WORLD METEOROLOGICAL ORGANIZATION
Weather – Climate – Water

EXECUTIVE COUNCIL
PANEL OF EXPERTS ON EDUCATION AND TRAINING
Task Team on Aeronautical Forecaster Qualifications

FIRST MEETING
(Exeter, United Kingdom, 9 – 13 February 2009)

FINAL REPORT WITH RECOMMENDATIONS

Secretariat of the World Meteorological Organization – Geneva – Switzerland
Executive Summary

The Task Team on Aviation Forecaster Qualifications created by the WMO Executive Council Panel of Experts on Education and Training at its 23rd Session (Costa Rica, March 2008) met at the UK Met Office in Exeter from 9 to 13 February 2009.

The Task Team reviewed the background and issues related to the qualifications required by Aeronautical Meteorologists. After extensive discussion and debate the team recommended a new pathway, for personnel without a degree, to become a WMO Meteorologist be incorporated in the next (fifth) edition of WMO Publication 258 “Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology, Vol. 1 Meteorology”, scheduled to be published in 2010. The new pathway ensures that anyone taking this route has an appropriate breadth and depth of meteorological knowledge (completing the BIP-M) supported by an underlying knowledge of physics and mathematics (attaining the prerequisite physics and mathematics as set out in WMO-No. 258) that would be expected of someone designated as a WMO Meteorologist.

In addition the Task Team recommended that the WMO Secretariat include the required competencies (i.e. knowledge, skills and work attitudes) of Aeronautical Meteorologists, as currently specified in Supplement 1 to WMO Publication 258 as Standards and Recommended Practices in WMO-No. 49 Vol. II. The Task Team has proposed timelines for implementation which put the priority on ensuring the aeronautical meteorological personnel have the required competencies. The three key dates are:

- Late 2013 - Aeronautical meteorological personnel (Aeronautical Meteorologists and Aeronautical Meteorological Technicians) to meet the competency requirements in WMO-No. 49 Vol. II.
- Late 2016 - Aeronautical Meteorologists to meet the education and training requirements as defined in WMO-No. 49 Vol. II and WMO-No. 258 so that they are designated as WMO Meteorologists.

In developing its recommendations to the EC Panel, the TT-AFQ noted the expected benefits of the proposed approach:

- Implementation of these recommendations will improve the quality of the meteorological services provided to international air navigation by ensuring that personnel are competent to provide these services;
- There will be clarity about the pathways to becoming designated as a WMO Meteorologist, thus providing a clear focus for initial and ongoing education and training programs;
- The current problem of “Standards” in Technical Regulations (WMO-No. 49, Vol. I and Vol. II) referencing “Guidelines”(WMO-No. 258) will be removed;
- The new pathway will be consistent with the original intention of the changes introduced in the fourth edition of WMO-No. 258 and will provide a natural development of the actions taken to implement WMO-No. 258 in recent years;
- The cost in terms of financial and personnel resources of the recommended approach for existing Meteorological Technicians will be less than the original approach of all WMO Meteorologists being required to have a degree while recognizing that for new entrants, the employment of personnel with a degree will be less costly and thus recommended as normal practice; and,
- Members will be given sufficient time to act and respond to the recommendations to ensure a synchronized approach between WMO and ICAO, the timeframe is explicitly tied to the governing update cycle for ICAO Annex 3 and the associated WMO-No. 49 Vol. II.
# Table of Contents

Executive Summary ........................................................................................................................................... 2

TABLE OF CONTENTS ........................................................................................................................................ 3

GENERAL SUMMARY OF THE WORK OF THE SESSION ........................................................................... 5

1. ORGANISATION OF THE SESSION ........................................................................................................... 5
   1.1 Opening of the Session .......................................................................................................................... 5
   1.2 Adoption of the Agenda .......................................................................................................................... 5
   1.3 Program of Work ..................................................................................................................................... 5

2. BACKGROUND TO AND STATUS OF THE ISSUE OF AERONAUTICAL FORECASTER QUALIFICATIONS .......................................................................................................................... 5
   2.1 Background ...................................................................................................................................... 5
   2.2 Current Status ..................................................................................................................................... 7

3. APPROACHES TO SETTING AND ASSESSING AERONAUTICAL METEOROLOGIST QUALIFICATIONS AND COMPETENCIES .............................................................................................. 7
   3.1 Qualifications ................................................................................................................................... 7
   3.2 Competency ............................................................................................................................... .... 10

4. RECOMMENDATIONS FOR EC-LXI AND THE EC PANEL OF EXPERTS ON EDUCATION AND TRAINING AND THE ASSOCIATED BENEFITS ......................................................................................... 11

5. FUTURE WORK PLAN ....................................................................................................................... 13

6. APPROVAL OF THE DRAFT REPORT ................................................................................................. 13

7. CLOSURE OF THE SESSION .......................................................................................................... 13
   Annex 1 ............................................................................................................................................. 14
   Annex 2 ............................................................................................................................................. 15
   List of Participants ................................................................................................................................... 15
   Annex 3 ............................................................................................................................................. 17
   Extracts from the 23rd Session of the WMO EC Panel of Experts on Education and Training, and the 61st Session of WMO Executive Council ............................................................................. 17
   Annex 4 ............................................................................................................................................. 19
   Relationship of WMO Publication 258 to ICAO Annex 3 ........................................................................ 19
   Annex 5 ............................................................................................................................................. 20
   Suggested approaches for non-accredited institutions to demonstrate that their courses meet the recommended course requirements of WMO-No. 258 ........................................................................ 20
   Annex 6 ............................................................................................................................................. 21
   Aeronautical Meteorologist competency assessment kit ............................................................................ 21
   Annex 7 ............................................................................................................................................. 22
   Key time frames ..................................................................................................................................... 22
First Meeting of the (EC Panel of Experts on Education and Training) Task Team on Aviation Forecaster Qualifications

Figure 1. Members of the first meeting of the Task Team on Aeronautical Forecaster Qualifications of the EC Panel of Experts on Education and Training.

(L – R) Dr Herbert Puempel (WMO), Mr Jeff Wilson (WMO), Dr Bob Riddaway (Invited expert), Mr Jun Ryuzaki (JMA), Mr Roger Deslandes (ABoM), Mr Ian Lisk (Chair, UK Met Office), Dr Olli Turpeinen (ICAO), Mr LeRoy Spayd (NOAA), Dr Vilma Castro (University of Costa Rica), Ms Kathy-Ann Caesar (CIMH). M Ilboudo Goama (ASECNA) was not able to attend the meeting but interacted with the Task Team from Senegal.
GENERAL SUMMARY OF THE WORK OF THE SESSION

1. ORGANISATION OF THE SESSION

1.1 Opening of the Session
The first meeting of the Task Team on Aeronautical Forecaster Qualifications (TT-AFQ) formed by the EC Panel of Experts on Education and Training was opened by the Chairman, Mr Ian Lisk, at 0930 on Monday 9 February 2009 in the UK Met Office in Exeter, UK. Mr Keith Groves, Director of Operations at the UK Met Office, welcomed the TT-AFQ to the Met Office on behalf of the Met Office Chief Executive, Mr John Hirst. Mr Groves noted that the severe weather being experienced across the UK, underlined the importance of the TT-AFQ work in ensuring that high standards of service are maintained to communities across the globe. Mr Groves arranged for the TT-AFQ to visit the Met Office Operations Centre and Met Office College during the meeting as part of the background to the activities of the TT-AFQ.

1.2 Adoption of the Agenda
The provisional agenda was adopted by the meeting with slight amendments, and is reproduced in Annex 1. The list of participants is found in Annex 2.

1.3 Program of Work
The Chairman proposed and the TT-AFQ agreed that the working hours would be from 09:00 to 12:30 and from 14:00 to 17:00, with the usual coffee breaks at 10:00 and 15:30.

2. BACKGROUND TO AND STATUS OF THE ISSUE OF AERONAUTICAL FORECASTER QUALIFICATIONS

2.1 Background
The TT-AFQ reviewed the background to the creation of the TT-AFQ in the context of the outcomes of the 23rd Session of the EC Panel of Experts on Education and Training (EC Panel) and the directions from the 60th Session of the WMO Executive Council. The pertinent sections from these two sessions are summarized in Annex 3 to this Report. In particular the TT-AFQ noted its tasks to:

(i) Review the implementation time lines suggested by the EC Panel;

(ii) Provide clarification of the meaning of relevant items of text contained in WMO Publication No. 258 “Guidelines for the Education and Training of Personnel in Meteorology and Operational Hydrology, Volume 1: Meteorology” 4th edition published 2002 (hereafter referred to as WMO-No. 258), and its Supplement 1 “Training and qualification requirements for aeronautical meteorological personnel” (hereafter referred to as WMO-No. 258 Supplement 1), including the term “or equivalent” and its application in Supplement 1, and recommend revisions as necessary;

Additionally, the TT-AFQ identified that in line with the directions from EC-LX it could provide suggestions about the status of WMO-No. 258 Supplement 1 to the EC Panel and, through the Chairman of the TT-AFQ, to the Commission for Aeronautical Meteorology Expert Team on Education and Training (CAeM ET/ET).

As one of the editors of the fourth edition of WMO-No. 258, Dr Bob Riddaway briefed the TT-AFQ on the development of the fourth edition and in particular the reasons behind the inclusion of the term “or equivalent”. He also emphasized that the editors considered WMO-No. 258 to be a set of guidelines (not standards) that Members could use as basis for
creating their own instruction programs for Meteorologists and Meteorological Technicians that took account of national requirements and practices.

Dr Riddaway further noted that the degree requirement had been chosen as it was a qualification that was widely available and was indicative of educational attainment. It thereby provided a means of distinguishing between the categories of meteorological personnel. It was not intended to strictly separate the roles that Meteorologists and Meteorological technicians could undertake. This is emphasized in the publication explicitly in Chapter 1 page 8, “in practice, some mid/senior-level technicians may perform duties that are similar or overlap with duties of entry/mid-level meteorologists.”

Dr Riddaway further stated his view that, if the editors had been aware of the cross-referencing between WMO Technical Regulations No 49 (Vol. 1 - General Meteorological Standards and Recommended Practices, and Vol. II - Meteorological Service for International Air Navigation; C.3.1 – International Standards and recommended practices. (hereafter referred to as WMO-No. 49 Vol. I or WMO-No. 49 Vol. II) and WMO-No. 258, then the language and phrasing used in WMO-No. 258 would have been rather different.

Dr Olli Turpeinen (Chief MET/AIM Section, International Civil Aviation Organization, ICAO) briefed the TT-AFQ on how ICAO in general, and the ICAO Universal Safety Oversight Audit inspections in particular, use the linkages between ICAO Publication: “Meteorological Service for Air Navigation “ (hereafter referred to as ICAO Annex 3), WMO-No. 49 Vol I and Vol II, and WMO-No. 258 and WMO-No. 258 Supplement 1.

Dr Turpeinen noted that ICAO Annex 3 is due for its next three-yearly update in November 2010, and WMO-No. 49 Vol. II will be updated concurrently. He went on to explain the difficulties that the “guidelines” status of WMO-No. 258 causes in terms of the safety inspections and, potentially, for the future implementation of Quality Management Systems (QMS). The linkage between ICAO publication Annex 3 and WMO-No. 258 is outlined in Annex 4 to this report.

Mr Jeff Wilson (Director of the WMO Education and Training Office) advised the TT-AFQ that WMO-No. 258 was published in 2002 (Supplement 1 was published in 2006 for clarification of Training and Qualification Requirements for Aeronautical Meteorological Personnel). Subsequently WMO-No. 258 was made a mandatory WMO publication by Congress XV in May 2007 requiring an update every eight years. Thus a fifth edition of the publication is due in 2010. This would provide an opportunity to refine the current text to take account of any decisions taken by EC-LXI on the recommendations made by the TT-AFQ, and subsequent input from CAeM and the EC Panel. The TT-AFQ noted the confusion and concern caused by the alternating use of the terms “forecaster” and “meteorologist” within WMO-No. 258 and WMO-No. 258 Supplement 1.

For clarity in the TT-AFQ’s discussions, forecasting was seen as one role of a “meteorologist” and aeronautical forecasting was seen as a specialized forecasting task. The TT-AFQ recommended that for the 5th edition of WMO-No. 258, the EC Panel consider replacing the use of terms such as “Aviation Meteorological Forecaster” and “Aviation Meteorological Observer” with the terms “Aeronautical Meteorologist” and “Aeronautical Meteorological Technician”.

The TT-AFQ agreed unanimously that, in order to ensure a positive impact of meteorological services to aviation on overall flight safety, Members would need to demonstrate that their Aeronautical Meteorologists had the competencies (skills, knowledge and work-attitudes) currently outlined in WMO-No. 258 Supplement 1. Noting the ambiguity that the lack of an agreed Standard caused, the TT-AFQ endorsed the concept of the competency Standards being included as an Annex to WMO-No. 49 Vol. II - Meteorological Service for International Air Navigation.
2.2 Current Status

The TT-AFQ reviewed the outcomes of the 2006 Education and Training “Survey on Members Training Requirements, Opportunities and Capabilities in Meteorology and Hydrology” (WMO Publication ETR No 19). Data from this survey was supplemented by responses from Members for additional information on the minimum qualifications of their aeronautical meteorological personnel and an indication of how many of their personnel meet the current qualifications as defined in WMO-No. 258.

In summary, 95 Members had responded to the combined survey, including 27 Least Developed Countries (LDCs). Of these 95 Members, 27 specified a minimum academic qualification of a degree for the personnel providing aeronautical meteorological forecasting and warning services. More than 8500 personnel from these 95 Members appear to be involved in the provision of meteorological services to air navigation. The TT-AFQ noted that this equated to approximately 90 personnel involved in aviation forecasting per Member and, whilst noting that the information was supplied by the Members themselves, suggested that independent checks on the numbers be made before the data was used as a robust number for planning purposes. More than 1400 of these personnel do not have a degree.

The TT-AFQ noted that the data was incomplete and that there appeared to be some inconsistencies when the raw data was reviewed. However, the data confirmed the general view that the minimum formal academic qualifications for aviation forecasters in many Members was less than that of a WMO Meteorologist as specified in the current edition of WMO-No. 258. Five of the LDCs specified a degree or higher as the minimum qualification for their aviation meteorologists. The TT-AFQ also noted that since much, but not all, of the data was collected in 2006, a significant number of these personnel had completed their training before 31 December 2004 (which meets the qualification requirement as stipulated in paragraph 1.3 of WMO-No. 258 Supplement 1) and thus their potential lack of a degree as covered by the provisions in WMO-No. 258 Supplement 1.

Using examples provided by the TT-AFQ members and their knowledge of other countries in their Regions, the TT-AFQ noted that a number of Members and Regional Training Centers (RTCs) offered education and training opportunities that were consistent with the condensed Basic Instruction Package for Meteorologists (BIP-M). These are outlined in WMO-No. 258 and include mathematics and physics to at least the normal first year university level and in many cases beyond this. However, due to the education and training institutes not being formally accredited by the tertiary education authorities in that country, the personnel from that course could not claim the title of WMO Meteorologist under the definition in the current edition of WMO-No. 258.

The TT-AFQ also noted that for the purposes of meeting the requirements of Supplement 1 to WMO-No. 258 (4th edition) it was also essential for personnel providing aeronautical meteorological services (including forecasts and warnings) to demonstrate the competencies required of an Aeronautical Meteorologist and this applied to all personnel undertaking that role, no matter how they obtained their education and training.

3. APPROACHES TO SETTING AND ASSESSING AERONAUTICAL METEOROLOGIST QUALIFICATIONS AND COMPETENCIES

3.1 Qualifications

Dr Riddaway, as one of the original authors of WMO-No. 258 Fourth Edition, advised the TT-AFQ that, from his perspective, the phrase containing the term “or equivalent” was not meant to be read as “or equivalent to a degree”, but rather as “degree or equivalent professional
qualification”. It was also noted that participants at the Directors of WMO RTCs Training Seminar (Langen, Germany, 20 - 24 October 2008) found it difficult if not impossible to universally define courses and qualifications as equivalent to a university degree. The TT-AFQ therefore reviewed the implications and application of the term “or equivalent”.

The TT-AFQ recognized that some Members run training centers or accept personnel from WMO RTCs that are not accredited as universities in the tertiary sector of their host countries. These personnel though respected for the quality of their work within their National Meteorological and Hydrological Service (NMHS) are not eligible to be called WMO Meteorologists under the current definition. This is despite the fact that many of the courses run by the non-accredited training centers cover the necessary prerequisite mathematics and physics and the required range and depth of meteorological material as outlined in the condensed BIP-M in WMO-No. 258.

In the light of the points made above, the TT-AFQ agreed that instead of trying to define in detail the interpretation of ‘equivalent’ it was more fruitful to consider what pathways could be available to meteorological personnel becoming designated as a WMO Meteorologist. It was recognized, however, that such pathways would need to be consistent with the thinking behind the original inclusion of the “or equivalent” statement.

Following extensive discussions the TT-AFQ developed an additional pathway to the WMO Meteorologist classification and recommended that this new pathway be added to the two existing pathways described in WMO-No. 258. The additional pathway still puts emphasis on an appropriate breadth and depth of meteorological knowledge (completing the condensed BIP-M), supported by an underlying knowledge of physics and mathematics (attaining the prerequisite physics and mathematics as set out in WMO-No. 258).

The additional pathway is particularly designed for operational personnel specializing in one or more of the elective fields outlined in WMO-No. 258. This pathway also recognizes the difficulty many Members experience in attracting and retaining university graduates. The TT-AFQ further recognized that for new personnel, the new pathway to becoming designated as a “WMO Meteorologist” would require considerably more investment in time and resources of an NHMS than the other two pathways and should not be viewed as a short-cut.

It was recognized, and agreed, within the TT-AFQ that a university degree in meteorology or science should remain the preferred pathway for someone working in meteorology. University studies generally develop a broad range of knowledge, problem solving, research skills and ongoing learning aptitudes that ultimately allow such personnel to readily adapt and specialize in different areas as their careers progress and as the underlying science, technology and service demands change. The TT-AFQ similarly recognized that a more vocationally orientated pathway should produce personnel who, in the short term, are better suited to operational tasks within a NMHS although these same personnel could require significantly more education and training in the future to move to other roles within the NMHS.

In defining an additional pathway to becoming a WMO Meteorologist, the TT-AFQ emphasized the importance of maintaining high levels of competency for the personnel providing meteorological information and services to the public and specialized users. Members accepting personnel from the newly defined pathway will need to ensure that they are satisfied that the standards and content of the course, the instruction and the personnel themselves are at least at the minimum level specified in WMO-No. 258. This is particularly so for those Members who have such personnel providing meteorological services to air navigation. The minimum standards will be included in Vol. II of WMO-No. 49 on a provisional basis from November 2010 and the ICAO Universal Safety Oversight Audit inspections will be expecting meteorological service providers to be able to show that the initial and ongoing education and training of their personnel meets the minimum standards. In late 2013 the competencies will become mandatory Standards. Annex 5 to this report
provides some suggestions to assist training centers (particularly those which are not accredited within the tertiary education sector of their host country) show that their courses meet the requirements described in WMO-No. 258.

Table 1 summarizes the proposed paths to become a “WMO Meteorologist” specializing in one of the elective fields and ready for operational duties. It also provides an indication of the minimum times required for personnel to reach operational status for the three entry pathways. Whilst the focus of the TT-AFQ was clearly on the role of an Aeronautical Meteorologist, the table has been kept general in order to show that the same principle can apply to all roles. These steps are not new but have been made more explicit to assist Members in their planning and documentation in light of the future requirements for QMS reporting.

The TT-AFQ further recognized that for many Members the personnel fulfilling the role of an Aeronautical Meteorologist were often involved in other roles, either in the same shift or in one shift rotation. In these cases the minimum times would need to be extended to ensure that new personnel were ready to fulfill all of their roles.

The table focuses on the steps required for a WMO Meteorologist to reach an operational status and thus it explicitly includes an allowance for:

- Role specific education and training that is based on bridging the gap between academic foundation and job-specializations as outlined in section 2.3 of WMO-No. 258;
- Supervised On-the-job training (Career levels for Meteorologists, Section 1.3 WMO-No. 258) of approximately 300 hours, where the new personnel are consolidating their meteorological skills and knowledge, improving their procedural knowledge, skills, timeliness and work-attitudes under close supervision (for example this may mean that they work day shift, shadow more experienced specialized operational Meteorologists, practice the operational tasks they will be performing but not independently issuing their forecasts); and,
- A period where the new personnel are working more independently, creating operational output, but are still monitored by experienced qualified meteorologists. In this last period the new personnel would be working as operational meteorologists (for example Aeronautical Meteorologists), but their work would be closely reviewed by experienced qualified meteorologists before being issued to the public and specialist users. In addition, assessments against the required competencies for that particular specialization (or range of specializations for Members where their personnel fulfill a range of roles in each shift) would be made in a range of differing circumstances and weather conditions. New personnel assessed as fully competent would then be rated as ready to perform fully independent operational duties.

The competency stage is addressed more fully in the next section of this report. For Aeronautical Meteorologists these initial assessments, follow-up assessments and records of any Continuous Education and Training (CET) would act as documentary evidence for audits such as the ICAO Universal Safety Oversight Audit inspections.

Provided the personnel from each pathway are assessed in the same manner, the pathway they have taken to be assessed as fully competent should not matter.
**Table 1. Three possible pathways to becoming an operationally ready WMO Meteorologist specialising in one of the elective fields noted in WMO-No. 258.**

<table>
<thead>
<tr>
<th>Meteorological Degree</th>
<th>Non meteorological Degree</th>
<th>No degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualifies as WMO Meteorologist here</td>
<td>Condensed BIP-M</td>
<td>Prerequisite Maths, Physics as set out in WMO-No. 258</td>
</tr>
<tr>
<td>Role specific education and training</td>
<td>Qualifies as WMO Meteorologist here</td>
<td>Condensed BIP-M</td>
</tr>
<tr>
<td>Closely supervised OJT in operational area, does not independently issue any products (minimum 300 hours)</td>
<td>Role specific education and training</td>
<td>Qualifies as WMO Meteorologist here</td>
</tr>
<tr>
<td>Close monitoring, feedback and ongoing assessment prior to finally being ‘signed-off’ as competent to perform fully independent operations.</td>
<td>Closely supervised OJT in operational area, does not independently issue any products (minimum 300 hours)</td>
<td>Role Specific education and training</td>
</tr>
<tr>
<td>Recommended minimum 6-month period of training and assessment from initial recruitment to fully independent operations.</td>
<td>Close monitoring, feedback and ongoing assessment prior to finally being ‘signed-off’ as competent to perform fully independent operations.</td>
<td>Closely supervised OJT in operational area, does not independently issue any products (minimum 300 hours)</td>
</tr>
<tr>
<td></td>
<td>Recommended minimum 12-month period of training and assessment from initial recruitment to fully independent operations.</td>
<td>Close monitoring, feedback and ongoing assessment prior to finally being ‘signed-off’ as competent to perform fully independent operations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recommended minimum 24-month period of training and assessment from initial recruitment to fully independent operations.</td>
</tr>
</tbody>
</table>

1 WMO-No. 258 Paragraph 1.3(b) refers

3.2 Competency

The TT-AFQ proposed an end-to-end process for the competency assessment of Aeronautical Meteorologists. The approach incorporates the refinement of the competencies currently described in Supplement 1 to WMO-No. 258. A review of these competences is already being undertaken by the Commission for Aeronautical Meteorology Expert Team on Education and Training (CAeM ET/ET).

The TT-AFQ was informed of the range of approaches that could be taken to define and assess competencies. These ranged from a bare minimum level of self- or supervisor assessment linked to annual performance reviews to a more encompassing approach that incorporates the linking of the competencies to a national vocation qualification framework and potentially external certification (e.g. the National Vocational Qualification for Weather Forecasters in the UK).

Noting the comments from Mr Andy Wells (UK Civil Aviation Authority, UK CAA), who advised the meeting on what the UK CAA had looked for during a recent training and education audit of the UK Met Office, and comments from several members of the TT-AFQ who had undergone an ICAO Universal Safety Oversight Audit inspection. The TT-AFQ emphasized the importance of following a quality management process in the assessment and documentation of the competency of Aeronautical Meteorologists and Aeronautical...
Meteorological Technicians. Under a QMS approach, the competency assessor would be expected to have undergone competency assessment training and also be recognized as an expert in the technical area.

These trainers/assessors could work with Members to adapt the global competencies to national competency frameworks that focus on the key aeronautical problems and hazards in their region. They could further ensure that the assessment was pertinent to the range of techniques available to the Member and the services provided by the Member. If the global competencies of the Aeronautical Meteorologist and Aeronautical Meteorological Technician were included in WMO 49 Vol. II, they would also have to be reviewed every three years in line with the review and update cycle of that document.

To assist the trainers/assessors, an assessment and documentation kit based on the guidance in Sections 2.2 to 2.4 of Supplement 1 to WMO-No. 258 and its subsequent updates should be developed. This kit should consist of two components:

i) example learning and assessment guides, and documentation sheets based on the existing good practices in a number of Members and;

ii) online quizzes and resource material to review and assess the general and specific background knowledge required of an Aeronautical Meteorologist.

This kit would be built up by the TT-AFQ and CAeM ET/ET over time. However, for Members to see significant benefits it would be necessary to identify and resource a core group to project-manage and guide the development and implementation of the necessary assessment kits and assessor programs. Annex 6 provides further detail.

Whilst the TT-AFQ discussed the desirability for an external certification of the Aeronautical Meteorologist competencies, there was no clear process to identify who could undertake this process and how it would be funded. The TT-AFQ inquired of Dr Turpeinen if the Meteorological Authority in each of ICAO’s contracting states could play this role. Dr Turpeinen advised the TT-AFQ that this would have to be investigated if ICAO received a formal request from WMO.

4. RECOMMENDATIONS FOR EC-LXI AND THE EC PANEL OF EXPERTS ON EDUCATION AND TRAINING AND THE ASSOCIATED BENEFITS

In response to the tasks given to the TT-AFQ by the EC Panel and subsequently endorsed with modifications by EC-LX, the TT-AFQ formulated the following recommendations.

1) The ETR Office to provide copies of the final report of this meeting to the EC Panel to discuss the TT-AFQ findings by correspondence.

2) The WMO Secretariat seek approval from EC LXI that the term “or equivalent” in the 4th edition of WMO-No. 258 be understood to mean “or equivalent to the relevant professional qualifications” rather than “or equivalent to a degree”.

3) The WMO Secretariat to advise the EC Panel of the Task Team’s recommendation to include a pathway for non-degreed personnel to become a WMO Meteorologist. This recommendation is based on the clarification of ‘or equivalent’ in the current edition of WMO-No. 258 (Section 1.1 Basic Assumptions (c) and (d)).

4) The WMO Secretariat to advise the EC Panel that the terms “Aviation Meteorological Forecaster” or “Aviation Meteorological Observer” used in WMO-No. 258 be replaced with the terms “Aeronautical Meteorologist” and “Aeronautical Meteorological Technician” to better reflect the changing nature of the job, and the level of education and training associated with these roles.

5) The WMO Secretariat to seek approval from EC-LXII to publish this revised 5th edition of WMO-No. 258 as soon as practicable.
6) The WMO Secretariat to include the required competencies (i.e. knowledge, skills and work attitudes) of Aeronautical Meteorologists, as currently specified in WMO-No. 258 Supplement 1 (Sections 2.2 to 2.4) and updated by CAeM ET/ET, as Standards and Recommended Practices in WMO-No. 49 Vol. II for approval by EC.

7) The implementation timetable proposed by the EC Panel of full compliance by end of 2014 be modified in light of recommendations 2, 3 and 4.

The new implementation timetable is based upon the three yearly update of WMO-No. 49. Late 2013 has been selected to prioritize safety relevant competencies and allow the education and training institutions time to establish appropriate education and training programs in time for late 2016. The revised timelines would then consist of the following:

**Late 2010**

- WMO-No. 49 2010 Edition to include Standards and Recommended Practices (SARPs) on the competencies for Aeronautical Meteorologists and Aeronautical Meteorological Technicians with an applicability date of November 2013 and November 2016 as specified below.
- The fifth edition of WMO-No. 258 to be published.
- WMO Regional Training Centers and Members to adapt their education and training programs for consistency with the 5th edition of WMO-No. 258.
- Members to assess and document which of their staff will require further education and training towards meeting the requirements stipulated in WMO-No. 49 Vol II and WMO-No. 258. This information should be used by Members to develop an implementation plan to enable their staff to meet the 2013 and 2016 deadlines.

**Late 2013**

- Aeronautical Meteorological personnel (Aeronautical Meteorologists and Aeronautical Meteorological Technicians) to meet the competencies described in WMO-No. 49 Vol II.

**Late 2016**

- Aeronautical Meteorologists to meet the education and training requirements as defined in WMO-No. 49 Vol. II and WMO-No. 258.

In developing the following recommendation, the TT-AFQ noted the positive benefits of the proposed approach:

- Implementation of these recommendations will improve the quality of the meteorological services provided to air navigation;
- There will be clarity about the pathways to becoming designated as a WMO Meteorologist which will be of value to Members, education and training institutions and individuals;
- Members will be provided with a range of accredited pathways to develop personnel to the level of WMO Meteorologist;
- The current problem of “Standards” in Technical Regulations (WMO-No. 49, Vol. I and Vol. II) referencing “Guidelines” (WMO-No. 258) will be removed;
- The new pathway will be consistent with the original intention of the changes introduced in the fourth edition of WMO-No. 258 and will provide a natural development of actions taken to implement WMO-No. 258 in recent years;
- Members will be provided with further information on the recommended practices for ensuring that their personnel are competent to provide meteorological services to air navigation and provide a clear focus for their initial and ongoing education and training programs;
The cost in terms of financial and staff resources of the recommended approach for existing Meteorological Technicians will be less than the original approach of all WMO Meteorologists being required to have a degree while recognizing that for new personnel, the employment of personnel with a degree will be less costly and thus recommended as normal practice and,

• Members will be given sufficient time to act and respond to the recommendations to ensure a synchronized approach with WMO and ICAO, the timeframe is explicitly tied to the governing update cycle for ICAO Annex 3 and the associated WMO-No. 49 Vol. II.

5. FUTURE WORK PLAN
The TT-AFQ identified that significant work would need to be undertaken on the following tasks:

• Identify existing learning and competency assessment guides – Kathy-Ann Caesar.
• Identify existing education and training resources to complement the learning and assessment guides – LeRoy Spayd to coordinate with CAeM ET/ET for the TT-AFQ
• Identify the key areas for review of the current edition of WMO-No. 258 – EC Panel.
• Propose who should carry out competency assessments and how often they should occur (the Task Team noted that the ICAO Universal Safety Oversight Audit inspections occur on a five yearly rotation and thus this should be the maximum interval for reassessment of competency) - for further discussion within the TT-AFQ.
• Identify providers of aeronautical training programs in each Region – ETR in conjunction with CAeM ET/ET.
• Identify potential partners for development and delivery of learning resources– ETR in conjunction with CAeM ET/ET.
• Review the key time frames outlined in Annex 7, update and coordinate them with the appropriate parties. - Chair

6. APPROVAL OF THE DRAFT REPORT
6.1 The TT-AFQ reviewed the draft report of the meeting and approved it, subject to the inclusion of agreed corrections and editorial amendments.

7. CLOSURE OF THE SESSION
7.1 The Chairman of the meeting expressed his satisfaction with the constructive spirit in which the TT-AFQ had worked throughout the present meeting on an extremely difficult and sensitive topic, and wished them a speedy and safe return home.

7.2 The session was closed after the customary exchange of courtesies on 13 February 2009 at 15:30.
Annex 1

AGENDA

1. ORGANIZATION OF THE SESSION
   1.1 OPENING OF THE SESSION
   1.2 APPROVAL OF THE AGENDA

2. BACKGROUND AND STATUS TO THE ISSUE OF AVIATION FORECASTER QUALIFICATIONS
   2.1 BACKGROUND
   2.2 STATUS

3. APPROACHES TO SETTING AND ASSESSING AERONAUTICAL FORECASTER QUALIFICATIONS AND COMPETENCIES

4. RECOMMENDATIONS FOR EC

5. FUTURE WORK PLAN

6. APPROVAL OF THE DRAFT REPORT

7. CLOSURE OF THE SESSION
### List of Participants

<table>
<thead>
<tr>
<th>Name</th>
<th>Title/Position</th>
<th>Address/Contact Information</th>
</tr>
</thead>
<tbody>
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<td>Mr. I. LISK</td>
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<td>Professor</td>
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<td>Mr. LeRoy Spayd</td>
<td>Chief NWS Training Division</td>
<td>NOAA/National Weather Service, 1325 East-West Highway, Silver Spring, Maryland, USA</td>
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<td>Principal of the Bureau of Meteorology Training Centre</td>
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<td>Mr. Jun Ryuzaki</td>
<td>Scientific Officer</td>
<td>Office of Aviation Weather Forecast, 1-3-4, Otemachi, Chiyoda-ku, Tokyo 100-8122, Japan</td>
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<tr>
<td>Ms Kathy-Ann Caesar</td>
<td>Meteorologist</td>
<td>Caribbean Institute of Meteorology and Hydrology, P.O. Box 130, Bridgetown, Barbados, West Indies</td>
</tr>
<tr>
<td>Mr. Goama Ilboudu *</td>
<td>Chief, Bureau CELICA Met, ASECNA, Senegal</td>
<td>(was not able to physically attend the meeting but participated via email)</td>
</tr>
<tr>
<td>Dr Bob Riddaway</td>
<td>Consultant</td>
<td>Royal Met Society, UK</td>
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### INVITED EXPERTS

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<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Dr Bob Riddaway</td>
<td>Consultant</td>
<td>Royal Met Society, UK</td>
</tr>
</tbody>
</table>
### First Meeting of the (EC Panel of Experts on Education and Training) Task Team on Aviation Forecaster Qualifications

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<th>Dr. Olli Turpeinen</th>
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<tr>
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### WMO SECRETARIAT

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<tr>
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<table>
<thead>
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<th>Dr Herbert Puempel</th>
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<tbody>
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<td>Chief, WMO Aeronautical Met Division</td>
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<tr>
<td>Case postale No. 2300</td>
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<tr>
<td>1211 GENEVA 2, Switzerland</td>
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</tbody>
</table>
Background from the WMO Executive Council Panel of Experts on Education and Training
(extract from Section 4.4 of the final report for the 23rd meeting)

Regarding the certification of Aeronautical Forecasters and Observers the Panel considered processes and time lines to assist Members have their personnel certified to provide meteorological services for air navigation. The Panel noted that it was not practical or desirable to change the underlying thrust of the fourth edition of WMO publication 258 and retrospectively remove the requirement that WMO Meteorologists hold an appropriate degree in meteorology or an appropriate science and mathematics degree and have successfully completed a condensed basic instruction package (meteorology) course. With this starting point the Panel noted the following time lines:

- Aviation Forecasters trained prior to 1 January 2005 don't need to have a degree to be independent forecasters but they do need to be able to demonstrate that they meet the requirements outlined in Supplement 1 to WMO-No. 258.

- Aviation forecasters trained after 31 December 2004 must have an appropriate degree as well as meet the requirements laid down in Supplement 1 to WMO-No. 258.

- In late 2010, ICAO will mandate that Air Navigation Service Providers (ANSP) must have implemented an ISO approved Quality Management Framework.

Given these time lines the Panel recommended the following actions:

- Revision and strengthening of Supplement 1 to WMO No. 258 into a standalone "Guide" or minimum set of standards that must be met. This would include developing an instruction and assessment "kit", to complement the Guide that could be used by Members.

- Advising ICAO that non-degreed forecasters trained after 31 December 2004 and prior to 1 January 2011 be allowed to continue operating as independent aviation forecasters provided they are pursuing appropriate undergraduate studies that will allow them to graduate with the appropriate qualification prior to 31 December 2014 AND they can demonstrate that they meet the requirements outlined in Supplement 1 to WMOno. 258.

To assist in the implementation of these two actions the Panel formed two Expert Teams, the first one to revise and strengthen Supplement 1 to 258 and develop the instruction and assessment "kit". The Convenor for this team is Mr Ian Lisk from the UK Meteorological Office. The second team to be convened by Dr Vilma Castro from the University of Costa Rica is to investigate options for delivery of an accredited online undergraduate degree that could be taken by Members whilst continuing to work as aviation forecasters. The team will initially pilot the project for RA III and RA IV Members and then extend it to other regions as suitable providers are identified. In addition the Panel noted the discussions in some Regions for Members to form regionally based Aviation Forecasting Centres to provide meteorological services for air navigation to a range of Members. Noting that in this situation, staff from one Member would be providing services to one or more other Members consideration of training and fellowship requests to support these initiatives should take into account the potential for these activities to benefit the Members in that region.
Background from the WMO Executive Council
(Extract from doc 4.2 of the 60th session, paragraphs 4.2.46)

The Council strongly supported the work of the EC Panel of Experts on Education and Training to assist Members in ensuring that their personnel providing meteorological services for air navigation meet the requirements of Supplement 1 to WMO-No.258. The time lines suggested by the Panel are consistent with ICAO plans, but are likely to cause significant difficulties for some Members. The Council therefore requested the Secretary-General to support the EC Panel to work through two task teams to:

(i) Review the implementation time lines suggested by the EC Panel;

(ii) Provide clarification of the meaning of relevant items of text contained in WMO-No. 258, and Supplement 1, including the term “or equivalent” and its application in Supplement 1, and recommend revisions as necessary; and

(iii) Investigate means of enhancing the availability of university-level education opportunities for meteorological personnel;

The Council requested that the status of Supplement 1 to WMO-No. 258 should be reviewed by appropriate WMO bodies, and the implementation plan and any revision recommendations should be presented to EC-LXI for consideration of adoption. The Council therefore proposed that when a final decision on the recommendations would be reached by ICAO and WMO, the Members be informed through a joint letter from the Secretary-General of both Organizations, addressed to the relevant Ministers in order to ensure national action and compliance. The Council welcomed the offer by JMA to contribute to the work of the EC Panel of Expert on Education and Training Task Team.
Annex 4

Relationship of WMO Publication 258 to ICAO Annex 3

ICAO publication Annex 3
(for standards on education and qualifications of aeronautical meteorological personnel see WMO Tech 49)

WMO Technical Regulation 49
(Education and qualifications of aeronautical met personnel, see WMO publication 258)

WMO-No. 258 Guidelines

Supplement 1 to 4th edition of WMO-No. 258
collates and clarifies education and training for aeronautical meteorologists
Suggested approaches for non-accredited institutions to demonstrate that their courses meet the recommended course requirements of WMO-No. 258

The options outlined below provide an indication of some of the ways a training institution could demonstrate that its courses would provide the knowledge necessary to meet the BIP-M requirements in WMO-No. 258 and allow personnel without a degree to be called a WMO Meteorologist. The WMO RTCs are assessed once every eight years. This external assessment is not frequent enough, or usually rigorous enough, to fully satisfy the needs of quality control for the purposes of certifying non-degree personnel attending non-accredited tertiary institutes.

<table>
<thead>
<tr>
<th>Option</th>
<th>Benefits</th>
<th>Disadvantages</th>
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</thead>
<tbody>
<tr>
<td>Seek accreditation of the course as a tertiary or post graduate course and the institution as certified to run the course</td>
<td>This would provide graduates from the course with a university level degree or higher</td>
<td>Costly and lengthy process for an institution to undertake.</td>
</tr>
<tr>
<td>The institution to seek accreditation as a recognised tertiary provider</td>
<td>The institution would be certified as an education and training provider with the quality control and standards of the country. Would make it easier for the provider to claim quality control of the course</td>
<td>Less costly than full accreditation of the course and the course still not accredited.</td>
</tr>
<tr>
<td>Seek partnerships with accredited providers in the host country or elsewhere that recognise the courses run by the institution</td>
<td>Depending on the partnership arrangements this could provide personnel with formal qualifications for some or all of their course work.</td>
<td>Depending on the country and arrangements this may not be practical or desirable from the training institution perspective</td>
</tr>
<tr>
<td>Use an industry based body to oversee the running and evaluation of the course.</td>
<td>Provides some external assessment of the course and the training institution</td>
<td>May not be practical or desirable from the training institution perspective and may be difficult to demonstrate the quality of the course</td>
</tr>
<tr>
<td>Invite outside experts in to regularly review and evaluate the course and provide advice and feedback</td>
<td>Provides some external assessment of the course and the training institution</td>
<td>Costs to the training institution. The independence of the external experts may be questioned</td>
</tr>
<tr>
<td>Institution regularly reviews and evaluate the course and the quality of the personnel seeking input from the employers of the graduated personnel</td>
<td>Demonstrates that the institution has a QMS approach and is striving to maintain standards and meet the needs of its clients</td>
<td>None, this should be done regularly</td>
</tr>
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</table>
Aeronautical Meteorologist competency assessment kit

* Assessment kit
Background knowledge: Utilise the online resources already identified by the CAeM Expert Team on Education, for example - COMET ("Writing TAFS"/ Thunderstorm / Using SkewT-Log P / Satellite imagery….) and associated assessment quizzes; additional material (to be quality controlled) from other sources such as RTCs and Members training centres

Collecting Evidence:
- Assessment sheets to be completed by aeronautical meteorologists on shift to be submitted to local or Regional assessor (assess Supplement 1 competencies)
- Portfolio of forecasts to be collected over an agreed period of time and assessed by local or Member assessor
- Aeronautical Meteorologists conduct Weather discussion online utilizing groups like the WMO Virtual Laboratory to demonstrate a subset of WMO Supplement 1 competencies
- Phone interviews

Time frequency: Ideally each aeronautical meteorologist is assessed once every 5 years which fits with the periodicity of the ICAO Universal Safety Oversight Audit inspections.

To speed up the process of creating the assessment and learning kits it would:
- Require a project manager to strategically manage the process and work with RTC or NMHS people;
- Identify a Member stakeholder that can facilitate the process in their area.
  - Identify a potential assessor in each office or
  - Write implementation plans for each Office in their region
  - Help with assessments
- Utilize existing standards (which may be evolving as they are "living documents")
- Utilize existing resources (Conduct an audit of resources that can be used to support the process).

Project manager works with Member stakeholders to assemble assessment "kit"*.

After assessment kit* resources are assembled conduct centralized train-trainer meeting with Member stakeholders to run them through the assessment process.
## Key time frames

<table>
<thead>
<tr>
<th>Date</th>
<th>Organization</th>
<th>Action</th>
</tr>
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<tbody>
<tr>
<td>Feb 2009</td>
<td>TT-AFQ</td>
<td>Commence work on assessment and documentation kit</td>
</tr>
<tr>
<td></td>
<td>ETR</td>
<td>Provide report to EC Panel on TT-AFQ and commence revision of WMO-No. 258</td>
</tr>
<tr>
<td></td>
<td>ETR / AEP</td>
<td>Draft input for EC-LXI</td>
</tr>
<tr>
<td></td>
<td>CAeM ET/ET</td>
<td>Review WMO-No. 258 Supplement 1 competencies</td>
</tr>
<tr>
<td>June 2009</td>
<td>EC-LXI</td>
<td>Requested to endorse TT-AFQ recommendations</td>
</tr>
<tr>
<td>November 2009</td>
<td>TT-AFQ</td>
<td>First draft of assessment and documentation kit for review by CaeM ET on ETR</td>
</tr>
<tr>
<td></td>
<td>CaeM ET on ETR</td>
<td>to recommend updated competencies for inclusion into an annex in WMO-No. 49</td>
</tr>
<tr>
<td></td>
<td>EC Panel TT-AFQ on Distance Education</td>
<td>First meeting</td>
</tr>
<tr>
<td>February 2010</td>
<td>CaeM</td>
<td>Review recommendations and work of CaeM ET on ETR and work of TT-AFQ. Provide EC Panel with recommendations, comments and suggestions on WMO-No. 258. Agree changes to WMO-No. 49 and suggested implementation timeframes</td>
</tr>
<tr>
<td>March 2010</td>
<td>EC Panel</td>
<td>Approve the draft of the 5th Edition of WMO-No. 258</td>
</tr>
<tr>
<td></td>
<td>ETR Office</td>
<td>Draft of 5th edition circulated to members for comment</td>
</tr>
<tr>
<td>June 2010</td>
<td>EC-LXII</td>
<td>Approve 5th edition of WMO-No. 258</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Address the financial implications associated with the implementation of the qualifications standard in WMO-No. 49 in Nov 2013</td>
</tr>
<tr>
<td>Nov 2010</td>
<td>WMO / ICAO</td>
<td>Amend 75 to ICAO Annex 3 active, WMO Technical Regulations include statement on qualifications but not enforceable</td>
</tr>
<tr>
<td></td>
<td>ETR</td>
<td>XI WMO ETR Symposium addresses issues associated with new implementation of WMO-No. 258</td>
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</table>
First Meeting of the (EC Panel of Experts on Education and Training) Task Team on Aviation Forecaster Qualifications

<table>
<thead>
<tr>
<th>Year</th>
<th>Organization</th>
<th>Details</th>
</tr>
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<tbody>
<tr>
<td>Nov 2013</td>
<td>WMO / ICAO</td>
<td>WMO-No. 49 mandate competency assessment</td>
</tr>
<tr>
<td>Nov 2016</td>
<td>WMO / ICAO</td>
<td>WMO-No. 49 mandate new definition of WMO Meteorologist</td>
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