data reports have to be made by participants during the time of the intercomparison or when data are available as chart records or visual observations, the organizing committee should agree on the responsibility for checking these data, on the period within which the data should be submitted to the project leader, and on the formats and media that would allow storage of these data in the database of the host. When possible, direct comparisons should be made against the reference instrument.

5.6 Schedule of the intercomparison

The organizing committee should agree on an outline of a time schedule for the intercomparison, including normal and specific tasks, and prepare a time chart. Details should be further worked out by the project leader and the project staff.

6. Data processing and analysis

6.1 Database and data availability

6.1.1 All essential data of the intercomparison, including related meteorological and environmental data, should be stored in a database for further analysis under the supervision of the project leader. The organizing committee, in collaboration with the project leader, should propose a common format for all data, including those reported by participants during the intercomparison. The organizing committee should agree on near-real-time monitoring and quality-control checks to ensure a valid database.

6.1.2 After completion of the intercomparison, the host country should, on request, provide each participating Member with a dataset from its submitted instrument(s). This set should also contain related meteorological, environmental and reference data.

6.2 Data analysis

6.2.1 The organizing committee should propose a framework for data analysis and processing and for the presentation of results. It should agree on data conversion, calibration and correction algorithms, and prepare a list of terms, definitions, abbreviations and relationships (where these differ from commonly accepted and documented practice). It should elaborate and prepare a comprehensive description of statistical methods to be used that correspond to the intercomparison objectives.

6.2.2 Whenever a direct, time-synchronized, one-on-one comparison would be inappropriate (for example, in the case of spatial separation of the instruments under test), methods of analysis based on statistical distributions should be considered. Where no reference instrument exists (as for cloud base, meteorological optical range, and so on), instruments should be compared against a relative reference selected from the instruments under test, based on median or modal values, with care being taken to exclude unrepresentative values from the selected subset of data.

6.2.3 Whenever a second intercomparison is established some time after the first, or in a subsequent phase of an ongoing intercomparison, the methods of analysis and the presentation should include those used in the original study. This should not preclude the addition of new methods.

6.2.4 Normally the project leader should be responsible for the data-processing and analysis. The project leader should, as early as possible, verify the appropriateness of the selected analysis procedures and, as necessary, prepare interim reports for comment by the members of the organizing committee. Changes should be considered, as necessary, on the basis of these reviews.

6.2.5 After completion of the intercomparison, the organizing committee should review the results and analysis prepared by the project leader. It should pay special attention to recommendations for the utilization of the intercomparison results and to the content of the final report.

7. Final report of the intercomparison

7.1 The organizing committee should draft an outline of the final report and request the project leader to prepare a provisional report based on it.

7.2 The final report of the intercomparison should contain, for each instrument, a summary of key performance characteristics and operational factors. Statistical analysis results should be presented in tables and graphs, as appropriate. Time-series plots should be considered for selected periods containing events of particular significance. The host country should be invited to prepare a chapter describing the database and facilities used for data-processing, analysis and storage.

7.3 The organizing committee should agree on the procedures to be followed for approval of the final report, such as:

(a) The draft final report will be prepared by the project leader and submitted to all organizing committee members and, if appropriate, also to participating Members;

(b) Comments and amendments should be sent back to the project leader within a specified time limit, with a copy to the chairperson of the organizing committee;

(c) When there are only minor amendments proposed, the report can be completed by the project leader and sent to the WMO Secretariat for publication;

(d) In the case of major amendments or if serious problems arise that cannot be resolved by correspondence, an additional meeting of the organizing committee should be considered (the president of CIMO should be informed of this situation immediately).

7.4 The organizing committee may agree that intermediate and final results may be presented only by the project leader and the project staff at technical conferences.

8. Responsibilities

8.1 Responsibilities of participants

8.1.1 Participants shall be fully responsible for the transportation of all submitted equipment, all import and export arrangements, and any costs arising from these. Correct import/export procedures shall be followed to ensure that no delays are attributable to this process.

8.1.2 Participants shall generally install and remove any equipment under the supervision of the project leader, unless the host country has agreed to do this.

8.1.3 Each participant shall provide all necessary accessories, mounting hardware, signal and power cables and connectors (compatible with the standards of the host country), spare parts and consumables for its equipment. Participants requiring a special or non-standard power supply shall provide their own converter or adapter. Participants shall provide all detailed instructions and manuals needed for installation, operation, calibration and routine maintenance.

8.2 Host country support

8.2.1 The host country should provide, if asked, the necessary information to participating Members on temporary and permanent (in the case of consumables) import and export procedures. It should assist with the unpacking and installation of the participants’ equipment and provide rooms or cabinets to house equipment that requires protection from the weather and for the storage of spare parts, manuals, consumables, and so forth.

8.2.2 A reasonable amount of auxiliary equipment or structures, such as towers, shelters, bases or foundations, should be provided by the host country.

8.2.3 The necessary electrical power for all instruments shall be provided. Participants should be informed of the network voltage and frequency and their stability. The connection of instruments to the data-acquisition system and the power supply will be carried out in collaboration with the participants. The project leader should agree with each participant on the provision, by the participant or the host country, of power and signal cables of adequate length (and with appropriate connectors).

8.2.4 The host country should be responsible for obtaining legal authorization related to measurements in the atmosphere, such as the use of frequencies, the transmission of laser radiation, compliance with civil and aeronautical laws, and so forth. Each participant shall submit the necessary documents at the request of the project leader.

8.2.5 The host country may provide information on accommodation, travel, local transport, daily logistic support, and so forth.

8.3 Host country servicing

8.3.1 Routine operator servicing by the host country will be performed only for long-term intercomparisons for which absence of participants or their representatives can be justified.

8.3.2 When responsible for operator servicing, the host country should:

(a) Provide normal operator servicing for each instrument, such as cleaning, chart changing, and routine adjustments as specified in the participant’s operating instructions;

(b) Check each instrument every day of the intercomparison and inform the nominated contact person representing the participant immediately of any fault that cannot be corrected by routine maintenance;

(c) Do its utmost to carry out routine calibration checks according to the participant’s specific instructions.

8.3.3 The project leader should maintain in a log regular records of the performance of all equipment participating in the intercomparison. This log should contain notes on everything at the site that may have an effect on the intercomparison, all events concerning participating equipment, and all events concerning equipment and facilities provided by the host country.

9. Rules during the Intercomparison

9.1 The project leader shall exercise general control of the intercomparison on behalf of the organizing committee.

9.2 No changes to the equipment hardware or software shall be permitted without the concurrence of the project leader.

9.3 Minor repairs, such as the replacement of fuses, will be allowed with the concurrence of the project leader.

9.4 Calibration checks and equipment servicing by participants, which requires specialist knowledge or specific equipment, will be permitted according to predefined procedures.

9.5 Any problems that arise concerning the participants’ equipment shall be addressed to the project leader.

9.6 The project leader may select a period during the intercomparison in which equipment will be operated with extended intervals between normal routine maintenance in order to assess its susceptibility to environmental conditions. The same extended intervals will be applied to all equipment.

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1. Based on the Abridged Final Report with Resolutions and Recommendations of the Twelfth Session of the Commission for Instruments and Methods of Observation (WMO‑No. 881), Annex II, and updated thereafter. [↑](#footnote-ref-1)
2. When more than one site is involved, site managers shall be appointed, as required. Some tasks of the project leader, as outlined in this annex, shall be delegated to the site managers. [↑](#footnote-ref-2)