AERODROME METEOROLOGICAL OBSERVATION AND FORECAST STUDY GROUP (AMOFSG)

NINTH MEETING

Montréal, 26 to 30 September 2011

SUMMARY OF DISCUSSIONS

1. HISTORICAL

1.1 The ninth meeting of the Aerodrome Meteorological Observation and Forecast Study Group (AMOFSG) was held at the Headquarters of the International Civil Aviation Organization (ICAO) in Montréal, Canada, 26 to 30 September 2011.

1.2 The meeting was opened by Mr. Greg Brock, Chief of the Meteorology Section of the Air Navigation Bureau of ICAO. Mr. Brock reminded the group of the extensive workload ahead of them and, in noting the diverse nature of the agenda items to be presented, wished the group well in their discussions for the coming week.

1.3 The names and contact details of the participants are listed in **Appendix A**. Mr. Bill Maynard was elected Chairman of the meeting. The meeting was served by the Secretary of the AMOFSG, Mr. Neil Halsey, Technical Officer in the Meteorology Section.

1.4 The meeting considered the following agenda items:

1) Opening of the meeting;

2) Election of Chairman;

3) Adoption of working arrangements;

4) Adoption of the agenda;

5) Observing and forecasting at the aerodrome and in the terminal area;

5.1) Observations, and

5.2) Forecasts; and

6) MET information to support air traffic management (ATM);

7) Transition to table-driven codes;

8) Future work programme – deliverables;

9) Any other business, and

10) Closure of the meeting.

1.5 A list of study notes and information papers issued for the meeting is given in **Appendix B**.

2. AGENDA ITEMS 1 TO 4: OPENING OF THE MEETING; ELECTION OF CHAIRMAN; ADOPTION OF WORKING ARRANGEMENTS; ADOPTION OF THE AGENDA

2.1 These items are covered under Section 1: Historical.

3. AGENDA ITEM 5: OBSERVING AND FORECASTING AT THE AERODROME AND IN THE TERMINAL AREA

3.1 Aerodrome observations

General considerations

3.1.1 The group recalled that some concerns had been expressed at the AMOFSG/8 Meeting on behalf of operators relating to Annex 3 — *Meteorological Service for International Air Navigation*, 2.3.3 which required them to report flight schedules, non-scheduled operations and cancellations to the meteorological office concerned. It had been noted that, in many large aerodromes, this provision had been impractical, and it had been agreed that this provision should be reworded accordingly, placing emphasis on the need for up-to-date information concerning the requirements for meteorological information, and placing the onus on the meteorological authority to establish those needs rather than the operators themselves. (Action Agreed 8/6 refers). This had been regarded as being in conflict with the title of Annex 3, 2.3 which called for action from the operators. The suggested solution provided in **Appendix C** retained the onus on the operator but removed the requirement to notify of individual changes in operator schedules, and sought that the operator ensured that the meteorological offices are aware of schedules rather than necessarily directly providing them. This modification will form a compromise between those operators in highly developed States, and the needs of the meteorological services in the developing world. The group agreed to formulate the following action:

RSPP	**Action Agreed 9/1 — Updating of Annex 3, 2.3.3 relating to the requirements for meteorological information by operators** That a proposal to modify Annex 3, 2.3.3 to simplify the need to establish and maintain the up-to-date requirements for meteorological information, as provided in Appendix C, be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.2 The group recalled that the AMOFSG/8 Meeting had tasked an ad hoc group (WG/2) with studying the use of the term "representative" in Annex 3 relating to the siting of meteorological instruments and the conduct of observations at aerodromes. This had been done in order to consider whether a number of provisions in Annex 3, Appendix 3 could be upgraded from Recommended Practices to Standards. Further study had also been requested on the provisions relating to the criteria for the issuance of aerodrome special meteorological report (in meteorological code form) (SPECI) for changes in visibility and runway visual range (RVR). The group noted the main findings of WG/2 given below, together with suggestions for appropriate courses of action:

a) the WG/2 had agreed, in principle, with the long-term objective of identifying new standards based upon the current recommendations in paragraphs 1.1 and 1.2 of Appendix 3 to Annex 3. However, for the time being, the most favoured option by the group participants was to maintain the status quo;

b) there had been agreement that the applicable ICAO documents should be reviewed to update and improve their inclusion of essential content found in World Meteorological Organization (WMO) manuals and guides;

c) there had been agreement that the next appropriate step would be to invite the WMO to develop improved manuals and guides suitable for reference from future Standards on these matters;

d) the Secretary should have been invited to consider whether paragraphs 1.1 and 1.2 of Appendix 3 should be moved to Chapter 4 of the Annex;

e) the AMOFSG/9 was asked to consider if a successor ad hoc group should be assigned with reviewing any new WMO manuals or guidance material that may support upgrading paragraphs 1.1 and 1.2 of Appendix 3 to Annex 3 to Standards and / or to consider additional options by which potential new standards may be able to address some of the key underlying intents of these provisions, and

f) there had been no support for new SPECI Standards for changes in visibility or RVR.

3.1.3 The group agreed that the focus of considering the term "representative" had been to examine the possibility of upgrading the particular provisions 1.1 and 1.2 in Annex 3, Appendix 3 to Standards in that these provisions provide overarching requirements for the siting and operation of meteorological instruments at aerodromes. Furthermore, the group agreed that no action should be taken to upgrade these standards without a more careful consideration of the related guidance material provided by both ICAO and the World Meteorological Organization (WMO) in this respect. This was particularly pertinent in the case of WMO No 8 – *Guide to Meteorological Instruments and Methods of Observation* which stated in its preface that it was not intended to be a detailed instruction manual. The group noted that whilst it was important that the WMO guidance material be reviewed it would likely be a slow process owing to the volume of material involved and the limited resources available to carry out the task. The group agreed to the following actions in order to improve the supporting guidance from both organizations in support of the above provisions:

Action Agreed 9/2 — Guidance supporting the siting and operations of meteorological instruments at aerodromes

That the **Michel and Herbert** develop guidance material for inclusion in Doc 9837, *Manual on Automatic Meteorological Observing Systems at Aerodromes* referencing essential content from the appropriate WMO manuals and guides and provide to the **Secretary** by 31 December 2012.

Action Agreed 9/3 — Supporting guidance from WMO on the siting and operation of meteorological instruments at aerodromes - suitable for supporting ICAO standards

That **Herbert** arrange for WMO to develop suitable guidance material that would be capable of supporting ICAO standards on the siting and operation of meteorological instruments at aerodromes.

3.1.4 The group noted some concerns expressed about the potential lack of procedural manuals in States containing working practices and specifications and a corresponding suggestion, which was not supported by the group, that the development and use of such a manual should be a requirement in lieu of supporting guidance from WMO as discussed above.

3.1.5 The group also noted, but did not support, proposals to add specific siting requirements for temperature and atmospheric pressure sensors since specific requirements were not thought to exist over and above the more general requirements already provided in Annex 3, Appendix 3, 1.1 and 1.2.

3.1.6 It was noted that WG/2 had suggested that the provisions discussed above could have been considered for inclusion in Chapter 4 of Annex 3 rather than in Appendix 3. This would imply that these provisions related primarily to the meteorological authority rather than the actual service provision. In consideration of this the group agreed that whilst there was some merit in this course of action, noting that it was hoped that these provisions could be upgraded to Standards in the foreseeable future, it was prudent to wait until this was facilitated before such a change.

3.1.7 The group agreed that further consideration of these and other provisions could take place once the supporting guidance had been developed, and that there was no need for further work in the meantime.

3.1.8 The group also agreed with WG/2 that there was no current requirement for Standards for the specification of SPECI criteria for visibility and RVR.

3.1.9 The group recalled that the AMOFSG/8 Meeting had discussed the definition of aerodrome meteorological office and the difficulties that had been experienced by some States where the offices were not necessarily located at the aerodrome. In Action Agreed 8/12 the Secretariat had been tasked with adjusting the definition to accommodate those States. However, on further examination there were many instances in Annex 3 where the terms aerodrome meteorological office and meteorological office were used interchangeably, with no discernable difference in function. As a result, an amendment proposal was provided in **Appendix C** which was intended to remove all ambiguity by only referring to

the term aerodrome meteorological office throughout Annex 3, whilst removing the need for that office to be located at the aerodrome in the definition. The group agreed the following action:

RSPP **Action Agreed 9/4 — Updating of Annex 3 relating to the naming and location of meteorological offices**

That a proposal to modify Annex 3 by rationalizing the naming and functions of meteorological offices as provided in Appendix C be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.10 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/4 had tasked the Secretary with providing some limited guidance in the *Manual of Aeronautical Meteorological Practice* (Doc 8896) concerning the reporting steps for cumulonimbus (CB) and towering cumulus (TCU) with bases above 3 000 m (10 000 ft). The group noted that the revised version of Doc 8896 was scheduled for publication imminently.

3.1.11 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/19 had sought guidance on the distance from the aerodrome to be used for the automatic reporting of cloud, particularly CB and TCU. The group noted that guidance to this effect has been included in the now published Doc 9837.

3.1.12 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/2 had requested a report into the use of an array of ceilometers stemming from studies that had been carried out in Austria and the Netherlands. Details of the studies and corresponding conclusions were provided. The main results of the studies indicated that the benefits of such systems would be markedly different depending on the traffic mix at the aerodrome, with the greatest benefits derived where a significant number of visual flight rules (VFR) flights and/or specific missed approach procedures were in place (typical in areas of complex terrain). The group agreed that it would be premature to consider amendments to the Annex 3 provisions at that stage, but that some guidance material could be considered to assist States in the use and benefits of such a system. To this end the group agreed the following action:

Action Agreed 9/5 — Guidance material on the use and benefits of an array of ceilometers at aerodromes

That **Herbert, Jarmo and Michel** develop guidance material for inclusion in Doc 8896 and/or Doc 9837 relating to the use and benefits of an array of ceilometers at an aerodrome by 31 December 2012.

3.1.13 The AMOFSG/8 Meeting, in its Action Agreed 8/7, had requested that guidance be sought on the precise meaning of the term “approach area” with particular regard to the requirements for the observing and reporting of clouds in local reports. The group noted that there was no definition of approach area in any ICAO document, nor was the term used outside of the context of the Annex 3, 4.6.5.2. The group agreed that the ideal solution would be to find a more appropriate term in the provision concerned rather than attempting to define approach area. However, the group agreed that finding a suitable term was challenging with only two possibilities known to the Secretary, i.e. final approach and protected area which were both problematic. The term final approach was defined using the final marker where instrument approach procedures were in place, but otherwise, was wholly dependent on each

individual flight procedure, and thus would change dependent on the traffic mix and approach sequences being used at a particular aerodrome. Similarly, the protected area did define an area but that area depended on the landing procedures being used and varied markedly between instrument procedures and visual procedures. The group agreed that, in view of the above difficulties, it was be more appropriate to redefine the domain for the reporting of cloud in local reports to correspond to that of METAR/SPECI, which would remove any ambiguity without incurring any additional costs. Therefore, the group agreed the following action:

RSPP **Action Agreed 9/6 — Reporting domain for cloud in local reports**

That a proposal to modify Annex 3 to specify that the domain for the reporting of cloud in local reports should be the aerodrome and its vicinity as provided in Appendix C be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.14 A proposal was made to the group to consider upgrading the SPECI criteria for sandstorm and duststorm to a Standard to align it with the TAF amendment criteria. A similar proposal was also made for the development of a SPECI criterion for rapid pressure changes, which was a particular issue relating to Remote Altimeter Setting Sources (RASS) where QNH values were issued automatically from remote points from the destination aerodrome at times, and there was no information available on a rapid pressure changes that may have occurred since the last update, all occurring in uncontrolled airspace.

3.1.15 The group felt that to upgrade the sandstorm and duststorm criteria to a standard was somewhat premature as the criteria for identifying moderate versus heavy sandstorms and duststorms was only being proposed by this meeting and had therefore not been implemented widely. It was anticipated that once some operational experience had been developed, then this proposal could be reconsidered in the future. Similarly, the group felt that it was premature to include rapid pressure changes in the SPECI criteria, but suggested that the consideration of this as a future requirement alongside temperature corrections should be included in the work of the MARIE-PT (Action Agreed 9/36).

Wind reporting

3.1.16 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/18, in part, had sought guidance on the wind assessment system being used at Hong Kong International Airport. The group noted that guidance to that effect had been included in Doc 9837.

3.1.17 The group recalled that considerable discussion had taken place at the AMOFSG/8 Meeting regarding the calculation of crosswind and tailwind components with particular reference to the inclusion of gusts in such calculations. In its Action Agreed 8/3 the group had established an ad hoc group (WG/1) to work towards developing guidance material to assist in this regard with a four step process given below:

a) review existing regulatory material;

b) consider existing algorithms;

c) propose suitable algorithms, and

d) report action to the AMOFSG/9 Meeting.

3.1.18 The group noted the detailed results of the work of WG/1. In summary, four suggested methodologies were provided by WG/1 which could have been used as guidance material in the calculation of crosswind and tailwind components, although each of these proposals carried certain advantages and corresponding disadvantages. In other words, none of the methods suggested provided a perfect solution and had varying degrees of ease of implementation, versus varying degrees of meeting the user needs which remain imperfectly defined. The four methods are outlined below for ease of reference:

a) take the highest 3-second mean assessed in the past 10 minutes, and note the corresponding 3-second mean wind direction and use this information to calculate the crosswind and tailwind;

— **advantage**: Easy to implement using existing sensors and systems.

— **disadvantage**: The 3 second mean wind direction at the time of the recorded gust value may deviate vastly from the 10 minute mean wind direction and could well be in an opposing direction to that of the mean crosswind or tailwind gust value.

b) take the highest 3-second mean wind speed in the past 10 minutes and note the 10 minute (or 2 minute if usage is required within the aerodrome) average mean wind direction;

— **advantage**: Easy to implement using existing sensors and systems.

— **disadvantage**: This would mean that a different crosswind or tailwind gust value would be provided depending on the averaging period.

c) take the highest 3-second mean wind speed in the past 10 minutes and note the 10 minute wind direction. Use these speed and direction values to resolve the crosswind and tailwind values;

— **advantage**: Easy to implement using existing sensors and systems.

— **disadvantage**: This would use the 10 min mean wind direction in calculating the crosswind and tailwind gust value for use within the aerodrome; and

d) record all the highest 3-second mean wind speeds along with their corresponding 3 second mean directions for the last 10 minutes. For each set of mean wind speed and direction firstly derive the crosswind and tailwind components. Then use the maximum wind speed and corresponding direction values in the past 10 minutes to derive the crosswind and tailwind gust components.

— **advantage**: This should ensure that the gust values are using the appropriate wind direction and will provide the highest values of crosswind and tailwind gust over the previous 10 (or 2) minute period.

— **disadvantage**: The calculation becomes more complicated, the reported crosswind and tailwind are calculated independently and they may occur at different times.

3.1.19 It was also suggested that a paper or statement be developed for the Air Traffic Management Requirements and Performance Panel (ATMRPP) to alert them of the issues involved and suggest their input to assist in the development of the most appropriate solution from the user perspective. The group agreed that it would be more pertinent to establish the user needs from the perspective of the pilot, Aircraft Certification Agencies as well as the air traffic management (ATM) community. Initially views would be sought from the pilot community through the Operations Panel (OPSP) since they had previously discussed similar issues stemming from the OPSP/6 Meeting held back in September 2003. The group noted the following example of user difficulties provided to the OPSP/6 Meeting where an accident had occurred in the Netherlands:

a) runway in use: RW19;

b) reported wind: 220/30;

c) expected crosswind angle: 30°;

d) expected crosswind component: 15 kt;

e) actual crosswind angle: 59°, and

f) actual crosswind component: 37 kt (pilot not notified).

3.1.20 Paraphrasing the paper presented to the OPSP/6 Meeting, this major difference in reported versus observed wind had stemmed from the facts that variation in wind direction was not reported unless it was greater than 60°; gusts were not reported unless 10 kt greater than the mean wind speed, and also desirable level of accuracy allowed for a 10 per cent error in measurement. It should also be argued that the siting of the anemometer was only representative of the touchdown zone in as far as can be achieved practically at any aerodrome. The proposed solution by the OPSP is provided at **Appendix D** which involved an amendment to the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444). The proposal contained a number of requirements which should be met in runway nomination, when the criteria for crosswind and tailwind components are 20 kt for the crosswind component and 7 kt for the tailwind component, instead of the prescribed 15 kt for the crosswind and 5 kt for the tailwind component. The group noted the significant parts of this proposal at i), ii) and iv) which included the data processing and interpretation of wind sensor measurements, and the inclusion of the reporting of gusts 5kt greater than the mean speed, as well as a statement that it shall be ensured that crosswind or tailwind values do not exceed the certified limits for the aircraft concerned. Furthermore, a Standard was then set which required the accuracy specified in guidance material (Attachment A to Annex 3) which would lead to legal difficulties in ICAO provisions. The group agreed that the operational problems highlighted by the OPSP needed to be addressed but that the solution proposed was not ideal, and that a more appropriate reporting mechanism for winds and gusts, in particular for local reports, would go some way to alleviate these difficulties. The group further noted proposals for the calculation and the reporting of crosswind and tailwind components in the METAR/SPECI and local reports. The group felt that further study was necessary taking all of the proposals into consideration. To achieve this, the group agreed that an ad hoc group should continue to work on developing appropriate guidance and/or provisions. The core work of the group would be as follows:

The group will review:

a) the most appropriate manner to calculate cross and tail wind incorporating gusts. This will involve a study using a set of historic wind data and by using a wind simulation

model (as used to define JAR –AWO material (European regulatory material)) to understand the sensitivities in cross and tail wind reports;

b) the feasibility of providing cross and tail wind information in local routine and local special reports; and

c) the provision of significant changes of cross and tail wind information noting the significant changes detailed in PANS ATM, 6.6.4 a).

3.1.21 The group noted that there was currently no requirement to provide a local special report for 5 kt gusts when required at aerodromes where noise abatement procedures were applied (Annex 3, Appendix 3, 4.1.5.2.c) refers). However, there was a provision (Annex 3, Appendix 3, 2.3.2 b)) to generate a local special report for a gust increase of 10 kt or more since the last report, but not 5 kt. Furthermore it was agreed that the current provision for the reporting of gusts in METAR/SPECI should reflect that SPECI should be issued when the variation from the mean **changed** rather than **increased** by 10kt. The group agreed the following action:

RSPP **Action Agreed 9/7 — Reporting of gusts in local special reports and SPECI**

That a proposal to modify Annex 3 for the issuance of local special reports and SPECI for variations in the mean wind speed, as provided in Appendix C, be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.22 In addition, the group will seek views of the OPSP, the ATMRPP and the aircraft certification bodies to better understand the requirements and responsibilities for the provision of crosswind and tailwind information. This should include how the information is to be used in order to ensure the most appropriate calculation method is employed, and how best this information should be disseminated to users.

3.1.23 It was noted that the OPSP was to meet in Montréal during the week following the AMOFSG/9 Meeting, and that it was opportune to provide a statement that could be passed to the OPSP by the **Secretary** that would modify the proposed action by the OPSP, and seek support for and assistance in developing a further course of action to address the problems highlighted in the reporting of crosswind and tailwinds incorporating gusts. In summary, the group agreed the following actions:

Action Agreed 9/8 — Guidance and/or provisions to enable a more appropriate calculation of crosswind and tailwind components

That an ad hoc group (WG/1) consisting of **Colin, Jan and PW (with an invitation to the OPSP to nominate)** develop appropriate guidance material and/or proposals to amend the ICAO provisions to enable a more appropriate calculation of crosswind and tailwind components, with particular reference to the inclusion of gusts, and provide a report by 11 January 2013 for consideration by the group.

Action Agreed 9/9 — AMOFSG Statement to be presented to the OPSP 13th Working Group of the Whole Meeting

That the **Secretary** present a statement from the AMOFSG to the OPSP 13th Working Group of the Whole Meeting to suggest that the modified version of the PANS-ATM amendment proposal at **Appendix E** be proposed to the ANC and to seek OPSP involvement in the Action Agreed 9/8.

3.1.24 The group also noted a report on the criteria used in the Netherlands for obstacle induced wind disturbances, with values being identified for the allowable wind disturbances due to structures for use in planning at the aerodrome. Any planned structures exceeding the criteria would be subject to additional testing for wake effects. The group agreed that the information provided, although not subject to ICAO provisions, would nevertheless be useful to any States planning new structures, and the group formulated the following action accordingly:

Action Agreed 9/10 — Guidance on the criteria used for obstacle induced wind disturbances

That **Jan** and **PW** develop brief guidance material for inclusion in Doc 8896 on the criteria used for obstacle induced wind disturbances, to assist States in the planning of buildings at aerodromes by 31 December 2012.

3.1.25 The group noted an inconsistency in Annex 3, Attachment C with the averaging period used for the evaluation of gusts in local reports, and formulated the following action accordingly:

RSPP **Action Agreed 9/11 — Averaging period for evaluating gusts in local reports**

That a proposal to modify Annex 3, Attachment C to correct the averaging period used for gusts in local reports, as provided in Appendix C, be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

Visibility and runway visual range (RVR) reporting

3.1.26 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/16 had tasked the **Secretary** to verify the use of visibility and the use of conversion factors from visibility to runway visual range (RVR) in the *Manual of All-Weather Operations* (Doc 9365). The group noted that these conversion factors had been included in a proposed amendment to this manual and that they have been removed as the conversions being used had been incorrect (they had attempted to convert from meteorological optical range rather than from aeronautical visibility, which was not available to aeronautical users). The amended version of Doc 9365 was yet to be published and the current version of the document was unaffected by this change.

3.1.27 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/17 had tasked the **Secretary** with ensuring the consistency between the assessment heights for RVR given in Annex 3, and those recommended in the *Manual of Runway Visual Range Observing and Reporting Practices* (Doc 9328). Annex 3, Appendix 3, 4.3.1.1 gave the assessment height as 2.5 m (7.5 ft) above the runway,

which coincides with the height recommended in Doc 9328, 5.4 for instrumented systems. However, Doc 9328, 5.4 also recommended that a human observer should carry out the assessment from an eye height of 5m (15 ft), to be coincident with the average position of the pilot. Furthermore, the group acknowledged that, whilst permissible to assess RVR without the use of instruments, it was not preferable to do so, and it was agreed that specific reference to the human assessment of RVR should not be included in Annex 3, and that the guidance contained in Doc 9328 was sufficient. The group agreed that Annex 3, Appendix 3, 4.3.1.1 should be amended accordingly to correct the anomaly without specific mention of the human assessment of RVR, and agreed the following action:

RSPP **Action Agreed 9/12 — Updating of Annex 3 relating to the assessment height for runway visual range**

That a proposal to modify Annex 3, Appendix 3, 4.3.1.1 to add that the appropriate assessment height only relates to automated systems, as provided in Appendix C, be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.28 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/14 had tasked the **Secretary** with developing an amendment to Annex 3 for the SPECI criteria for RVR to coincide with the operational thresholds identified in Annex 6 — *Operation of Aircraft* for the categories for precision approach and landing operations. Furthermore, it was brought to the attention of the group that the provisions relating to the reporting of marked discontinuities in RVR should be brought into line with those thresholds with the exception of 50 m which was considered impractical. In addition, the group agreed that owing to the complex nature of the provisions concerning marked discontinuities in RVR, it would be useful to develop additional guidance in this respect. The group agreed the following actions:

RSPP **Action Agreed 9/13 — Updating of Annex 3 relating to the SPECI criteria for runway visual range**

That a proposal to modify Annex 3, Appendix 3, 2.3.3 c) to be aligned with the Annex 6 categories for precision approach and landing operations as, provided in Appendix C, be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

Action Agreed 9/14 — Guidance on the reporting of marked discontinuities in RVR

That **Michel** and **Jarmo** develop guidance on the reporting of marked discontinuities in RVR for inclusion in Doc 9328 by 31 December 2012.

3.1.29 The group recalled that the AMOFSG/8 Meeting, in its Action Agreed 8/15, had tasked the **Secretary** to ensure that references to RVR versus runway visual range were consistent throughout Annex 3, as the terms appeared to be used interchangeably without any logical introduction to the abbreviation. The group agreed that the most appropriate solution is to avoid the use of the abbreviation RVR (aside from the code tables in Appendix 3 and Appendix 5) as this would avoid any possible confusion and agreed the following action accordingly:

RSPP **Action Agreed 9/15 — Updating of Annex 3 relating to the use of the terms runway visual range and RVR**

That a proposal to modify Annex 3 to only refer to runway visual range rather than the abbreviation RVR, as provided in Appendix C, be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.30 The group noted some concerns expressed about the reporting of variations in RVR and, in particular when SPECI are reported, since any significant variations would already be captured by the use of a tendency making the additional reporting of those variations redundant. It was also noted that the provision relating to the reporting of these variations was complex and likely to be confusing to the user. The group therefore agreed that this provision should be deleted along with its associated note. The group formulated the following action:

RSPP **Action Agreed 9/16 — Updating of Annex 3 relating to the reporting of variations in RVR**

That a proposal to modify Annex 3 to remove the need for reporting variations in RVR, as provided in Appendix C, be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.31 The group was informed of some difficulties being experienced where operating minima were being applied including the value of 1 600 m for visibility. It was noted that the majority of States use a threshold of 1 500 m and that this small difference was causing some operational difficulties in the State concerned. It was suggested that this value had been used in the ICAO Doc 9365 and the group agreed that, before taking any further action, some clarification would be needed regarding the criteria provided in this document. Therefore, the group agreed the following action:

Action Agreed 9/17 — Operating minima suggested in Doc 9365

That the **Secretary** investigate the operating minima suggested in Doc 9365 including the most recent update and report back to the next meeting of the group.

3.1.32 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/18, in part, had sought guidance on the thunderstorm reporting system being used at Hong Kong International Airport. The group noted that guidance to that effect had been included in Doc 9837.

3.1.33 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/5 had sought guidance on the reporting of fog in low temperatures (below minus 30° Celsius) where no water sources were present, to indicate that freezing fog need not be reported under such circumstances since no icing hazard would exist. The group noted that guidance to that effect had been included in Doc 8896.

3.1.34 The group noted that a few editorial changes with regard to the referencing of Annex 3, Appendix 3, 4.4.2.5 and 4.4.2.6 had been brought to the attention of the **Secretary.** The group agreed the following action to correct these omissions:

RSPP **Action Agreed 9/18 — Updating of Annex 3 relating to editorial omissions regarding the referencing of Annex 3, Appendix 3, 4.4.2.5 and 4.4.2.6**

That a proposal to modify Annex 3, Appendix 3 to correct omissions concerning the referencing of Annex 3, Appendix 3, 4.4.2.5 and 4.4.2.6 as provided in Appendix C be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.35 The group recalled that at the AMOFSG/8 Meeting it had been noted that some States in the European Air Navigation Planning Group (EANPG) (Conclusion 51/27) had expressed some concern over the reporting of volcanic ash (VA) in METAR and SPECI in relation to ash deposition on the runway surfaces. It had been further noted that volcanic ash contamination of the runway could be reported using NOTAM and ASHTAM but that this had not been possible using the runway state group in METAR/SPECI. The group noted that since the AMOFSG/8 Meeting this issue had been raised with the Runway Friction Task Force which formed a part of the Aerodromes Panel (AP). This task force was intended to study the reporting of runway contamination with a view to providing a consistent global approach for the future. To ensure that the meteorological components were considered there was to be representation in the task force from the MET Section in ICAO. The group agreed that no action should be taken concerning the requirements for the reporting of volcanic ash deposition although it was agreed that in light of the recent experiences in Japan a report on issues encountered would be useful. The group therefore formulated the following action:

Action Agreed 9/19 — Report on volcanic ash reporting issues

That **Jun** provide a report on reporting issues encountered in Japan concerning volcanic ash and its deposition at aerodromes in particular for consideration by the group at the next meeting.

3.1.36 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/9 had tasked the **Secretary** with developing an amendment proposal to Annex 3 to allow States to opt out of reporting recent weather phenomena in the supplementary information of local reports and METAR/SPECI if they were issuing local special reports and SPECI. This had been under the supposition that a local special report and SPECI would be issued in the event of a significant change in the meteorological conditions that would render the recent weather information redundant. The group therefore agreed the following action:

RSPP **Action Agreed 9/20 — Updating of Annex 3 relating to the need for reporting recent weather in local reports and METAR/SPECI where local special reports and SPECI are issued**

That a proposal to modify Annex 3, Appendix 3 to allow States to cease reporting recent weather in local reports and METAR/SPECI where local special reports and SPECI are issued as provided in Appendix C be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.37 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/10 had requested that a report be provided concerning any additional information that could be provided by the WMO Commission for Basic Systems (CBS) regarding the distinction between moderate and heavy sandstorms/duststorms. The group noted that some discussion on this subject had taken place within the Meteorological Warnings Study Group (METWSG) which had been discussing identical issues regarding SIGMET. The group noted that the METWSG had agreed that the same criteria should be used for SIGMET and decided by the AMOFSG in respect of METAR/SPECI, local reports and TAF with the exception that an areal extent should be included as an additional requirement for SIGMET and AIRMET. It was noted by the group that no significant progress had been made in this regard by WMO since the AMOFSG/8 Meeting but that WMO was supportive of the operational practice adopted by Bahrain where simple visibility and sky obscuration criteria were used. The group therefore agreed that the practice used in Bahrain could be adopted in Annex 3 that would assist in the provisions for SIGMET and AIRMET and that appropriate guidance should be developed to be used in Doc 8896 that would correspondingly apply to METAR/SPECI, local reports and TAF. As a result the following actions were agreed:

RSPP **Action Agreed 9/21 — Updating of Annex 3 relating to the criteria for moderate and heavy sandstorm/duststorm**

That a proposal to modify Annex 3 to develop criteria for moderate and heavy sandstorm/duststorm as provided in Appendix C be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.38 The group noted that the METWSG/3 Meeting which had been held in Montréal, 15 to 18 November 2010 in its Action Agreed 3/6 tasked IATA with providing feedback on the continuing need, or otherwise, of the separate reporting of dust and sand. In summary the group noted that there was a firm user requirement to continue to report and forecast dust and sand separately and as such there was no requirement to change the Annex 3 provisions in this regard. Further recommendations were provided concerning the science to clearly differentiate the impact of sand versus dust on airframes and engines and the flight operations approach regarding sand and dust versus volcanic ash. The group agreed that in principle it was important to maintain the separation of duststorm and sandstorm as a result of the user input provided.

3.1.39 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/13 had established an ad hoc group (WG/3) to study the observation of present weather and other phenomena by automatic systems with a view to identifying the need for any changes to the requirements in Annex 3 or associated guidance material. In summary, some proposals were made with regard to the reporting of missing information for the various elements in METAR/SPECI and local reports and for the minimum common standard for reporting present weather in Annex 3, 4.1.5 and 4.6.4.1.

3.1.40 Proposals were considered for the introduction of additional codes in local reports and METAR/SPECI to indicate the unserviceability of the sensors such as WINDNA, VISNA and CLDNA etc for METAR/SPECI and corresponding WIND NA, WINDDIR NA and VIS NA in local reports. The group felt on reflection that the introduction of these new codes whilst they would provide a more precise set of information they would also carry considerable software modification costs and could potentially give the impression that systematic reporting of missing information was acceptable rather than a temporary situation in the event of a sensor failure. It was noted that solidi "/" were widely used for several meteorological elements in such reports without any problems being made known to States or the Secretariat. The group therefore agreed that solidi should be included in Annex 3 to indicate the failure of present weather sensors as this would provide a solution at negligible or no cost from the software

development standpoint. It was further agreed that whereas a temporary sensor failure can be communicated through the use of solidi in the METAR/SPECI or local report it would be ideal to have specific information in relation to the failure provided by the use of NOTAM. To this end the group agreed that some limited guidance should be provided to States to encourage the use of NOTAM under these circumstances.

3.1.41 In order to update Annex 3, 4.1.5 and 4.6.4.1 more appropriately with the capabilities of fully automatic systems the group considered the ability of automatic systems to differentiate between rain, drizzle and snow as well as the identification of haze and mist as suitable candidates to be explicitly listed in Annex 3, 4.6.4.1 which provides for the minimum requirements for the identification of present weather. However, it was also noted that some shortcomings were in evidence concerning the identification of present weather in the vicinity, which was agreed to be removed. In relation to the requirements for Cat II and Cat III operations it was considered appropriate to add present weather to the list of automated equipment as prescribed in Annex 3, 4.1.5. The group agreed the following action:

RSPP **Action Agreed 9/22 — Updating of Annex 3 relating to the reporting of present weather by automatic observing systems**

That a proposal to modify Annex 3, Appendix 3 to update the requirements for the reporting of present weather in view of the capabilities of automatic observing systems as provided in Appendix C be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.42 The group recalled that the AMOFSG/8 Meeting had discussed the potential need for reporting wave height in the supplementary information in METAR/SPECI in place of the state of sea which had not met the needs of at least one State in terms of the level of accuracy requirements. The group had noted that the costs of changing the METAR/SPECI code to meet this new requirement would be high and had requested that a common position be sought from other States that operate in the North Sea area where this issue had arisen. The group was pleased to note that the European Air Navigation Planning Group (EANPG) in its Conclusion 52/32 had since requested that ICAO consider the use of significant wave height as an alternative to state of sea. The EANPG had noted that a MetSAO North Sea alliance consisting of a number of States that operated in the North Sea had reached a mutual position that this change would be beneficial. However, the group also wish noted that the EANPG had noted the opinion that this change would have had no bearing on those States not operating in the North Sea environment. On balance the group agreed that this change should be facilitated and formulated the following action:

RSPP **Action Agreed 9/23 — Updating of Annex 3 relating to the inclusion of significant wave height in the supplementary information of METAR/SPECI**

That a proposal to modify Annex 3, Appendix 3 to allow States the option of reporting significant wave height in the supplementary information of METAR/SPECI as provided in Appendix C be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.43 Proposals were presented to the group to delete the requirement for the reporting of vertical visibility, ice crystals and showers in METAR/SPECI and local reports.

3.1.44 Concerning vertical visibility, mixed views were expressed by the group with extensive use of it being made in some States and no use whatsoever in others. It was felt by some that vertical visibility was able to act as a surrogate for the height of cloud base where that height could not be established whereas others believed it to provide a misleading value that should not be used to make operational decisions. To this end some States reported a height of cloud base at zero with a vertical visibility coded as VV/// or missing vertical visibility measurement indicating sky obscured. Owing to the lack of a clear view it was agreed that members of the group should be invited to establish user requirements from their respective States and to provide reports for the next meeting of the group. Therefore, the group formulated the following action:

Action Agreed 9/24 — User requirements for the reporting of vertical visibility

That **Members** provide reports on the operational requirements in their respective States or from their respective user organizations for the reporting of vertical visibility.

3.1.45 The group was satisfied that there was no operational requirement for the reporting of ice crystals as the only potential hazard associated with ice crystals was the obscuration which would always be reported as fog should the visibility be reduced sufficiently. The group also noted that this removal would also apply to TAF and trend forecasts. The group therefore formulated the following action:

RSPP **Action Agreed 9/25 — Updating of Annex 3 relating to the removal of "ice crystals" as a present weather element**

That a proposal to modify Annex 3, Appendix 3 to remove "ice crystals" as a present weather element in METAR/SPECI and local reports and TAF and trend forecasts as provided in Appendix C be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.46 The group had mixed views on the operational requirements for reporting showers although it was agreed that showers were difficult to observe using automatic systems and that in many cases such systems actually reported intermittent precipitation as showers. It was acknowledged that the convective nature of the atmosphere was reported by means of the cloud type, namely TCU and CB. This led the group to consider what the aeronautical requirement was for the reporting of showers other than to report intermittent precipitation in meteorological reports in general. The group noted that the actual reporting of intermittent precipitation in METAR and SPECI had ceased as a part of Amendment 70 to Annex 3 which became applicable on 1 January 1996. As a result the group agreed that an ad hoc team should be created to establish what the user requirement was for the reporting of showers and intermittent precipitation. The group formulated the following action:

Action Agreed 9/26 — User requirements for the reporting of intermittent precipitation

That an ad hoc group (WG/2) consisting of **Colin (rapporteur), Carole, [IATA], Keith, Steve, Michael** and **Bill** establish the user

requirements for the reporting of intermittent precipitation and showers and provide a report for the next meeting of the group.

Cloud

3.1.47 The group was informed that situations had been experienced where thunderstorms had been detected in the vicinity of an aerodrome by the use of an automatic system but that no cloud was detected at the aerodrome. This had given rise to some difficulties regarding how to report the cloud with one option being to report VCTS NCD and the other option to report VCTS //////CB which would imply the presence of CB rather than detect it directly. It was noted that the former choice was the most accurate assessment of the real situation but it was also reflected that human observers would often infer the presence of CB in the presence of thunderstorms where the cloud base was obscured. The group agreed that some guidance would be beneficial and agreed the following action accordingly:

Action Agreed 9/27 — Guidance on the reporting of undetected cloud where thunderstorms are detected in the vicinity by automatic systems

That **Michel** develop brief guidance material for inclusion in Doc 9837 on the reporting of undetected cloud where thunderstorms are detected in the vicinity by an automatic system by 31 December 2012.

3.1.48 A paper was presented to the group outlining further detailed corrections needed in Annex 3 regarding the reporting of cloud. Firstly, a simplification was agreed in the use of solidi for the reporting of missing values i.e. that the individual cases of cloud amount and the height of cloud base should be treated separately as the availability of information about each was independent. Furthermore it was agreed that the number of compulsory digits available for the reporting of the height of cloud base and for vertical visibility were too high. The group formulated the following action accordingly:

RSPP **Action Agreed 9/28 — Updating of Annex 3 relating to the formatting of cloud information in local reports and METAR/SPECI**

That a proposal to modify Annex 3, Appendix 3 to modify the formatting of cloud information in local reports and METAR/SPECI as provided in Appendix C be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.1.49 The group was presented with a number of editorial corrections to Annex 3, Tables A3-1 and A3-2 relating to the footnotes in the respective tables. The group therefore formulated the following action:

RSPP **Action Agreed 9/29 — Updating of Annex 3 relating to the footnotes in Tables A3-1 and A3-2**

That a proposal to modify Annex 3 relating to the footnotes in Tables A3-1 and A3-2 as provided in Appendix C be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.2 **Aerodrome forecasts**

3.2.1 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/22 had tasked the **Secretary** with developing an Annex 3 amendment proposal relating to the issuance of TAF and the continuation of TAF through non-operational hours by the use of NOFCST through a period of non-operation bearing in mind the stated IATA requirement for global 24/30 hour TAF. Reservations were expressed by the group regarding the potential confusion that could occur with a period of "no forecast" in the middle or even at the beginning of TAF. It was suggested by some members that if a TAF could no longer be kept under review due to the lack of observations and if airlines wished to continue to use the aerodrome in question as an alternate then the airline should provide appropriate funds to allow the monitoring to be carried out. On the other hand it was suggested that a period of no forecast with valid forecast information following would potentially provide fuel savings, would save on forecaster workload and would enable a more complete TAF verification. The group noted that much of the discussion surrounded the varying interpretations of what constituted a continuous review of a TAF and given the limited guidance in Doc 8896 the group agreed that the guidance should be reviewed. The group agreed the following action:

Action Agreed 9/30 — Guidance on the continuous monitoring of TAF

That an ad hoc team (WG/3) consisting of **Colin (Rapporteur), Steve, Keith, Bill and [IATA]** review the guidance in Doc 8896 on the continuous monitoring of TAF and update, if necessary for consideration by the group at the next meeting.

3.2.2 The group recalled that it had been agreed at the AMOFSG/8 Meeting that all TAF should be issued within one hour of the validity time on a global basis and that this would entail a removal of the reliance of the regional air navigation plans (ANP) in this respect. The group noted that any necessary removal of the related provisions in the (ANP) would be facilitated by the Secretariat in due course. The group agreed the following action:

RSPP **Action Agreed 9/31 — Updating of Annex 3 relating to the issuance of TAF less than one hour before its validity period commences**

That a proposal to modify Annex 3, Appendix 3 to stipulate that TAF shall be issued within one hour of the forecast validity period as provided in Appendix C be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.2.3 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/23 had sought additional information on the routine TAF amendments that were carried out in the United States with a view to considering the benefits of issuing all TAF at three hourly intervals rather than the six hourly intervals that are currently stipulated for all TAF whose validity period is twelve hours or greater. The group noted that TAF had been issued at 35 aerodromes within the United States with routine amendments issued three hours later regardless of the actually accuracy of the original forecast. It was noted that a marked improvement had been observed both through objective verification and user satisfaction statements. The group also noted that a similar exercise had taken place in Canada with similar results. It was commented that the concept of a routine amendment, rather than a more frequent update/renewal, could lead to confusion since the purpose of an amendment has traditionally been to

correct an erroneous forecast rather than to renew or update the information provided. The group agreed that no further action was required.

3.2.4 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/24 had tasked the **Secretary** with developing an amendment proposal to Annex 3 to optimize the TAF amendment issuance times. This proposal had stemmed from the EANPG/50 Meeting where it had been noted that these issuance times should either be expressed at a finer resolution, i.e. hours and minutes, or would stipulate becoming valid at the next hour. The EANPG had also requested an additional example of a TAF amendment should it be difficult to clarify the requirements. The group agreed that the addition of minutes to the issuance time would be a costly move in terms of software changes which would leave a simple choice of using either the previous hour or the following hour as the issuance time. The group agreed that the only sensible solution would be to use the previous hour as the beginning of the validity period for the new amended TAF which would then not lead to any period where no valid TAF existed. The group agreed that some limited guidance material should be developed in this regard. The group agreed the following action:

Action Agreed 9/32 — Guidance on the validity period of amended TAF

That the **Secretary** develop brief guidance material for inclusion if Doc 8896 on the validity period of amended TAF by 31 December 2012.

3.2.5 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/25 had sought guidance on the geographical area covered by TAF that should be consistent with that applied to METAR. The group noted that guidance to that effect had been included in Doc 8896.

3.2.6 The group recalled that the AMOFSG/8 Meeting had tasked an ad hoc group (WG/4) to develop guidance on the area of coverage of trend forecasts and to report of trials taking place in the Netherlands and to provide recommendations to clarify the issuance of trend in SPECI and local special reports. The group provided a comprehensive report in this regard and in particular proposed the use of the concept of prevailing conditions to simplify the production process of trend when the meteorological conditions were fluctuating. The group noted the foreseen benefits of the use of the prevailing conditions in the trend which would remove the need for the re-issuance of a trend each time a special report was issued on many occasions. The group agreed that some questions still remained including whether there was significant value in the issuance of trend in local special reports at all which would resolve the entire issue if the requirement was removed. The group noted the foreseen trials in the Netherlands and agreed that further consideration could be given at the next meeting of the group. The group formulated the following action:

Action Agreed 9/33 — Trial of trend forecasts in the Netherlands

That **Jan** provides a report on progress made in the trial in the Netherlands on the use of trend forecasts including more detail on user requirements.

3.2.7 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/27 had tasked the **Secretary** with developing an Annex 3 amendment proposal to make the issuance of take-off forecasts optional. The group agreed the following action:

RSPP **Action Agreed 9/34 — Updating of Annex 3 relating to the optional issuance of take-off forecasts**

That a proposal to modify Annex 3, Appendix 3 to make the issuance of take-off forecasts optional as provided in Appendix C be forwarded by the **Secretary** as part of draft Amendment 76 to Annex 3.

3.2.8 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/28 had tasked the **Secretary** with developing an amendment proposal to Annex 3 to only permit the use of "00" to represent midnight at the end of a forecast period for all meteorological products. The group noted that on closer inspection it appeared that there were no Annex 3 provisions which actually state the range of valid time values that were available other than the use of "nn". From the legal perspective this would mean that the Annex 5 — *Units of Measurement to be Used in Air and Ground Operations* requirements would prevail which clearly indicated the use of "00" as was applied in NOTAM and other ICAO products. The group agreed that the most appropriate way forward would be to develop appropriate guidance material which could be used in the preparation of TAF, aerodrome and wind shear warnings, SIGMET, AIRMET and GAMET. The group agreed the following action:

Action Agreed 9/35 — Development of guidance material for the representation of midnight in meteorological products

That the **Secretary** develop guidance material for the representation of midnight in meteorological products by 31 December 2012.

3.2.9 The group noted a brief report on the progress made in the Netherlands on RVR forecasting and that some capacity benefits were being derived. It was agreed that there were no mature proposals that could be considered for inclusion in either Annex 3 or guidance material at this stage. However, the group agreed that the forecasting of RVR was a topic that should be borne in mind by the MARIE-PT (Action Agreed 9/36).

3.2.10 The group discussed proposals concerning the future of TAF with a view to considering a number of Recommended Practices in Annex 3 for potential upgrading to Standards. It was noted that the TAF amendment criteria for the onset or cessation of freezing fog and thunderstorm (without precipitation) were Recommended Practices whereas similar provisions for SPECI issuance were Standards and it was agreed by the group that these would be upgraded. Further discussion considered Annex 3, Appendix 5, 1.3.3 to 1.3.6 which govern the use of change groups in TAF. It was agreed that it was premature to upgrade these provisions at the time but that consideration could be given for Amendment 77 to Annex 3. It was suggested to the group that in the foreseeable future automated TAF would be produced which would demand a new set of performance parameters that were yet to be considered.

4. AGENDA ITEM 6: MET INFORMATION TO SUPPORT ATM

4.1 WMO Task Team TT-UN and MET requirements for ATM from the user perspective

MET support to ATM

4.1.1 The group recalled that the AMOFSG/8 Meeting had established an ad hoc group (WG/6) in its Action Agreed 8/31. That group had been essentially tasked with providing an outlet for the World Meteorological Organization (WMO) task team that had been working on the future needs for meteorological information at the aerodrome and in the terminal area and then linking that information to the aviation needs with particular regard to the air traffic management (ATM) requirements. In order to achieve this links had been established with the ICAO Air Traffic Management Requirements and Performance Panel (ATMRPP).

4.1.2 The international air navigation system was undergoing a paradigm shift from the past air traffic control (ATC) environments to the more integrated collaborative and performance based ATM systems. This change aimed at ensuring that ICAO's vision of a secure, efficient and environmentally sustainable air transport system would continue to be available to all aviation stakeholders at the global, regional and national levels. The new ATM systems would make use of the enhanced capabilities provided by advances in science and technology, and would allow the effective application/sharing of information under the concept of collaborative decision making (CDM).

4.1.3 A gap was recognized between the MET products stipulated in the existing ICAO Annex 3 and the evolving ATM user needs for MET information to support global ATM and Performance Based Navigation (PBN). For instance, ICAO Annex 3 stipulated meteorological data products such as the aerodrome forecast (in meteorological code form) (TAF), trend-type landing forecast (TREND) and aerodrome warnings, which were presented to the users in highly simplified and condensed codes in textual format. The coded aspect of this weather data had been developed to address the limitation in bandwidth in legacy telecom systems back in the mid-20th Century, but had increasingly become a severe constraint for both meteorologists and aviation users as the huge increase of available and valuable weather information (as supported by the growth in knowledge and improvement in capabilities) in many cases could not be conveyed.

4.1.4 In addition to safety, an objective of MET support to global ATM and PBN (MET-ATM-PBN) was their quest to minimize the impact of weather on the total air transport system so as to ensure that optimum throughput is sustained in all meteorological conditions, and that an effective mitigation of the impact could be introduced based on improved planning.

4.1.5 Some initiatives to address this challenge included the Next Generation Air Transportation System (NextGen) in the United States and the Single European Sky ATM Research (SESAR) programme in Europe.

4.1.6 The above objectives called for greater integration of MET information into the ATM processes, compared to today's concept where users (e.g., controllers, traffic manager, dispatcher, and pilots) separately interpret MET information before subjectively integrating the information into traffic decisions based on their understanding of the information presented. In the future, MET information will need to be integrated more into Flight Management Systems, as well as ATM decision-support systems to support safe and more efficient flight.

4.1.7 MET-ATM-PBN promotes sharing common MET information and replaces the use of individual and potentially conflicting weather products with network-enabled consistent weather information that supports a common situational awareness both in the air and on the ground.

4.1.8 It is of utmost importance in the future that MET information be translated directly into ATM constraints and impacts to support the ATM decision-making process. Weather information will be expressed as calibrated factors that can be assigned to aircraft types and scenarios rather than characterized as light, moderate, or severe without regard to what aircraft type is penetrating the weather. Ultimately, the interpretation and translation of weather information should be automated and objective rather than left to the subjective experience of individual users.

4.1.9 ATM will also require decision support tools (DST) that can deal with the MET information which has been translated into ATM constraints and impacts and provide ATM with best choice options. DSTs will generally be multifactoral software applications used to facilitate the evaluation of the weather impact evaluation and air traffic/customer response.

4.1.10 Integration of MET information into ATM processes and the use of sophisticated DSTs are a prerequisite for efficient trajectory-based operations (TBO) and operations in high-density airspace. Integration will incorporate the weather information into the DSTs that formulate the most efficient air traffic routing and flight profile solutions and continually account for inherently dynamic weather phenomena. The ultimate goal of integration is to objectively translate weather information from purely meteorological data into weather impacts on air traffic operations – allowing end users to make decisions based on impacts rather than on meteorological interpretation. The underlying weather information may eventually not need to be presented in its current format, just as today's flight planners may not need to look at winds aloft if the winds are integrated into a competent flight planning system.

4.1.11 Another key precept of MET-ATM-PBN is the characterization of weather forecast uncertainty. Proper use of uncertainty information expressed as probabilistic forecasts of events and intensities is the most appropriate form of risk management. In traditional OPMET codes, "deterministic" weather information essentially conveys that the probability of occurrence is greater than or equal to 50 per cent without conveying the level of uncertainty. A 50 per cent threshold for decisions may be appropriate if all possible outcomes are equally costly. However, if some outcomes are very much more expensive than others, then the threshold for decisions may be higher or lower than 50 per cent. For example, a user may choose an expensive course of action only if they are very certain that the forecast condition will occur. Or a user may make another decision if there is even a slight chance of adverse weather occurring to avoid expensive weather damage. Objective methods to support these decisions are freely available. The availability of probabilistic weather information enables decision-makers to make binary decisions according to their own objectively-determined thresholds for action.

4.1.12 The global provisions structure of ICAO was categorised in four main categories in descending order of regulatory scope.

1. Annexes to the Convention;
2. Procedures (for Air Navigation Services);
3. Manuals; and
4. Other guidance material.

4.1.13 Annex 3 was structured for today's weather forecasts and products in support of primarily flight planning, pre-flight briefing, and hazard avoidance during the execution of flight. This was reflected in provisions for paper-based significant weather (SIGWX) forecasts, and teletype generation-based coded TAFs, METARs and SIGMETs. Global MET-ATM-PBN would be able to use

much more information than was provided by these traditional chart and text based products and other means of exchange, which in most cases represent only a small fraction of all potentially available data. To support ATM, the MET data would be drawn from a virtual information system using data discovery, access and retrieval that would be integrated into risk-based flight path trajectory planning and execution.

4.1.14 Every category of provisions had its own distinct governance process. The annexes required an extensive and lengthy process of State consultation and endorsement to agree on a global baseline of services that should be provided. On the other side of the spectrum sat guidance material that could be issued by the Air Navigation Bureau without a formal approval process by the Contracting States.

4.1.15 It was noted that the core provisions for MET are contained in Annex 3. There is not a supporting Procedures for Air Navigation Services (PANS) document. There are only a limited number of publications that can be considered as providing 'Other Guidance' for MET. As a result, Annex 3 contains more detail than would otherwise be needed if there were additional supporting manuals (Figure 1). The group agreed in principle that a PANS-MET should be developed. It was noted that it was planned that the endorsement for the development of a PANS-MET was to be sought from the Air Navigation Conference scheduled for late 2012. The group agreed that the development of the PANS-MET should be given to the project team (MARIE-PT). As part of the development process of the PANS-MET, the project team will first prepare an initial set of functional requirements and performance metrics for the meteorological elements related to ATM as well as a concept of operations for MET support to ATM.

4.1.16 ICAO Annex 3 and guidance materials did not differentiate between congested and other airspace in terms of MET provisions.It was suggested that to effectively support MET-ATM-PBN, there should be a realignment of MET service provisions to address the needs of different airspace categories if required. It was proposed that this realignment would also reduce the volume of technical material in Annex 3 by transferring the more technical and rapidly changing material to a PANS-MET manual which would be empowered by Annex 3.

4.1.17 Figure 1 illustrates the allocation of MET provisions in ICAO for routine and for congested airspace.

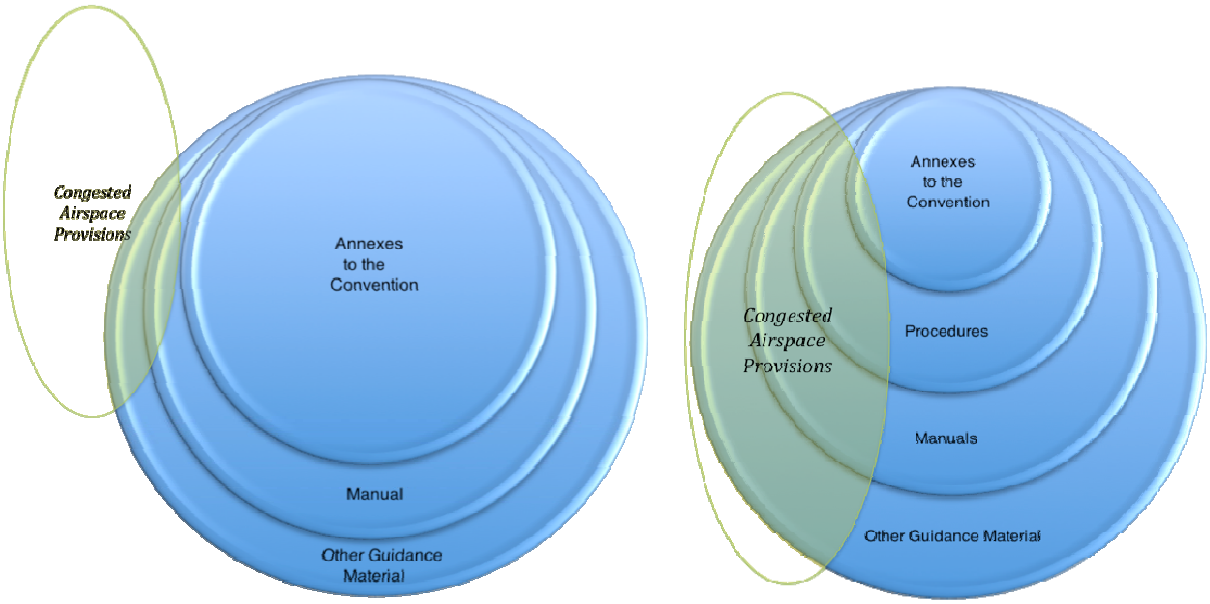

Figure 1: Current (left) and proposed (right) balance of MET provisions

4.1.18 The group noted that liaison had taken place between the ad hoc team and the Air Traffic Management Requirements and Performance Panel (ATMRPP) and that to support the work of the team the ATMRPP had committed to a three step process outlined below:

a) Identify ATM processes that need meteorological information;

b) Illustrate the current status of meteorological support, and

c) Identify future meteorological requirements.

WMO TT-UN and the Development of Meteorological Services in the Terminal Area (MSTA)

4.1.19 The group was pleased to note a report on the work of the WMO Expert Team on Meteorological Services in the Terminal Area (MSTA). The report outlined the status of efforts to develop MSTA and to gather input from users to ensure their needs are considered in the development of services. It was noted that MSTA had been presented at various meetings of the aviation user community and that user had been encouraged to provide direct feedback via the MSTA web portal.

4.1.20 IATA expressed concern on the development of MSTA without a more systematic and formalized approach to gathering user needs. IATA encouraged the WMO Expert Team to institute a more formalized process to gathering user needs and to include the diverse user groups including ATM, air navigation service providers (ANSP), aerodrome operators and pilots.

4.1.21 It was also noted that the WMO Expert Team had utilized user feedback from the various presentations through the preceding year to focus the progress of MSTA on the following in continued development of MSTA. The following was to be considered for future development:

a) Product representation which translates MET information into impact for use in decision support tools translating MET information into impacts;

b) Verification is essential to ensure users understand the skill of the MET information provided and the degree of uncertainty;

c) Probabilistic information presented in risk matrices may meet user needs for quantitative inputs to decision support tools, and

d) Performance based approach will benefit from MSTA which may be demonstrated using business cases.

4.1.22 A major component was aimed at providing guidance to the Met Service Providers to assist them in their future service provision with parallel close coordination with user groups in order to gather feedback. The group was pleased to note that future coordination was expected through the AMOFSG to ensure requirements were to be generated by ICAO and that MSTA development was to be aligned with these requirements with a view to presenting the results of the work to the MET-AIM Divisional Meeting expected to be held in mid 2014.

Meteorological Aeronautical Requirements and Information Exchange (MARIE) – Project Team

4.1.23 In considering the future work of the ad hoc group created by the AMOFSG/8 Meeting the group strongly encouraged the merging of the work of the MSTA with the ongoing involvement with the ATMRPP. In doing so the group agreed to form a project team (MARIE – PT) which would be expected to take the work forward towards the goal of developing concrete proposals and associated guidance material for presentation at the MET/AIM Divisional Meeting. The MARIE-PT would also be expected to oversee the development of a roadmap and plan for the emigration to table-driven codes (Agenda item 7). The group formulated the following action:

Action Agreed 9/36 — Formation of the Meteorological Aeronautical Requirements and Information Exchange Project Team (MARIE-PT)

That a project team with membership, deliverables and milestones set out in **Appendix F** be established with reports to be provided to the group as necessary.

4.2 **Updating of MET information in automatic terminal information service (ATIS)**

4.2.1 The group recalled the AMOFSG/8 Meeting in its Action Agreed 8/30 had sought to gain further information on the practices used by States to update automatic terminal information service (ATIS) with particular regard to those elements of meteorological information that were supplied to air traffic control (ATC) units via displays and thus updated frequently (one minute intervals or less). The group noted that the ATIS is populated by different organizations in various States with the MET service provider and the ATS provider often responsible but in many States a third party provider means that neither organization has full knowledge of the update frequency of information that is being supplied to the pilot community. The group further noted that whilst the Annex 3 provisions concerning the information to be supplied to the ATS unit are prescriptive, those in Annex 11 regarding the ATIS requirements are generic in nature. The group agreed that it would be beneficial to review the Annex 11

provisions in coordination with the ATM Section of ICAO to allow further consideration at the next meeting. The group is invited to agree the following action:

Action Agreed 9/37 — Assessment of the Annex 11 provisions relating to ATIS information

That the **Secretary** assess the Annex 11 provisions relating to ATIS information and provided a report for consideration at the next meeting.

4.3 Winds aloft

4.3.1 The group recalled that the AMOFSG/8 Meeting in its Action Agreed 8/32 had sought information regarding the provision of information on winds aloft to assist in the ATM provision. To this end the group reflected on information provided from Europe and noted that a number of States in that region were operationally providing upper winds data to support air traffic management functions. It was further noted that a guidance document had been developed for the EUR Region and it was agreed that this document could be placed on the AMOFSG website to allow States on a global basis to benefit from the information contained in the document. Dennis was invited to report to the MARIE PT on the user requirements that warranted the development of the wind aloft services presented. These requirements could be assessed by the MARIE-PT on the applicability of such requirements for global application. The group formulated the following action:

Action Agreed 9/38 — Guidance on the provision of winds aloft information

That the **Secretary** arrange to place EUR guidance material on the provision of winds aloft information on the AMOFSG website.

5. AGENDA ITEM 7:TRANSITION TO TABLE-DRIVEN DATA REPRESENTATION

5.1 Table-driven data representation and information management for ATM

5.1.1 The ICAO *Global Air Traffic Management Operational Concept* (Doc 9854) describes the manner in which the ATM system will deliver services and benefits to airspace users by 2025. The guiding principle is that the ATM system is based on the provision of services. The service-based framework described in Doc 9854 considers all resources such as inter alia, airspace, aerodromes, aircraft and humans, to be part of the ATM system. The primary functions of the ATM system will enable flight from an aerodrome into airspace and its subsequent landing, safely separated from hazards, within capacity limits and making optimum use of all system resources. It is clearly evident that the future ATM system will be a network-based operation formed by four main components. These will dramatically increase the efficiency of it:

a) a robustly networked ATM System will improve information sharing;

b) information sharing will enhance the quality of information and provide shared situational awareness;

c) shared situational awareness will enable collaboration and self-synchronization; and

d) deliver enhanced sustainability and speed of decision making.

5.1.2 The concept of common (collaborative) information sharing has been under development for a decade or more. It was born from a clear recognition that future ATM will be managed on a net (work)-centric basis, with each airport and each aircraft being considered as a node interlinked with all others within the system. The availability of timely, high quality information will provide a foundation for effective management of the air traffic system. Nevertheless, the system will continue to be subject to the effects of uncertainty, especially from adverse weather.

5.1.3 The transition towards table-driven data representation for MET is an extremely important component towards the implementation of net-centric oriented ATM. However, due consideration should be given to the fact that data representation is only one aspect of the required move towards net-centricity. The use of meteorological (MET) information in a net-centric ATM environment and satisfying the foreseen performance requirements for MET will have an impact on the information that needs to be made available and exchanged between information providers and users.

5.1.4 An important consideration in this respect is to ensure global interoperability not only from a MET information perspective but also clearly focused on the interlinks with other identified data domains that are relevant for ATM. ATM systems, such as controller decision support tools, will not only use MET information but will fuse this information with other relevant information such as Aeronautical Information (AIS/AIM) and Flight Information to support knowledge based decision making. MET information should therefore be structured in accordance with generic ATM information management principles applicable to all data domains.

5.1.5 It is recognized that the level of maturity of other data domains in the transition toward net-centricity is different than for MET. Consequently, a fully established baseline for generic ATM information management principles and functions has not been fully established. Nevertheless, multi-data domain interoperability for MET information exchange can be assured by applying philosophies adopted in the AIS/AIM domain which are clearly performance based and by basing developments on technical specifications from organizations with a wide-industry base such as the International Organization for Standardization (ISO) and OGC.

5.1.6 These multi-domain interoperable solutions will form the data-centric ATM environment and constitute the core building blocks of System Wide Information Management (SWIM). SWIM will increase the required agility of the ATM system by the ability to quickly develop applications and other support tools to meet evolving ATM business needs without having to revisit proprietary data provision standards.

5.1.7 The quality of service (QoS) is another important consideration in the context of information to support net-centric operations and the overall change and reorientation towards data/information services. From an information management perspective, the quality of the information that is exchanged, the so-called payload is not of direct concern. The concern lies in the intrinsic capability of making available information on the QoS aspect of the payload. An approved mechanism to convey QoS information is through the provision of metadata (data about data) attached to the payload.

5.1.8 In addition to QoS information, a number of other relevant ‘data about data’ aspects are crucial for the efficient sharing of information. Information on the provider issuing the information together with relevant time and source data attributes, limitations of the data, etc. will be extremely helpful in the functioning of a net-centric ATM environment and to decide on the applicability of the data in a specific user context.

5.1.9 Current Annex 3 provisions provide no explicit reference to metadata for MET information. However, in the evolution towards a data-oriented environment metadata is considered to be an essential component to be included in the transition, and in consequence reflected in the roadmap. From this perspective the logical approach would be to adopt technical specifications from organizations such as ISO and OGC to assure the earlier discussed multi data domain –interoperable- solution set. These technical specifications will provide the baseline for specific metadata profiles that could be used for aeronautical MET information.

5.1.10 The development of such a metadata profile requires domain expertise, both from an air transport perspective and a meteorology perspective. ICAO has recognized the value of adopting technical requirements developed by aviation industry bodies such as the European Organisation for Civil Aviation Equipment (EUROCAE), RTCA and from more generally based organizations such as ISO, OGC and the Society of Automotive Engineers (SAE) to meet its future needs. In support of this philosophy, OGC and its Aviation Domain Working Group and the World Meteorological Organization (WMO) are the most likely candidate organisations for the (conjoint) development and maintenance of such a profile.

5.2 Logical data model versus physical data models

5.2.1 International consensus exists on an overall migration of the numerous code forms and code descriptions for operational meteorological (OPMET) data towards the notion of one weather information exchange model (WXXM). The WXXM provides the semantics and abstract structure of all the information that needs to be made available by MET service providers as prescribed by Annex 3. It includes the intrinsic data requirements and structural business process rules. It provides a so-called technology independent description[1] not concerned with code form specifications such as GRIB, binary universal form for the representation of meteorological data (BUFR), and TAC[2]s for aerodrome routine meteorological report (in meteorological code form) (METAR), aerodrome forecast (in meteorological code form) (TAF), etc.

5.2.2 From a system's architectural perspective, this WXXM suffices as the guiding logical data model[3] for all physical implementation of systems that exchange MET information in the ATM domain. However, for the purpose of the international exchange of OPMET data it is considered to be beneficial to provide an additional level of structure and as a consequence to describe a model for the physical implementation of OPMET exchange.

5.2.3 As a comparison between such a physical implementation and existing Annex 3 provisions, the GRIB and BUFR code forms could be considered physical implementations of a format to exchange information. What is not in the current provisions is the overarching structure and interrelations between the information conveyed by the two data formats and how it correlates with the overall ATM business[4]. However, and especially true for the BUFR code form, these forms are considered to be relatively specific to MET, not widely adopted by ATM or other industries and are therefore expensive to integrate, use and maintain from a user application' perspective.

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[1] Technology independent description; A static description, in the Unified Modeling Language (UML), of the structure of the 'Meteorological Information Exchange system' by showing the system's classes, their attributes, operations(or)methods and the relationships between the classes.

[2] TAC: Traditional Alphanumeric Code.

[3] A logical data model is an operational view on the type of information exchanged, the frequency of exchanges and the nature of the information exchanges from an enterprise and system architectural perspective. This view is recognised and used in all the leading Architectural Reference Models, including the NATO Architectural Framework (NAF), US Department of Defense Architectural Framework (DoDAF) and the British Ministry of Defence Architecture Framework (MODAF).

[4] In the ICAO AIS/AIM domain, consensus exists on a similar approach for a technology independent (UML) description of aeronautical information semantics, the abstract structure of AIS/AIM information, the intrinsic data requirements and structural business process rules. This is currently referred to in the AIS/AIM domain as the 'Conceptual Model for AIS/AIM'.

5.2.4 Consequently, there is already an established general agreement on the migration of the BUFR code form used on a bilateral basis for METAR/SPECI and TAF to be replaced by a format that is widely accepted and based on the earlier mentioned generic standards. A code form based on XML[5] was identified. Moreover, the same consensus extends to the need to migrate towards a specific XML grammar to express geographical features which meteorological information in essence is. This specific XML grammar to describe MET information in function of time, place, coverage, etc. is GML[6].

5.2.5 SESAR and NextGen, two of the regional ATM developments programmes have developed a GML based format for OPMET data called the weather information exchange schema (WXXS). This specific GML based format enables the exchange of information formally captured in TAC but also has the intrinsic capability to provide so called GML-wrappers for other code forms including GRIB.

5.2.6 The development and maintenance of a logical data model (WXXM) and physical data models for MET information, in the context of OPMET the XML schema[7] (WXXS) require domain expertise. The focus for a logical data model is in principal on the development of a technology independent description of the semantics and abstract structure of all the MET information in an ATM context. Earlier in this paper, the move towards adopting technical requirements developed by aviation industry bodies and by more generally based organizations such as ISO, OGC and SAE to meet ICAO future needs was discussed. It could be argued that a leading role in this development and the maintenance of the logical data model is reserved for an appropriate body that is close to the ATM industry.

5.2.7 However, as the logical data model is close to the performance-based information requirements and in a fully data-centric environment the only representation for information (exchange) needs and the interrelationships, the ownership should be with ICAO.

5.2.8 An XML schema for the exchange of OPMET is a development that is very much content oriented and close to the development of code forms in an OPMET context. Therefore, ownership of the OPMET XML schema should be with WMO.

5.3 Transition approach

5.3.1 In the evolutionary process of transiting from what is essentially a product-oriented environment towards a data-oriented one, the aspects introduced and discussed above need to be reflected. Consequently, clearly defined components need to be identified with appropriate milestone dates. Taken together they will instantiate the transition process.

5.3.2 It should be recognized that the proposed transition approach is primarily focused on the digital data provision aspects of this transition towards a data-oriented environment. Generic aspects on how the service provision in totality should develop, including the evolution of the required data elements that need to be exchanged are not part of this roadmap. This roadmap is designed to enable the exchange of all aeronautical meteorological information in a flexible, easy expandable, open and transparent manner. Nevertheless it remains clearly focused on the transition of currently defined user products as prescribed by Annex 3.

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[5] XML: Extensible Markup Language.
[6] GML: Geography Markup Language.
[7] In the ICAO AIS/AIM domain, consensus exists on the development of provisions on an XML Schema for AIS/AIM Information. This is currently referred to in the AIS/AIM domain as the 'Data Encoding Specification for AIS/AIM'.

5.3.3 Activities related to the implementation -by States- of provisions developed in the context of identified roadmap (steps) were not considered by the group. An implementation roadmap or general guidance to support implementation could be considered by the Secretariat in conjunction with the publication of an amendment of Annex 3. Potential issues to consider in this context are:

5.3.4 XML coding at source (e.g. weather observation system at an airport) versus XML coding exclusively by collecting centres that will distribute information international;

a) Transition of OPMET Databanks towards new formats including XML;

b) Implication for information providers to fulfil metadata requirements.

5.3.5 A proposed logical structured flow of actions to be considered in the transition, thus roadmap, are the development of:

a) XML/GML format for TAC OPMET;

b) Metadata requirements;

c) Weather Information Exchange Model;

d) Information Management for ATM / SWIM.

The associated milestone dates for these components are linked to the currently known revision cycle of ICAO Annex 3 to provide the timing dimension of the required transition. However, this does not suggest that the listed components all need to be included in the Annex itself. Some of the identified steps are clearly related to guidance material, specifications or otherwise and not a Standard or Recommended Practice per se.

5.3.6 Table 1 outlines the revision cycle / time schedule involved.

Edition	***Applicability date***	***Publication date***	***Start State consultation***
18th / amd.76	November 2013	July 2013	January 2012
19th / amd 77	November 2016	July 2016	January 2015
20th / amd 78	November 2019	July 2019	January 2018

Table 1 Amendment cycle time schedule

5.4 **Roadmap**

5.4.1 The tentative roadmap was presented to the group.

Annex 3 | 18th edition | Amendment 76

5.4.2 The following evolutionary improvement steps need to be incorporated:

- **XML/GML format for TAC OPMET;** States in a position to do so should exchange METAR, SPECI and TAF in a digital form under bilateral agreement;

- **Metadata requirements;** States in a position to exchange METAR, SPECI or TAF in a digital form under bilateral agreement should include metadata;

- **Weather Information Exchange Model;** States in a position to exchange METAR, SPECI or TAF in a digital form under bilateral agreement should structure this information in accordance with defined features, attributes and associations[8].

- **Information Management for ATM / SWIM;** N/A.

Note 1: The overall notion of ATM Information Management from an ICAO perspective needs to develop further to justify the inclusion of relevant provisions on ATM Information Management for amendment 76. However, extreme caution should be applied to not include provisions or modifications to existing provisions that could be contradictory with what is known today of the overall transition towards common (collaborative) information sharing. Currently under development is the notion of an overarching ATM Information Reference Model (AIRM). This AIRM is the 'glue' between the earlier discussed interoperable data domain specific information exchange solutions. To apply common standards and specification in every data domain is already a significant step in the move towards a data-centric ATM environment. But to link the data domains with one reference model for ATM information will improve the consistency and coherency of all the ATM information considerably and will remove the apparent overlaps between data domains. To ensure a first level of convergence, the alignment with associated information sharing principles developed for AIS/AIM (Annex 15) should be assured.

5.4.3 A series of activities can be summarized to support the aforementioned improvement steps. These need to be completed before January 2013:

- Develop and publish[9] a first iteration of the weather information exchange model (WXXM) which will specify the semantics and abstract structure (features, attributes and associations) for aeronautical MET information. There should be a clear focus on METAR, SPECI and TAF exchange in a digital form[10].

- Develop and publish a first iteration specification for METAR, SPECI and TAF exchange in digital form which shall:
  - use XML;
  - comply with the GML specification for the encoding of geographical information;
  - be expressed in the form of an XML schema;
  - be structured in accordance with defined features, attributes and associations (WXXM).

- Develop and publish a first iteration metadata profile for METAR, SPECI and TAF exchange in compliance with ISO 19115 and ISO 19139.

- Propose and obtain the approval of States for the modification of the appropriate provisions in Annex 3. Appendix A provides a first suggestion of the changes this could encompass. It is fully recognized that the Secretariat will develop the proposal for the appropriate amendments. It is also not intended to cover all necessary changes to provisions. The aim is to highlight the important aspects of change.

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[8] Whilst this improvement step is formulated in the context of TAC migration only, sufficient coordination is required with the METWSG on their ambition to migrate graphical SIGMET elements from BUFR to XML and the associated logical data model implications.

[9] When the words 'develop' and 'publish' are used in paragraph 4, these are transparent processes to the stakeholder inclusive of a)the coordination with other Operational and Study groups and b)the appropriate verification and validation of developed specifications including version control.

[10] See footnote 8.

Annex 3 | 19th edition | Amendment 77

5.4.4 The following evolutionary improvement steps need to be incorporated:

- **XML/GML format for TAC OPMET;** METAR, SPECI and TAF should be exchanged in a digital form.

- **Metadata requirements;** METAR, SPECI and TAF in a digital form should include metadata.

- **Weather Information Exchange Model;** When METAR, SPECI and TAF are exchanged in a digital form, the information should be structured in accordance with defined features, attributes and associations. States in a position to do so, under bilateral agreement, should structure all meteorological information in accordance with defined features, attributes and associations.

- **Information Management for ATM / SWIM;** States in a position to do so, under bilateral agreement, should adhere to general principles with respect to information management and consequent communication services and digital data provision.

Note 2: It is expected that global and regional developments of ATM Information Management, sometimes referred to as SWIM, and the development of the notion of an overarching ATM Information Reference Model (AIRM) will be sufficiently mature to have an impact on data domain / interest area specific provisions such as encapsulated in Annex 3. A first set of general principles of information management and exchange and associated Communication Services and Digital Data Provision should be agreed, introduced and commonly applied to all data domains.

5.4.5 A series of activities to support the aforementioned improvement steps which need to be completed before January 2016 are summarized as follows:

- Publish a Major Release of the WXXM which will specify the semantics and abstract structure (features, attributes and associations) for aeronautical MET information.
- Publish a Major Release specification for METAR, SPECI and TAF exchange in digital form which shall:
    - use XML;
    - comply with the GML specification for the encoding of geographical information;
    - be expressed in the form of an XML schema;
    - be structured in accordance with defined features, attributes and associations (WXXM).
- Develop and publish a first iteration specification for MET information exchange (exclusive of the METAR, SPECI and TAF schema) in digital form which shall:
    - use XML;
    - comply with the GML specification for the encoding of geographical information;
    - be expressed in the form of an XML schema;
    - be structured in accordance with defined features, attributes and associations (WXXM);
    - allow for the exchange of gridded information and associated exchange formats.

- Publish a Major Release metadata profile for METAR, SPECI and TAF exchange in compliance with ISO 19115 and ISO 19139.

- Develop and publish a first iteration metadata profile for aeronautical MET information exchange (exclusive of the METAR, SPECI and TAF) in compliance with ISO 19115.

- Develop or modify existing guidance on the application of generic information management principles for MET.

- Modify and obtain States approval of the appropriate provisions in Annex 3. Appendix B provides a first indication of change especially the foreseen incorporation of relevant provisions with respect to information management. It is fully recognized that the Secretariat will develop the proposal for the appropriate amendments in due course. The intention is not to cover all necessary changes to provisions but mainly to illustrate the important aspects that need to be included.

Annex 3 | 20th edition | Amendment 78

5.4.6 The following evolutionary improvement steps need to be incorporated:

- **XML/GML format for TAC OPMET;** METAR, SPECI and TAF shall be exchanged in a digital form.

- **Metadata requirements;** METAR, SPECI and TAF in a digital form shall include metadata.

- **Weather Information Exchange Model;** When METAR, SPECI and TAF are exchanged in a digital form, the information shall be structured in accordance with defined features, attributes and associations. All other MET information should be structured in accordance with defined features, attributes and associations.

- **Information Management for ATM / SWIM;** To be further developed for MARIE-PT.

5.4.7 A series of activities to support the aforementioned improvement steps which need to be completed before January 2019 are summarised as follows:

- Publish a Major Release of the Weather Information Exchange Model (WXXM) to specify the semantics and abstract structure (features, attributes and associations) for aeronautical meteorological information.

- Publish a Major Release specification for MET information exchange in digital form which shall:
    - use XML;
    - comply with the GML specification for the encoding of geographical information;
    - be expressed in the form of an XML schema;
    - be structured in accordance with defined features, attributes and associations (WXXM);
    - allow for the exchange of gridded information and associated exchange formats.

- Publish a Major Release metadata profile for MET information exchange in compliance with ISO 19115 and ISO 19139.

- Modify and obtain States approval on the appropriate provisions in Annex 3.

5.5 The way forward

5.5.1 The group was pleased to note the extensive material presented by the ad hoc group and agreed that the future work in this area needed to be tied in with the work of the MARIE-PT as outlined in Action 9/36 above.

6. FUTURE WORK

6.1 The group agreed with a proposal to split the work of the study group with the core work (Agenda Item 5 of this meeting) remaining with the AMOFSG and the future work of the MARIE-PT being proposed to the Air Navigation Commission (ANC) as a new study group. The effect of this decision would be to allow the MARIE-PT to work directly with the Secretariat and not have the additional step of reporting through the entire study group. It was understood that the decision in this respect would lie with the ANC and that until such a decision was forthcoming the MARIE-PT would remain a sub-group of the AMOFSG.

7. ANY OTHER BUSINESS

7.1 The group agreed that further meetings of the group would be necessary. Given the MET/AIM Divisional Meeting expected to be held in mid 2014 it would not be possible to hold AMOFSG meetings at 18 month intervals and still provide adequate input to the global meeting. The meeting tentatively agreed to hold one meeting only before the global meeting with a date during the summer of 2013 being preferred. It was understood that the venue of the meeting would be Montreal.

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APPENDIX A

LIST OF PARTICIPANTS

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APPENDIX B

LIST OF DOCUMENTATION

Study Notes

NUMBER	PRESENTED BY	TITLE	AGENDA ITEM
SN 1	Secretary	Provisional agenda	4
SN 2	Secretary	Tasks relating to observing and forecasting at the aerodrome and in the terminal area	5
SN 3	Secretary	Tasks relating to MET information to support ATM	6
SN 4	Secretary	Tasks relating to the transition to table-driven data representation	7
SN 5	Secretary	Future work programme of the group	8
SN 6	Bill Maynard, Rapporteur of AMOFSG/8 ad hoc WG/2	Report from the ad hoc working group on proposed new standards	5
SN 7	Steven Albersheim, C.M. Cheng and Dennis Hart AMOFSG/8 ad hoc WG/6	Concept for MET in support of ATM and PBN	7
SN 8	Dennis Hart, Rapporteur of AMOFSG/8 ad hoc WG/5	Considerations on and the roadmap for the transition to table-driven data representation	8
SN 9	Herbert Puempel	On the use of an array of ceilometers in automated METAR	5.1
SN 10	Andrew Schulz	Sandstorm and duststorm reporting	5.1
SN 11	Colin Hord, Rapporteur of AMOFSG/8 ad-hoc WG/3	Report of the ad-hoc working group on the future reporting of present weather in fully automated MET reports	5.1
SN 12	Steven Albersheim	The TAF and the total observing concept	5.1
SN 13	Jan Sondij	On the use of an array of ceilometers in automated local routine and special reports	5.1
SN 14	Jan Sondij	RVR forecasting capabilities for ATM in the Netherlands	5.2

NUMBER	PRESENTED BY	TITLE	AGENDA ITEM
SN 15	Colin Hord, Rapporteur of AMOFSG/8 ad-hoc WG/1	Report of the ad-hoc working group on the calculation of crosswind and tailwind components with particular regard to the inclusion of gusts	5.1
SN 16	Dennis Hart	Wind aloft information, European considerations and practices	6
SN 17	Ossi Korhonen	Automated cloud reporting with thunderstorm in the vicinity	5.1
SN 18	Ossi Korhonen	Cloud coding formats in METAR and local reports	5.1
SN 19	Ossi Korhonen	Runway visual range marked discontinuity definition	5.1
SN 20	Ossi Korhonen	Runway visual range variation in METAR	5.1
SN 21	Jan Sondij	Trial TREND - Improving landing forecasts in the Netherlands	5.2
SN 22	Colin Hord	Guidance for the use of the proposed term "NOFCST" in TAF	6
SN 23	Colin Hord	Report on the use of 5kt gusts in local routine and special reports	6
SN 24	Colin Hord	Reporting of crosswind and tailwind in MET reports	5.1
SN 25	Jan Sondij	Criteria for obstacle induced wind disturbance	5.1
SN 26	Michel Leroy	Updating of information provided by display in ATS units and practices used to update ATIS	5.1
SN 27	Hu Jiamei	Amendment to visibility SPECI criteria	5.1
SN 28	Bill Maynard	Use of WMO Manuals in Annex 3	5
SN 29	Bill Maynard	Representative	5
SN 30	Bill Maynard	Proposed new SPECI provisions	5.1
SN 31	Bill Maynard	Revalidation of aeronautical requirements for vertical visibility, ice crystals and showers	5.1
SN 32	Bill Maynard	The future of the TAF	5.2
SN 33	Andrew Schultz	Meteorological services in the terminal area (MSTA)	5.2
SN 34	Herbert Puempel	Development of Meteorological services in the terminal area (MSTA)	7

Information Papers

NUMBER	PRESENTED BY	TITLE	AGENDA ITEM
IP 1	Secretary	Arrangements for the meeting	3
IP 2	Jan Sondij	Insect filtering of meteorological optical range measurements by a forward scatter sensor	5.1
IP 3	Colin Hord	Report on the use of remote sensing capabilities to further automate aeronautical meteorological reports in the United Kingdom	5.1
IP 4	Bill Maynard	TAF temperature forecasts	5.2
IP 5	Bill Maynard	Assessing the value of updating TAFS every 3 hours	5, 2
IP/6	Steven Albersheim	Rightsizing - Introduction to the flexible terminal sensor network	5.1
IP/7	Steven Albersheim and Dennis Hart	Supporting the transition towards a data-centric air transport system	7
IP/8	Jan Sondij	AUTO METAR system at civil airports in the Netherlands: Description and experiences	5.1

List of Documentation in Order of Agenda Item

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4	SN/1
5	SN/2, SN/6, SN/9, SN/10, SN/11, SN/12, SN/13, SN/14, SN/15, SN/17, SN/18, SN/19, SN/20, SN/21, SN/24, SN/25, SN/26, SN/27, SN/28, SN/29, SN/30, SN/31, SN/32, SN/33, IP/2, IP/3, IP/4, IP/5, IP/6, IP/8
6	SN/3, SN/16, SN/22, SN/23
7	SN/4, SN/7, SN/34, IP/7
8	SN/5, SN/8

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APPENDIX C

DRAFT AMENDMENT TO ANNEX 3 — *METEOROLOGICAL SERVICE FOR INTERNATIONAL AIR NAVIGATION*

(SEVENTEENTH EDITION — JULY 2010)

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PART I. CORE SARPs

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CHAPTER 1. DEFINITIONS

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Aerodrome meteorological office. An office~~, located at an aerodrome,~~ designated to provide meteorological service for aerodromes serving international air navigation.

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CHAPTER 2. GENERAL PROVISIONS

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2.3 Notifications required from operators

2.3.1 An operator requiring meteorological service or changes in existing meteorological service shall notify, sufficiently in advance, the meteorological authority or the aerodrome meteorological office(s) concerned. The minimum amount of advance notice required shall be as agreed between the meteorological authority or aerodrome meteorological office(s) and the operator.

. . .

2.3.3 The ~~aerodrome meteorological office, or the meteorological office concerned, shall be notified by the~~ operator or a flight crew member shall ensure that, where required, the aerodrome meteorological office concerned is notified:

a) of flight schedules; and

b) when non-scheduled flights are to be operated.~~;and~~

~~c) when flights are delayed, advanced or cancelled.~~

2.3.4 **Recommendation.—** *The notification to the aerodrome meteorological office~~, or the meteorological office~~ concerned, of individual flights should contain the following information except that, in the case of scheduled flights, the requirement for some or all of this information may be waived by agreement between the aerodrome meteorological office and the operator:*

. . .

CHAPTER 3. WORLD AREA FORECAST SYSTEM AND METEOROLOGICAL OFFICES

. . .

3.3 Aerodrome Meteorological offices

. . .

3.3.2 An aerodrome meteorological office shall carry out all or some of the following functions as necessary to meet the needs of flight operations at the aerodrome:

. . .

g) exchange meteorological information with other aerodrome meteorological offices; and

. . .

3.3.3 The aerodromes for which landing forecasts are required shall be determined by regional air navigation agreement.

3.3.4 For aerodromes without aerodrome meteorological offices at the aerodrome:

a) the meteorological authority concerned shall designate one or more aerodrome meteorological offices to supply meteorological information as required; and

. . .

CHAPTER 4. METEOROLOGICAL OBSERVATIONS AND REPORTS

Note.— Technical specifications and detailed criteria related to this chapter are given in Appendix 3.

4.1 Aeronautical meteorological stations and observations

. . .

4.1.5 At aerodromes with runways intended for Category II and III instrument approach and landing operations, automated equipment for measuring or assessing, as appropriate, and for monitoring and remote indicating of surface wind, visibility, runway visual range, present weather, height of cloud base, air and dew-point temperatures and atmospheric pressure shall be installed to support approach and landing and take-off operations. These devices shall be integrated automatic systems for acquisition, processing, dissemination and display in real time of the meteorological parameters affecting landing and take-off operations. The design of integrated automatic systems shall observe Human Factors principles and include back-up procedures.

. . .

4.6 Observing and reporting meteorological elements

. . .

4.6.4 Present weather

4.6.4.1 The present weather occurring at the aerodrome ~~and/or its vicinity~~ shall be observed and reported as necessary. The following present weather phenomena shall be identified, as a minimum: ~~precipitation~~ rain, drizzle, snow and freezing precipitation (including intensity thereof), haze, mist, fog, freezing fog and thunderstorms (including thunderstorms in the vicinity).

. . .

4.6.5 Clouds

. . .

~~4.6.5.2 **Recommendation.**— *Cloud observations for local routine and special reports should be representative of the approach area.*~~

4.6.5.~~3~~2 **Recommendation.—** *Cloud observations for local routine and special reports and METAR and SPECI should be representative of the aerodrome and its vicinity.*

. . .

CHAPTER 6. FORECASTS

6.1 Interpretation and use of forecasts

. . .

6.1.2 The issue of a new forecast by ~~a~~ an aerodrome meteorological office, such as a routine aerodrome forecast, shall be understood to cancel automatically any forecast of the same type previously issued for the same place and for the same period of validity or part thereof.

6.2 Aerodrome forecasts

. . .

6.2.2 An aerodrome forecast shall be issued at a specified time not more than one hour before the commencement of the validity period of the forecast and consist of a concise statement of the expected meteorological conditions at an aerodrome for a specified period.

. . .

6.2.4 Aerodrome ~~Meteorological~~ meteorological offices preparing TAF shall keep the forecasts under continuous review and, when necessary, shall issue amendments promptly. The length of the forecast messages and the number of changes indicated in the forecast shall be kept to a minimum.

. . .

6.2.7 When issuing TAF, aerodrome meteorological offices shall ensure that not more than one TAF is valid at an aerodrome at any given time.

6.3 Landing forecasts

6.3.1 A landing forecast shall be prepared by the aerodrome meteorological office designated by the meteorological authority concerned as determined by regional air navigation agreement; such forecasts are intended to meet the requirements of local users and of aircraft within about one hour's flying time from the aerodrome.

. . .

6.4 Forecasts for take-off

6.4.1 A forecast for take-off shall be prepared by the aerodrome meteorological office designated by the meteorological authority concerned, if required, by agreement between the meteorological authority and operators.

. . .

6.4.4 **Recommendation.—** ~~*Meteorological*~~ *Aerodrome meteorological offices preparing forecasts for take-off should keep the forecasts under continuous review and, when necessary, should issue amendments promptly*.

6.5 Area forecasts for low-level flights

. . .

6.5.3 Area forecasts for low-level flights prepared in support of the issuance of AIRMET information shall be issued every 6 hours for a period of validity of 6 hours and transmitted to meteorological watch offices concerned not later than one hour prior to the beginning of their validity period.

CHAPTER 7. SIGMET AND AIRMET INFORMATION, AERODROME WARNINGS AND WIND SHEAR WARNINGS AND ALERTS

. . .

7.3 Aerodrome warnings

7.3.1 Aerodrome warnings shall be issued by the aerodrome meteorological office designated by the meteorological authority concerned and shall give concise information of meteorological conditions which could adversely affect aircraft on the ground, including parked aircraft, and the aerodrome facilities and services.

. . .

7.4 Wind shear warnings and alerts

. . .

7.4.1 Wind shear warnings shall be prepared by the aerodrome meteorological office designated by the meteorological authority concerned for aerodromes where wind shear is considered a factor, in accordance with local arrangements with the appropriate ATS unit and operators concerned. Wind shear warnings shall give concise information on the observed or expected existence of wind shear which could adversely affect aircraft on the approach path or take-off path or during circling approach between runway level and 500 m (1 600 ft) above that level and aircraft on the runway during the landing roll or take-off run. Where local topography has been shown to produce significant wind shears at heights in excess of 500 m (1 600 ft) above runway level, then 500 m (1 600 ft) shall not be considered restrictive.

CHAPTER 9. SERVICE FOR OPERATORS AND FLIGHT CREW MEMBERS

. . .

9.1 General provisions

. . .

9.1.10 Meteorological information shall be supplied to operators and flight crew members at the location to be determined by the meteorological authority, after consultation with the operators and at the time to be agreed upon between the aerodrome meteorological office and the operator concerned. The service for pre-flight planning shall be confined to flights originating within the territory of the State concerned. At an aerodrome without ~~a~~ an aerodrome meteorological office at the aerodrome, arrangements for the supply of meteorological information shall be as agreed upon between the meteorological authority and the operator concerned.

9.2 Briefing, consultation and display

. . .

9.2.3 If the aerodrome meteorological office expresses an opinion on the development of the meteorological conditions at an aerodrome which differs appreciably from the aerodrome forecast included in the flight documentation, the attention of flight crew members shall be drawn to the divergence. The portion of the briefing dealing with the divergence shall be recorded at the time of briefing and this record shall be made available to the operator.

9.2.4 The required briefing, consultation, display and/or flight documentation shall normally be provided by the aerodrome meteorological office associated with the aerodrome of departure. At an aerodrome where these services are not available, arrangements to meet the requirements of flight crew members shall be as agreed upon between the meteorological authority and the operator concerned. In exceptional circumstances, such as an undue delay, the aerodrome meteorological office associated with the aerodrome shall provide or, if that is not practicable, arrange for the provision of a new briefing, consultation and/or flight documentation as necessary.

9.2.5 **Recommendation.—** *The flight crew member or other flight operations personnel for whom briefing, consultation and/or flight documentation has been requested should visit the aerodrome meteorological office at the time agreed upon between the aerodrome meteorological office and the operator concerned. Where local circumstances at an aerodrome make personal briefing or consultation impracticable, the aerodrome meteorological office should provide those services by telephone or other suitable telecommunications facilities.*

9.3 Flight documentation

. . .

9.3.2 Whenever it becomes apparent that the meteorological information to be included in the flight documentation will differ materially from that made available for pre-flight planning and in-flight re-planning, the operator shall be advised immediately and, if practicable, be supplied with the revised information as agreed between the operator and the aerodrome meteorological office concerned.

9.3.3 **Recommendation.**— *In cases where a need for amendment arises after the flight documentation has been supplied, and before take-off of the aircraft, the aerodrome meteorological office should, as agreed locally, issue the necessary amendment or updated information to the operator or to the local air traffic services unit, for transmission to the aircraft.*

. . .

9.5 Information for aircraft in flight

9.5.1 Meteorological information for use by aircraft in flight shall be supplied by ~~a~~ an aerodrome meteorological office to its associated air traffic services unit and through D-VOLMET or VOLMET broadcasts as determined by regional air navigation agreement. Meteorological information for planning by the operator for aircraft in flight shall be supplied on request, as agreed between the meteorological authority or authorities and the operator concerned.

. . .

CHAPTER 10. INFORMATION FOR AIR TRAFFIC SERVICES, SEARCH AND RESCUE SERVICES AND AERONAUTICAL INFORMATION SERVICES

. . .

10.1 Information for air traffic services units

10.1.1 The meteorological authority shall designate ~~a~~ an aerodrome meteorological office to be associated with each air traffic services unit. The associated aerodrome meteorological office shall, after coordination with the air traffic services unit, supply, or arrange for the supply of, up-to-date meteorological information to the unit as necessary for the conduct of its functions.

10.1.2 **Recommendation.—** *~~The associated~~ An aerodrome meteorological office ~~for~~ should be associated with an aerodrome control tower or approach control unit ~~should be an aerodrome meteorological office~~ for the provision of meteorological information.*

10.1.3 ~~The associated meteorological~~ A meteorological watch office shall be associated with ~~for~~ a flight information centre or an area control centre ~~shall be a~~ for the provision of meteorological ~~watch office~~information.

10.1.4 **Recommendation.—** *Where, owing to local circumstances, it is convenient for the duties of an associated aerodrome meteorological office or meteorological watch office to be shared between two or more aerodrome meteorological offices or meteorological watch offices, the division of responsibility should be determined by the meteorological authority in consultation with the appropriate ATS authority.*

. . .

10.2 Information for search and rescue services units

Meteorological watch offices designated by the meteorological authority in accordance with regional air navigation agreement shall supply search and rescue services units with the meteorological information they require in a form established by mutual agreement. For that purpose, the designated meteorological watch office shall maintain liaison with the search and rescue services unit throughout a search and rescue operation.

. . .

CHAPTER 11. REQUIREMENTS FOR AND USE OF COMMUNICATIONS

. . .

11.1 Requirements for communications

. . .

11.1.3 Suitable telecommunications facilities shall be made available to permit world area forecast centres to supply the required world area forecast system products to aerodrome meteorological offices, meteorological watch offices, meteorological authorities and other users.

11.1.4 Telecommunications facilities between aerodrome meteorological offices and, as necessary, aeronautical meteorological stations and aerodrome control towers or approach control units shall permit communications by direct speech, the speed with which the communications can be established being such that the required points may normally be contacted within approximately 15 seconds.

11.1.5 **Recommendation.—** *Telecommunications facilities between meteorological watch offices and flight information centres, area control centres, rescue coordination centres and aeronautical telecommunications stations should permit:*

. . .

11.1.8 Suitable telecommunications facilities shall be made available to permit aerodrome meteorological offices or meteorological watch offices to exchange operational meteorological information with other aerodrome meteorological offices or meteorological watch offices.

. . .

11.2 Use of aeronautical fixed service communications and the public Internet — meteorological bulletins

Meteorological bulletins containing operational meteorological information to be transmitted via the aeronautical fixed service or the public Internet shall be originated by the appropriate aerodrome meteorological office or aeronautical meteorological station.

. . .

PART II. APPENDICES AND ATTACHMENTS

. . .

APPENDIX 2. TECHNICAL SPECIFICATIONS RELATED TO WORLD AREA FORECAST SYSTEM AND METEOROLOGICAL OFFICES

(See Chapter 3 of this Annex.)

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2. AERODROME METEOROLOGICAL OFFICES

. . .

2.2 Notification of WAFC concerning significant discrepancies

Aerodrome ~~Meteorological~~ meteorological offices using WAFS BUFR data shall notify the WAFC concerned immediately if significant discrepancies are detected or reported in respect of WAFS SIGWX forecasts concerning:

. . .

APPENDIX 3. TECHNICAL SPECIFICATIONS RELATED TO METEOROLOGICAL OBSERVATIONS AND REPORTS

(See Chapter 4 of this Annex.)

. . .

2. GENERAL CRITERIA RELATED TO METEOROLOGICAL REPORTS

2.1 Format of meteorological reports

. . .

2.1.3 **Recommendation**.— *METAR and SPECI should be disseminated, under bilateral agreements between States in a position to do so, in ~~the WMO BUFR code~~digital form, in addition to the dissemination of the METAR and SPECI in accordance with 2.1.2.*

~~*Note.— The BUFR code form is contained in WMO Publication No. 306,* Manual on Codes, *Volume I.2, Part B — Binary Codes.*~~

2.1.4 METAR and SPECI in digital form shall be formatted in accordance with a globally interoperable information exchange model and shall use extensible mark-up language (XML)/geography mark-up language (GML).

2.1.5 METAR and SPECI in digital form shall be accompanied by the appropriate metadata.

Note.— Guidance on the information exchange model, XML/GML and the metadata profile is provided in the Manual on the Digital Exchange of Aeronautical Meteorological Information (Doc ####).

2.2 Use of CAVOK

When the following conditions occur simultaneously at the time of observation:

. . .

c) no weather of significance to aviation as given in 4.4.2.3, 4.4.2.5 and 4.4.2.6;

information on visibility, runway visual range, present weather and cloud amount, cloud type and height of cloud base shall be replaced in all meteorological reports by the term "CAVOK".

2.3 Criteria for issuance of local special reports and SPECI

2.3.1 The list of criteria for the issuance of local special reports shall include the following:

. . .

d) the available supplementary information concerning the occurrence of significant meteorological conditions in the approach and climb-out areas as given in Table A3-1; ~~and~~

e) when noise abatement procedures are applied in accordance with paragraph 7.2.6 of the PANS-ATM (Doc 4444), and the variation of the mean surface wind speed (gusts) has changed by 2.5 m/s (5 kt) or more from that at the time of the latest report, the mean speed before and/or after the change being 7.5 m/s (15 kt) or more; and

~~e)~~f) those values which constitute criteria for SPECI.

2.3.2 Where required in accordance with Chapter 4, 4.4.2 b), SPECI shall be issued whenever changes in accordance with the following criteria occur:

. . .

c) when the variation from the mean surface wind speed (gusts) has ~~increased~~changed by 5 m/s (10 kt) or more from that at the time of the latest report, the mean speed before and/or after the change being 7.5 m/s (15 kt) or more;

. . .

2.3.3 **Recommendation.—** *Where required in accordance with Chapter 4, 4.4.2 b), SPECI should be issued whenever changes in accordance with the following criteria occur:*

c) when the runway visual range is improving and changes to or passes through one or more of the following values, or when the runway visual range is deteriorating and passes through one or more of the following values: ~~150~~50, 175~~350~~300, ~~600~~550 or 800 m;

. . .

e) when the onset or cessation of any of the following weather phenomena occurs:

~~*ice crystals*~~

. . .

4. OBSERVING AND REPORTING OF METEOROLOGICAL ELEMENTS

. . .

4.3 Runway visual range

4.3.1 Siting

4.3.1.1 **Recommendation.—** *Runway visual range should be assessed at a height of approximately 2.5 m (7.5 ft) above the runway for instrumented systems.*

. . .

4.3.2 Instrumented systems

Note.— Since accuracy can vary from one instrument design to another, performance characteristics are to be checked before selecting an instrument for assessing ~~RVR~~runway visual range. The calibration of a forward-scatter meter has to be traceable and verifiable to a transmissometer standard, the accuracy of which has been verified over the intended operational range. Guidance on the use of transmissometers and forward-scatter meters in instrumented ~~RVR~~runway visual range systems is given in the Manual of Runway Visual Range Observing and Reporting Practices *(Doc 9328).*

. . .

4.3.4 Averaging

Where instrumented systems are used for the assessment of runway visual range, their output shall be updated at least every 60 seconds to permit the provision of current, representative values. The averaging period for runway visual range values shall be:

. . .

Note.— A marked discontinuity occurs when there is an abrupt and sustained change in runway visual range, lasting at least 2 minutes, which reaches or passes through the values 800, 550, 300 and 175 m that are included in criteria for the issuance of SPECI reports given in 2.3.3 c).

4.3.5 Runway light intensity

Recommendation.— *When instrumented systems are used for the assessment of runway visual range, computations should be made separately for each available runway. ~~RVR~~ Runway visual range should not be computed for a light intensity of 3 per cent or less of the maximum light intensity available on a runway. For local routine and special reports, the light intensity to be used for the computation should be:*

. . .

4.3.6 Reporting

. . .

4.3.6.6 **Recommendation.—** *In METAR and SPECI when instrumented systems are used for the assessment of runway visual range, the variations in runway visual range during the 10-minute period immediately preceding the observation should be included* ~~*as follows:*~~

~~*a)*~~ *if the runway visual range values during the 10-minute period have shown a distinct tendency, such that the mean during the first 5 minutes varies by 100 m or more from the mean during the second 5 minutes of the period, this should be indicated. When the variation of the runway visual range values shows an upward or downward tendency, this should be indicated by the abbreviation "U" or "D", respectively. In circumstances when actual fluctuations during the 10-minute period show no distinct tendency, this should be indicated using the abbreviation "N". When indications of tendency are not available, no abbreviations should be included*~~*; and*~~*.*

~~*b) if the 1-minute runway visual range values during the 10-minute period vary from the mean value by more than 50 m or more than 20 per cent of the mean value, whichever is greater, the 1-minute mean minimum and the 1-minute mean maximum values should be reported instead of the 10-minute mean value. If the 10-minute period immediately preceding the observation includes a marked discontinuity in runway visual range values, only those values occurring after the discontinuity should be used to obtain variations.*~~

~~*Note. — A marked discontinuity occurs when there is an abrupt and sustained change in runway visual range, lasting at least 2 minutes, which reaches or passes through criteria for the issuance of SPECI given in 2.3.3 c).*~~

4.4 Present weather

4.4.1 Siting

Recommendation.— *When instrumented systems are used for observing present weather phenomena listed under 4.4.2.3, 4.4.2.5 and 4.4.2.6, representative information should be obtained by the use of sensors appropriately sited.*

4.4.2 Reporting

. . .

4.4.2.3 **Recommendation.—** *In local routine and special reports and in METAR and SPECI, the following types of present weather phenomena should be reported, using their respective abbreviations and relevant criteria, as appropriate:*

a) Precipitation

. . .

~~*Ice crystals (very small ice crystals in suspension, also known as diamond dust) IC*~~
~~*Reported only when associated visibility is 5 000 m or less.*~~

. . .

4.4.2.7 **Recommendation.—** *In local routine and special reports and in METAR and SPECI, the relevant intensity or, as appropriate, the proximity to the aerodrome of the reported present weather phenomena should be indicated as follows:*

. . .

Vicinity	*VC*

— *Between approximately 8 and 16km of the aerodrome reference point and used only in METAR and SPECI with present weather in accordance with the template shown in Table A3-2 when not reported under 4.4.2.5 and 4.4.2.6.*

4.4.2.8 In local routine and special reports and in METAR and SPECI:

a) one or more, up to a maximum of three, of the present weather abbreviations given in 4.4.2.3 ~~and~~, 4.4.2.5 and 4.4.2.6 shall be used, as necessary, together with an indication, where appropriate, of the characteristics and intensity or proximity to the aerodrome, so as to convey a complete description of the present weather of significance to flight operations;

. . .

4.4.2.9 **Recommendation.—** *In automated local routine and special reports, and METAR and SPECI, when the present weather cannot be observed by the automatic observing system, the present weather should be replaced by "//".*

4.5 Clouds

. . .

4.5.4 Reporting

. . .

4.5.4.4 In local routine and special reports~~:~~

~~a)~~ the units of measurement used for the height of cloud base and vertical visibility shall be indicated.~~; and~~

~~b) when there is more than one runway in use and the heights of cloud bases are observed by instruments for these runways, the available heights of cloud bases for each runway shall be reported and the runways to which the values refer shall be indicated.~~

4.5.4.5 **Recommendation.—** *In automated local routine and special reports and METAR and SPECI:*

. . .

c) when cumulonimbus clouds or towering cumulus clouds are detected by the automatic observing system and the cloud amount and the height of cloud base cannot be observed, the cloud amount and the height of cloud base elements should be replaced by "~~##~~///".

4.5.4.6 **Recommendation.—** *In automated local routine and special reports, and METAR and SPECI, when the sky is obscured and the value of the vertical visibility cannot be determined by the automatic observing system, the vertical visibility should be replaced by "///"*

. . .

4.8 Supplementary information

4.8.1 Reporting

4.8.1.1 **Recommendation.—** *In local routine and special reports and in METAR and SPECI, the following recent weather phenomena, i.e. weather phenomena observed at the aerodrome during the period since the last issued routine report or last hour, whichever is the shorter, but not at the time of observation, should be reported, up to a maximum of three groups, in accordance with the templates shown in Tables A3-1 and A3-2, in the supplementary information:*

. . .

Note.— The meteorological authority, in consultation with users, may agree not to provide recent weather information where local special reports and SPECI are issued.

. . .

4.8.1.3 **Recommendation.—** *In automated local routine and special reports and METAR and SPECI, in addition to the recent weather phenomena listed under 4.8.1.1, recent unknown precipitation should be reported in accordance with the template shown in Table A3-2 when the type of precipitation cannot be identified by the automatic observing system.*

Note.— The meteorological authority, in consultation with users, may agree not to provide recent weather information where local special reports and SPECI are issued.

. . .

4.8.1.5 **Recommendation.—** *In METAR and SPECI, the following information should be included in the supplementary information, in accordance with regional air navigation agreement:*

a) information on sea-surface temperature and the state of the sea or the significant wave height from aeronautical meteorological stations established on offshore structures in support of helicopter operations; and

. . .

Table A3-1. Template for the local routine (MET REPORT) and local special (SPECIAL) reports

Key: M = inclusion mandatory, part of every message;
C = inclusion conditional, dependent on meteorological conditions;
O = inclusion optional.

Note 1.— The ranges and resolutions for the numerical elements included in the local routine and special reports are shown in Table A3-4 of this appendix.

Note 2.— The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes *(PANS-ABC, Doc 8400).*

Element as specified in Chapter 4	*Detailed content*	*Template(s)*			*Examples*	
. . .						
Visibility (M)	Name of the element (M)	VIS		C A V O K	VIS 350M CAVOK VIS 7KM VIS 10KM	
	Runway (O)[2]	RWY nn[L] *or* RWY nn[C] *or* RWY nn[R]			VIS RWY 09 TDZ 800M END 1200M	
	Runway section (O)[3]	TDZ				
	Visibility (M)	n[n][n][n]M *or* n[n]KM				
	Runway section (O)[3]	MID				
	Visibility (O)[3]	n[n][n][n]M *or* n[n]KM				
	Runway section (O)[3]	END			VIS RWY 18C TDZ 6KM RWY 27 TDZ 4000M	
	Visibility (O)[3]	n[n][n][n]M *or* n[n]KM				
~~RVR~~ Runway visual range (C)[6]	Name of the element (M)	RVR			RVR RWY 32 400M RVR RWY 20 1600M	
. . .						
Present weather (C)[9, 10]	Intensity of present weather (C)[9]	FBL *or* MOD *or* HVY	—			
	Characteristics and type of present weather (C)[9,11]	DZ *or* RA *or* SN *or* SG *or* PL *or* DS *or* SS *or* FZDZ *or* FZUP[12] *or* FC[13] *or* FZRA *or* SHGR *or* SHGS *or* SHRA *or* SHSN *or* SHUP[12] *or* TSGR *or* TSGS *or* TSRA *or* TSSN *or* TSUP[12] *or* UP[12]	~~IC or~~ FG *or* BR *or* SA *or* DU *or* HZ *or* FU *or* VA *or* SQ *or* PO *or* FC *or* TS *or* BCFG *or* BLDU *or* BLSA *or* BLSN *or* DRDU *or* DRSA *or* DRSN *or* FZFG *or* MIFG *or* PRFG *or* //[12]		MOD RA HVY TSRA HVY DZ FBL SN HVY TSRASN FBL SNRA FBL DZ FG HVY SHSN BLSN HVY TSUP //	HZ FG VA MIFG

Element as specified in Chapter 4	*Detailed content*	*Template(s)*				*Examples*
Cloud (M)[14]	Name of the element (M)	CLD				
	~~Runway (O)[2]~~	~~RWY nn[L] *or* RWY nn[C] *or* RWY nn[R]~~				CLD NSC
	Cloud amount (M) *or* vertical visibility (O)[9]	FEW *or* SCT *or* BKN *or* OVC *or* ///[12]	OBSC	NSC *or* NCD[12]		CLD SCT 300M OVC 600M (CLD SCT 1000FT OVC 2000FT) CLD OBSC VER VIS 150M (CLD OBSC VER VIS 500FT)
	Cloud type (C)[9]	CB *or* TCU *or* ///[12]	—			CLD BKN TCU 270M (CLD BKN TCU 900FT)
	Height of cloud base *or* the value of vertical visibility (C)[9]	n[n][n][n]M (*or* n[n][n][n]FT) *or* ///M (*or* ///FT)[12]	[VER VIS n[n][n]M (*or* VER VIS n[n][n][n]FT)] *or* VER VIS ///M (*or* VER VIS ///FT)			~~CLD RWY 08R BKN 60M RWY 26 BKN 90M (CLD RWY 08R BKN 200FT RWY 26 BKN 300FT)~~ CLD /// CB ///M (CLD /// CB ///FT) ~~CLD /// CB 400M (CLD /// CB 1200FT)~~ CLD NCD
. . .						
Supplementary information (C)[9]	Significant meteorological phenomena (C)[9]	CB *or* TS *or* MOD TURB *or* SEV TURB *or* WS *or* GR *or* SEV SQL *or* MOD ICE *or* SEV ICE *or* FZDZ *or* FZRA *or* SEV MTW *or* SS *or* DS *or* BLSN *or* FC[15]				FC IN APCH WS IN APCH 60M-WIND: 360/13MPS WS RWY 12
	Location of the phenomena (C)[9]	IN APCH [n[n][n][n]M-WIND nnn/n[n]MPS] *or* IN CLIMB-OUT [n[n][n][n]M-WIND nnn/n[n]MPS] (IN APCH [n[n][n][n]FT-WIND nnn/n[n]KT] *or* IN CLIMB-OUT [n[n][n][n]FT-WIND nnn/n[n]KT]) *or* RWY ~~nn[n]~~ nn[L] *or* RWY nn[C] *or* RWY nn[R]				
	Recent weather (C)[9, 10]	REFZDZ *or* REFZRA *or* REDZ *or* RE[SH]RA *or* RERASN *or* RE[SH]SN *or* RESG *or* RESHGR *or* RESHGS *or* REBLSN *or* RESS *or* REDS *or* RETSRA *or* RETSSN *or* RETSGR *or* RETSGS *or* REFC *or* REPL or REUP[12] *or* REFZUP[12] *or* RETSUP[12] *or* RESHUP[12] *or* REVA *or* RETS				REFZRA CB IN CLIMB-OUT RETSRA
Trend forecast (O)[16]	Name of the element (M)	TREND				
	Change indicator (M)[17]	NOSIG	BECMG *or* TEMPO			TREND NOSIG TREND BECMG FEW 600M (TREND BECMG FEW 2000FT)
. . .						
	Visibility (C)[9]		VIS n[n][n][n]M *or* VIS n[n]KM		C A	TREND BECMG AT1800 VIS 10KM NSW TREND BECMG TL1700 VIS 800M FG TREND BECMG FM1030 TL1130 CAVOK

Element as specified in Chapter 4	*Detailed content*	*Template(s)*					*Examples*
	Weather phenomenon: characteristics and type (C)[9, 10, 11]		DZ *or* RA *or* SN *or* SG *or* PL *or* DS *or* SS *or* FZDZ *or* FZRA *or* SHGR *or* SHGS *or* SHRA *or* SHSN *or* TSGR *or* TSGS *or* TSRA *or* TSSN	~~IC *or*~~ FG *or* BR *or* SA *or* DU *or* HZ *or* FU *or* VA *or* SQ *or* PO *or* FC *or* TS *or* BCFG *or* BLDU *or* BLSA *or* BLSN *or* DRDU *or* DRSA *or* DRSN *or* FZFG *or* MIFG *or* PRFG		V O K	TREND TEMPO TL1200 VIS 600M BECMG AT1230 VIS 8KM NSW CLD NSC TREND TEMPO FM0300 TL0430 MOD FZRA TREND BECMG FM1900 VIS 500M HVY SNRA TREND BECMG FM1100 MOD SN TEMPO FM1130 BLSN
	Name of the element (C)[9]		CLD				
	Cloud amount and vertical visibility (C)[9,14]		FEW *or* SCT *or* BKN *or* OVC	OBSC	NSC		TREND BECMG AT1130 CLD OVC 300M (TREND BECMG AT1130 CLD OVC 1000FT)
	Cloud type (C)[9,14]		CB *or* TCU	—			TREND TEMPO TL1530 HVY SHRA CLD BKN CB 360M (TREND TEMPO TL1530 HVY SHRA CLD BKN CB 1200FT)
	Height of cloud base *or* the value of vertical visibility (C)[9,14]		n[n][n][n]M (*or* n[n][n][n]FT)	[VER VIS n[n][n]M (*or* VER VIS n[n][n][n]FT)]			

Notes.—

1. Fictitious location.
2. Optional values for one or more runways.
3. Optional values for one or more sections of the runway.
4. To be included in accordance with 4.1.5.2 c).
5. To be included in accordance with 4.1.5.2 b) 1).
6. To be included if visibility or ~~RVR~~runway visual range < 1 500 m.
7. To be included in accordance with 4.3.6.4 d).
8. To be included in accordance with 4.3.6.4 c).
9. To be included whenever applicable.
10. One or more, up to a maximum of three groups, in accordance with 4.4.2.8 a), 4.8.1.1 and Appendix 5, 2.2.4.3.
11. Precipitation types listed under 4.4.2.3 a) may be combined in accordance with 4.4.2.8 c) and Appendix 5, 2.2.4.1. Only moderate or heavy precipitation to be indicated in trend forecasts in accordance with Appendix 5, 2.2.4.1.
12. For automated reports only.
13. Heavy used to indicate tornado or waterspout; moderate used to indicate funnel cloud not reaching the ground.
14. Up to four cloud layers in accordance with 4.5.4.3 e).
15. Abbreviated plain language may be used in accordance with 4.8.1.2.
16. To be included in accordance with Chapter 6, 6.3.2.
17. Number of change indicators to be kept to a minimum in accordance with Appendix 5, 2.2.1, normally not exceeding three groups.

Table A3-2. Template for METAR and SPECI

Key: M = inclusion mandatory, part of every message;
C = inclusion conditional, dependent on meteorological conditions or method of observation;
O = inclusion optional.

Note 1.— The ranges and resolutions for the numerical elements included in METAR and SPECI are shown in Table A3-5 of this appendix.

Note 2.— The explanations for the abbreviations can be found in the Procedures for Air Navigation Services — ICAO Abbreviations and Codes *(PANS-ABC, Doc 8400)*.

Element as specified in Chapter 4	*Detailed content*	*Template(s)*				*Examples*
. . .						
~~RVR~~Runway visual range (C)[7]	Name of the element (M)	R			C A V O K	R32/0400 R12R/1700 R10/M0050 R14L/P2000
	Runway (M)	nn[L]/*or* nn[C]/ *or* nn[R]/				
	~~RVR~~Runway visual range (M)	[P *or* M]nnnn				R16L/0650 R16C/0500 R16R/0450 R17L/0450
	~~RVR variations (C)[8]~~	~~V[P *or* M]nnnn~~				~~R20/0700V1200~~ ~~R19/0350VP1200~~
	~~RVR~~runway visual range past tendency (C)[9]	U, D *or* N				R12/1100U R26/0550N R20/0800D R12/0700 ~~R09/0375V0600U~~ ~~R10/M0150V0500D~~
Present weather (C)[2, 10]	Intensity *or* proximity of present weather (C)[11]	– *or* +	—	VC		
	Characteristics and type of present weather (M)[12]	DZ *or* RA *or* SN *or* SG *or* PL *or* DS *or* SS *or* FZDZ *or* FZRA *or* FZUP[13] *or* FC[14] or SHGR *or* SHGS *or* SHRA *or* SHSN *or* SHUP[13] *or* TSGR *or* TSGS *or* TSRA *or* TSSN *or* TSUP[13] *or* UP[13]	~~IC *or*~~ FG *or* BR *or* SA *or* DU *or* HZ *or* FU *or* VA *or* SQ *or* PO *or* TS *or* BCFG *or* BLDU *or* BLSA *or* BLSN *or* DRDU *or* DRSA *or* DRSN *or* FZFG *or* MIFG *or* PRFG *or* //[13]	FG *or* PO *or* FC *or* DS *or* SS *or* TS *or* SH *or* BLSN *or* BLSA *or* BLDU *or* VA		RA HZ VCFG +TSRA FG VCSH +DZ VA VCTS –SN MIFG VCBLSA +TSRASN –SNRA DZ FG +SHSN BLSN UP FZUP TSUP FZUP //
Cloud (M)[14]	Cloud amount and height of cloud base *or* vertical visibility (M)	FEWnnn *or* SCTnnn *or* BKNnnn *or* OVCnnn *or* //////[13]	VVnnn *or* VV///	NSC *or* NCD[13]		FEW015 VV005 OVC030 VV/// NSC SCT010 OVC020 BKN025/// BKN/// ///015
. . .						

Element as specified in Chapter 4	*Detailed content*	*Template(s)*	*Examples*
Supplementary information (C)	Recent weather (C)[2, 10]	REFZDZ *or* REFZRA *or* REDZ *or* RE[SH]RA *or* RERASN *or* RE[SH]SN *or* RESG *or* RESHGR *or* RESHGS *or* REBLSN *or* RESS *or* REDS *or* RETSRA *or* RETSSN *or* RETSGR *or* RETSGS *or* RETS *or* REFC *or* REVA *or* REPL *or* REUP[13] *or* REFZUP[13] *or* RETSUP[13] *or* RESHUP[13]	REFZRA RETSRA
	Wind shear (C)[2]	WS Rnn[L] *or* WS Rnn[C] *or* WS Rnn[R] *or* WS ALL RWY	WS R03 WS ALL RWY WS R18C
	Sea-surface temperature and state of the sea or significant wave height (C)[15][16]	W[M]nn/Sn or W[M]nn/Hn[n][n]	W15/S2 W12/H75
	State of the runway (C)[16][17] — Runway designator (M)	R nn[L]/ *or* Rnn[C]/ *or* Rnn[R]/ — R/SNOCLO	R99/421594 R/SNOCLO R14L/CLRD//
	Runway deposits (M)	n *or* / — CLRD//	
	Extent of runway contamination (M)	n *or* /	
	Depth of deposit (M)	nn *or* //	
	Friction coefficient or braking action (M)	nn *or* //	
Trend forecast (O)[17]	Change indicator (M)[18][19]	NOSIG — BECMG *or* TEMPO	NOSIG BECMG FEW020
	Period of change (C)[2]	FMnnnn *and/or* TLnnnn *or* ATnnnn	
	Wind (C)[2]	nnn[P]nn[n][G[P]nn[n]]MPS (*or* nnn[P]nn[G[P]nn]KT)	TEMPO 25018G25MPS (TEMPO 25036G50KT)
	Prevailing visibility (C)[2]	nnnn — CAVOK	BECMG FM1030 TL1130 CAVOK BECMG TL1700 0800 FG BECMG AT1800 9000 NSW BECMG FM1900 0500 +SNRA BECMG FM1100 SN TEMPO FM1130 BLSN TEMPO FM0330 TL0430 FZRA
	Weather phenomenon: intensity (C)[11]	– *or* + — — NSW	
	Weather phenomenon: characteristics and type (C)[2, 10, 12]	DZ *or* RA *or* SN *or* SG *or* PL *or* DS *or* SS *or* FZDZ *or* FZRA *or* SHGR *or* SHGS *or* SHRA *or* SHSN *or* TSGR *or* TSGS *or* TSRA *or* TSSN — ~~IC or~~ FG *or* BR *or* SA *or* DU *or* HZ *or* FU *or* VA *or* SQ *or* PO *or* FC *or* TS *or* BCFG *or* BLDU *or* BLSA *or* BLSN *or* DRDU *or* DRSA *or* DRSN *or* FZFG *or* MIFG *or* PRFG — NSW	

Element as specified in Chapter 4	*Detailed content*	*Template(s)*					*Examples*
	Cloud amount and height of cloud base *or* vertical visibility (C)[2, 15]		FEWnnn *or* SCTnnn *or* BKNnnn *or* OVCnnn	VVnnn *or* VV///	N S C		TEMPO TL1200 0600 BECMG AT1200 8000 NSW NSC BECMG AT1130 OVC010
	Cloud type (C)[2,15]		CB *or* TCU	—			TEMPO TL1530 +SHRA BKN012CB

Notes.—

1. Fictitious location.
2. To be included whenever applicable.
3. To be included in accordance with 4.1.5.2 c).
4. To be included in accordance with 4.1.5.2 b) 1).
5. To be included in accordance with 4.2.4.4 b).
6. To be included in accordance with 4.2.4.4 a).
7. To be included if visibility or ~~RVR~~runway visual range < 1 500 m; for up to a maximum of four runways in accordance with 4.3.6.5 b).
8. To be included in accordance with 4.3.6.6 b).
9. To be included in accordance with 4.3.6.6 a).
10. One or more, up to a maximum of three groups, in accordance with 4.4.2.8 a), 4.8.1.1 and Appendix 5, 2.2.4.1.
11. To be included whenever applicable; no qualifier for *moderate* intensity in accordance with 4.4.2.7.
12. Precipitation types listed under 4.4.2.3 a) may be combined in accordance with 4.4.2.8 c) and Appendix 5, 2.2.4.1. Only moderate or heavy precipitation to be indicated in trend forecasts in accordance with Appendix 5, 2.2.4.1.
13. For automated reports only.
14. Heavy used to indicate tornado or waterspout; moderate (no qualifier) to indicate funnel cloud not reaching the ground.
15. Up to four cloud layers in accordance with 4.5.4.3 e).
16. To be included in accordance with 4.8.1.5 a).
17. To be included in accordance with 4.8.1.5 b).
18. To be included in accordance with Chapter 6, 6.3.2.
19. Number of change indicators to be kept to a minimum in accordance with Appendix 5, 2.2.1, normally not exceeding three groups.

. . .

Table A3-4. Ranges and resolutions for the numerical elements included in local reports

Element as specified in Chapter 4		*Range*	*Resolution*
. . .			
~~RVR~~Runway visual range	M M M	0 – 375 400 – 750 800 – 2 000	25 50 100
. . .			

* There is no aeronautical requirement to report surface wind speeds of 50 m/s (100 kt) or more; however, provision has been made for reporting wind speeds up to 99 m/s (199 kt) for non-aeronautical purposes, as necessary.

** Under circumstances as specified in 4.5.4.3; otherwise a resolution of 30 m (100 ft) is to be used.

Table A3-5. Ranges and resolutions for the numerical elements included in METAR and SPECI

Element as specified in Chapter 4		*Range*	*Resolution*
. . .	(no units)	01 – 36	1
~~RVR~~Runway visual range:	M M M	0000 – 0375 0400 – 0750 0800 – 2 000	25 50 100
. . .			
State of the sea:	(no units)	0 – 9	1
Significant wave height	M	0 – 999	0.1
. . .			

Example A3-1. Routine report

. . .

Meaning of both reports:

Routine report for Donlon/International* issued on the 22nd of the month at 1630 UTC; surface wind direction 240 degrees; wind speed 4 metres per second; visibility (along the runway(s) in the local routine report; prevailing visibility in METAR) 600 metres; runway visual range representative of the touchdown zone for runway 12 is 1 000 metres and the runway visual range values have shown an upward tendency during previous 10 minutes (~~RVR~~runway visual range tendency to be included in METAR only); and moderate drizzle and fog; scattered cloud at 300 metres; overcast at 600 metres; air temperature 17 degrees Celsius; dew-point temperature 16 degrees Celsius; QNH 1 018 hectopascals; trend during next 2 hours, visibility (along the runway(s) in the local routine report; prevailing visibility in METAR) becoming 800 metres in fog by 1700 UTC; at 1800 UTC visibility (along the runway(s) in the local routine report; prevailing visibility in METAR) becoming 10 kilometres or more and nil significant weather.

* Fictitious location

. . .

Example A3-2. Special report

. . .

Meaning of both reports:

Special report for Donlon/International* issued on the 15th of the month at 1115 UTC; surface wind direction 050 degrees; wind speed 25 knots gusting between 10 and 37 knots (minimum wind speed not to be included in SPECI) visibility 1 200 metres (along the runway(s) in the local special report); prevailing visibility 3 000 metres (in SPECI) with minimum visibility 1 200 metres to north east (directional variations to be included in SPECI only); ~~RVR~~runway visual range above 1 800 metres on runway 05 (~~RVR~~runway visual range not required in SPECI with prevailing visibility of 3 000 metres); thunderstorm with heavy rain; broken cumulonimbus cloud at 500 feet; air temperature 25 degrees Celsius; dew-point temperature 22 degrees Celsius; QNH 1 008 hectopascals; trend during next 2 hours, visibility (along the runway(s) in the local special report; prevailing visibility in SPECI) temporarily 600 metres from 1115 to 1200, becoming at 1200 UTC visibility (along the runway(s) in the local special report; prevailing visibility in SPECI) 8 kilometres, thunderstorm ceases and nil significant weather and nil significant cloud.

* Fictitious location

. . .

APPENDIX 4. TECHNICAL SPECIFICATIONS RELATED TO AIRCRAFT OBSERVATIONS AND REPORTS

(See Chapter 5 of this Annex.)

. . .

3. EXCHANGE OF AIR-REPORTS

3.1 Responsibilities of the meteorological watch offices

. . .

3.1.3 When a special air-report is received at the meteorological watch office but the forecaster considers that the phenomenon causing the report is not expected to persist and, therefore, does not warrant issuance of a SIGMET, the special air-report shall be disseminated in the same way that SIGMET messages are disseminated in accordance with Appendix 6, 1.2.1, i.e. to meteorological watch offices in adjacent flight information regions and~~,~~ WAFCs~~, and other meteorological offices~~ in accordance with regional air navigation agreement.

. . .

4. SPECIFIC PROVISIONS RELATED TO REPORTING WIND SHEAR AND VOLCANIC ASH

. . .

4.2 Post-flight reporting of volcanic activity

. . .

4.2.2 The completed report of volcanic activity received by ~~a~~ an aerodrome meteorological office shall be transmitted without delay to the meteorological watch office responsible for the provision of meteorological watch for the flight information region in which the volcanic activity was observed.

APPENDIX 5. TECHNICAL SPECIFICATIONS RELATED TO FORECASTS

(See Chapter 6 of this Annex.)

1. CRITERIA RELATED TO TAF

1.1 TAF format

. . .

1.1.2 **Recommendation**.— *TAF should be disseminated, under bilateral agreements between States in a position to do so, in ~~the WMO BUFR code~~digital form, in addition to the dissemination of the TAF in accordance with 1.1.1.*

~~*Note.— The BUFR code form is contained in WMO Publication No. 306,* Manual on Codes, *Volume I.2, Part B — Binary Codes.*~~

1.1.3 TAF in digital form shall be formatted in accordance with a globally interoperable information exchange model and shall use extensible mark-up language (XML)/geography mark-up language (GML).

1.1.4 TAF in digital form shall be accompanied by the appropriate metadata.

Note.— Guidance on the information exchange model, XML/GML and the metadata profile is provided in the Manual on the Digital Exchange of Aeronautical Meteorological Information (Doc ####).

. . .

1.3 Use of change groups

. . .

1.3.1 The criteria used for the inclusion of change groups in TAF or for the amendment of TAF shall be based on any of the following weather phenomena or combinations thereof being forecast to begin or end or change in intensity:

— freezing fog

— freezing precipitation
— moderate or heavy precipitation (including showers thereof)
— thunderstorm (with or without precipitation)
— duststorm
— sandstorm.

1.3.2 **Recommendation.**— *The criteria used for the inclusion of change groups in TAF or for the amendment of TAF should be based on the following:*

. . .

f) when any of the following weather phenomena or combinations thereof are forecast to begin or end:

~~— *ice crystals*~~
~~— *freezing fog*~~

. . .

~~— *thunderstorm (without precipitation)*~~

. . .

1.3.6 **Recommendation.**— *Where one set of prevailing weather conditions is expected to change significantly and more or less completely to a different set of conditions, the period of validity should be subdivided into self-contained periods using the abbreviation "FM" followed immediately by a ~~four~~six-figure time group in ~~whole~~ days, hours and minutes UTC indicating the time the change is expected to occur. The subdivided period following the abbreviation "FM" should be self-contained and all forecast conditions given before the abbreviation should be superseded by those following the abbreviation.*

. . .

2. CRITERIA RELATED TO TREND FORECASTS

. . .

2.2 Inclusion of meteorological elements in trend forecasts

. . .

2.2.4 Weather phenomena

. . .

2.2.4.2 The trend forecast shall indicate the expected onset or cessation of one or more of the following weather phenomena or combinations thereof:

~~— ice crystals~~

. . .

4. CRITERIA RELATED TO AREA FORECASTS FOR LOW-LEVEL FLIGHTS

. . .

4.4 Exchange of area forecasts for low-level flights

Area forecasts for low-level flights prepared in support of the issuance of AIRMET information shall be exchanged between meteorological watch offices responsible for the issuance of flight documentation for low-level flights in the flight information regions concerned.

. . .

Table A5-3. Template for GAMET

Key: M = inclusion mandatory, part of every message;
C = inclusion conditional, dependent on meteorological conditions;
O = inclusion optional;
= = a double line indicates that the text following it should be placed on the subsequent line.

Element	*Detailed content*	*Template(s)*	*Examples*
. . .			
Location indicator of meteorological watch office (M)	Location indicator of meteorological watch office originating the message with a separating hyphen (M)	nnnn–	YUDO–[1]
. . .			

Notes.—

1. Fictitious location.

. . .

Example A5-3. GAMET area forecast

. . .

Meaning: An area forecast for low-level flights (GAMET) issued for sub-area two of the Amswell* flight information region (identified by YUCC Amswell area control centre) for below flight level 120 by the Donlon/International* meteorological watch office (YUDO); the message is valid from 0600 UTC to 1200 UTC on the 22nd of the month.

* Fictitious location

. . .

APPENDIX 6. TECHNICAL SPECIFICATIONS RELATED TO SIGMET AND AIRMET INFORMATION, AERODROME WARNINGS AND WIND SHEAR WARNINGS AND ALERTS

. . .

1. SPECIFICATIONS RELATED TO SIGMET INFORMATION

1.1 Format of SIGMET messages

. . .

1.1.6 **Recommendation.**— *Meteorological watch offices in a position to do so should issue SIGMET information in graphical format using ~~the WMO BUFR code~~digital form, in addition to the issuance of this SIGMET information in abbreviated plain language in accordance with 1.1.1.*

~~*Note.— The BUFR code form is contained in WMO Publication No. 306,* Manual on Codes, *Volume I.2, Part B — Binary Codes.*~~

. . .

1.1.8 SIGMET in digital form shall be formatted in accordance with a globally interoperable information exchange model and shall use extensible mark-up language (XML)/geography mark-up language (GML).

1.1.9 SIGMET in digital form shall be accompanied by the appropriate metadata.

Note.— Guidance on the information exchange model, XML/GML and the metadata profile is provided in the Manual on the Digital Exchange of Aeronautical Meteorological Information (Doc ####).

1.2 Dissemination of SIGMET messages

1.2.1 SIGMET messages shall be disseminated to meteorological watch offices in adjacent flight information regions and~~,~~ WAFCs ~~and to other meteorological offices~~ in accordance with regional air navigation agreement. SIGMET messages for volcanic ash shall also be disseminated to VAACs.

. . .

2. SPECIFICATIONS RELATED TO AIRMET INFORMATION

. . .

2.2 Dissemination of AIRMET messages

2.2.1 **Recommendation.—** *AIRMET messages should be disseminated to meteorological watch offices in adjacent flight information regions and to other aerodrome meteorological offices or meteorological watch offices, as agreed by the meteorological authorities concerned.*

. . .

4. DETAILED CRITERIA RELATED TO SIGMET AND AIRMET MESSAGES AND SPECIAL AIR-REPORTS (UPLINK)

. . .

4.2 Criteria related to phenomena included in SIGMET and AIRMET messages and special air-reports (uplink)

. . .

4.2.9 **Recommendation.—** *Sandstorm/duststorm should be considered:*

a) heavy whenever the visibility is below 200 m and the sky is obscured; and

b) moderate whenever the visibility is greater than or equal to 200 m but below 600 m.

5. SPECIFICATIONS RELATED TO AERODROME WARNINGS

. . .

5.2 Quantitative criteria for aerodrome warnings

Recommendation.— *When quantitative criteria are necessary for the issue of aerodrome warnings covering, for example, the expected maximum wind speed or the expected total snowfall, the criteria should be established by agreement between the aerodrome meteorological office and the users of the warnings.*

. . .

APPENDIX 8. TECHNICAL SPECIFICATIONS RELATED TO SERVICE FOR OPERATORS AND FLIGHT CREW MEMBERS

(See Chapter 9 of this Annex.)

. . .

1. MEANS OF SUPPLY AND FORMAT OF METEOROLOGICAL INFORMATION

1.1 Meteorological information shall be supplied to operators and flight crew members by one or more of the following, as agreed between the meteorological authority and operator concerned, and with the order shown below not implying priorities:

. . .

f) in lieu of a) to e), by means of an automated pre-flight information system providing self-briefing and flight documentation facilities while retaining access by operators and aircrew members to consultation, as necessary, with the aerodrome meteorological office, in accordance with 5.1.

. . .

4. SPECIFICATIONS RELATED TO FLIGHT DOCUMENTATION

4.1 Presentation of information

. . .

4.1.2 METAR and SPECI (including trend forecasts as issued in accordance with regional air navigation agreement), TAF, GAMET, SIGMET, AIRMET and volcanic ash and tropical cyclone advisory information shall be presented in accordance with the templates in Appendices 1, 2, 3, 5 and 6, respectively. Such meteorological information received from other aerodrome meteorological offices or meteorological watch offices shall be included in flight documentation without change.

. . .

5. SPECIFICATIONS RELATED TO AUTOMATED PRE-FLIGHT INFORMATION SYSTEMS FOR BRIEFING, CONSULTATION, FLIGHT PLANNING AND FLIGHT DOCUMENTATION

5.1 Access to the systems

Automated pre-flight information systems providing self-briefing facilities shall provide for access by operators and flight crew members to consultation, as necessary, with ~~a~~ an aerodrome meteorological office by telephone or other suitable telecommunications means.

. . .

6. SPECIFICATIONS RELATED TO INFORMATION FOR AIRCRAFT IN FLIGHT

6.1 Supply of information requested by an aircraft in flight

Recommendation.— *If an aircraft in flight requests meteorological information, the aerodrome meteorological office which receives the request should arrange to supply the information with the assistance, if necessary, of another aerodrome meteorological office.*

. . .

APPENDIX 9. TECHNICAL SPECIFICATIONS RELATED TO INFORMATION FOR AIR TRAFFIC SERVICES, SEARCH AND RESCUE SERVICES AND AERONAUTICAL INFORMATION SERVICES

(See Chapter 10 of this Annex.)

1. INFORMATION TO BE PROVIDED FOR AIR TRAFFIC SERVICES UNITS

. . .

1.3 List of information for the area control centre and flight information centre

The following meteorological information shall be supplied, as necessary, to an area control centre or a flight information centre by its associated meteorological watch office:

. . .

c) any other meteorological information required by the flight information centre or area control centre to meet requests from aircraft in flight; if the information requested is not available in the associated meteorological watch office, that office shall request the assistance of another aerodrome meteorological office or meteorological watch office in supplying it;

. . .

1.5 Format of information

1.5.1 **Recommendation.—** *Local routine and special reports, METAR and SPECI, TAF and trend forecasts, SIGMET and AIRMET information, upper wind and upper-air temperature forecasts and amendments thereto should be supplied to air traffic services units in the form in which they are prepared, disseminated to other meteorological watch offices or received from other meteorological watch offices, unless otherwise agreed locally.*

. . .

2. INFORMATION TO BE PROVIDED FOR SEARCH AND RESCUE SERVICES UNITS

. . .

2.2 Information to be provided on request

2.2.1 **Recommendation.—** *On request from the rescue coordination centre, the designated meteorological watch office should arrange to obtain details of the flight documentation which was supplied to the missing aircraft, together with any amendments to the forecast which were transmitted to the aircraft in flight.*

2.2.2 **Recommendation.—** *To facilitate search and rescue operations the designated meteorological watch office should, on request, supply:*

. . .

2.2.3 **Recommendation.—** *On request from the rescue coordination centre, the designated meteorological watch office should supply or arrange for the supply of meteorological information required by ships undertaking search and rescue operations.*

. . .

APPENDIX 10. TECHNICAL SPECIFICATIONS RELATED TO REQUIREMENTS FOR AND USE OF COMMUNICATIONS

(See Chapter 11 of this Annex.)

. . .

2. USE OF AERONAUTICAL FIXED SERVICE COMMUNICATIONS AND THE PUBLIC INTERNET

2.1 Meteorological bulletins in alphanumeric format

. . .

2.1.3 Heading of bulletins

Meteorological bulletins containing operational meteorological information to be transmitted via the aeronautical fixed service or the public Internet shall contain a heading consisting of:

. . .

b) the ICAO four-letter location indicator corresponding to the geographical location of the aerodrome meteorological office or meteorological watch office originating or compiling the meteorological bulletin;

. . .

4. USE OF AERONAUTICAL DATA LINK SERVICE — D-VOLMET

. . .

4.2 Criteria related to information to be available for D-VOLMET

. . .

4.2.2 **Recommendation.—** *TAF included in the D-VOLMET should be amended as necessary to ensure that a forecast, when made available for uplink to aircraft in flight, reflects the latest opinion of the aerodrome meteorological office concerned.*

. . .

5. USE OF AERONAUTICAL BROADCASTING SERVICE — VOLMET BROADCASTS

. . .

5.2 Criteria related to information to be included in VOLMET broadcasts

. . .

5.2.2 **Recommendation.—** *TAF included in scheduled VOLMET broadcasts should be amended as necessary to ensure that a forecast, when transmitted, reflects the latest opinion of the aerodrome meteorological office concerned.*

ATTACHMENT C. SELECTED CRITERIA APPLICABLE TO AERODROME REPORTS

(The guidance in this table relates to Chapter 4 and Appendix 3.)

	Surface wind				*Visibility (VIS)*			~~RVR~~Runway visual range[1] *A* –10 / *B* –5 (Time, MIN) *(OBS TIME)*			*Present weather*	*Cloud* Amount				*Cloud* Type[2]	*Temperature*	*Pressure (QNH, QFE)*		*Supplementary information*
Specifications	Directional variations[3]			Speed variations[3]	Directional variations[4]			Past tendency[5]		~~Variations[5]~~	No general criteria applicable to all the WX phenomena (for specific criteria, see Appendix 3, 4.4.2)	Layers reported if coverage					No criteria	Parameters reported	Updated if changes > agreed magnitude	Parameter to be included
	≥ 60° and < 180°		≥ 180°	Exceeding the mean speed by ≥ 5 m/s (10 kt)	General rule	Special cases Minimum VIS ≠ prevailing VIS		$\lvert \bar{R}_{5(AB)} - \bar{R}_{5(BC)} \rvert$		~~$\lvert \bar{R}_1 - \bar{R}_{10} \rvert$ > MAX [50 m or 20% × $\bar{R}_{10}$]~~										
	Mean speed					Minimum VIS < 1 500 m or < 0.5 × prevailing VIS	VIS fluctuating and prevailing VIS cannot be determined													
	< 1.5 m/s (3 kt)	≥ 1.5 m/s (3 kt)						< 100 m	≥ 100 m			Lowest layer	Next layer >	Next higher layer >	CB[6] or TCU	Identification		Parameters reported	Updated if changes > agreed magnitude	Parameter to be included
Local routine and special report	~~2~~10 min[7] VRB + 2 extreme directions[8]	~~2~~10 min mean + 2 extreme directions[8]	2/10 min VRB (no extremes)[8]	~~2~~10 min Minimum and maximum speed	1 min VIS along the runway(s)	N/A	N/A	1 min N/A[9]				Always	2/8	4/8	Always	CB TCU		QNH QFE[10]	Yes	All[11]
METAR/ SPECI	10 min VRB (no extremes)	10 min mean + 2 extreme directions	10 min VRB (no extremes)	10 min Maximum speed[8]	10 min Prevailing VIS	Prevailing VIS and minimum VIS + direction	Minimum VIS	10 min No tendency observed ("N") / No tendency available, the tendency is to be omitted	Upward ("U") or downward ("D")	~~1 min Minimum and maximum (instead of 10-minute mean)~~		Always	2/8	4/8	Always	CB TCU		QNH	No	Recent WX of operational significance and wind shear[12]
Relevant reporting scales for all messages	Direction in three figures rounded off to the nearest 10 degrees (degrees 1 – 4 down, degrees 5 – 9 up)			Speed in 1 m/s or 1 kt Speed < 0.5 m/s (1 kt) indicated as CALM	*If* / *Step applicable*: VIS < 800 m :50 m; 800 m ≤ VIS < 5 000 m :100 m; 5 000 m ≤ VIS < 10 km :1 km; VIS ≥ 10 km :None, given as 10 km or covered under CAVOK			*If* / *Step applicable*: RVR < 400 m : 25 m; 400 m ≤ RVR ≤ 800 m : 50 m; 800 m < RVR < 2 000 m : 100 m[13]			N/A	*If* / *Step applicable*: Base ≤ 3 000 m (10 000 ft) : 30 m (100 ft) (Reference level: Aerodrome elevation[14] or mean sea level for offshore structures)					Rounded off to whole degrees: up for decimal 5	In whole hPa[15] rounding down for decimals 1 – 9		N/A

Notes.—

1. Considered for the past 10 minutes (exception: if the 10-minute period includes a *marked discontinuity* (i.e. ~~RVR~~Runway visual range changes or passes ~~150~~175, ~~350~~300, ~~600~~550 or 800 m, lasting ≥ 2 minutes), only data after the discontinuity to be used). A simple diagrammatic convention is used to illustrate those parts of the 10-minute period prior to the observation relevant to ~~RVR~~runway visual range criteria, i.e. AB, BC and AC.
2. Layer composed of CB and TCU *with a common base* should be reported as "CB".
3. Considered for the past 10 minutes (exception: if the 10-minute period includes a *marked discontinuity* (i.e. the direction changes ≥ 30° with a speed ≥ 5 m/s *or* the speed changes ≥ 5 m/s lasting ≥ 2 minutes), only data after the discontinuity to be used).
4. If several directions, the most operationally significant direction used.
5. Let ~~$\bar{R}_1$ = any 1-minute mean RVR value during period AC, $\bar{R}_{10}$ = 10-minute mean RVR value during period AC,~~ $\bar{R}_{5(AB)}$ = 5-minute mean ~~RVR~~runway visual range value during period AB and $\bar{R}_{5(BC)}$ = 5-minute mean ~~RVR~~runway visual range value during period BC.
6. CB (cumulonimbus) and TCU (towering cumulus = cumulus congestus of great vertical extent) if not already indicated as one of the other layers.
7. Time averaging, if applicable, indicated in the upper left-hand corner.
8. According to the WMO *Manual on Codes* (WMO-No. 306), Volume I.1, Part A — Alphanumeric Codes, paragraph 15.5.5, "it is recommended that the wind measuring systems should be such that peak gusts should represent a three-second average".
9. N/A = not applicable.
10. QFE is to be included if required. Reference elevation for QFE should be aerodrome elevation except for precision approach runways, and non-precision approach runways with threshold ≥ 2 m (7 ft) below or above aerodrome elevation, where the reference level should be the relevant threshold elevation.
11. As listed in Appendix 3, 4.8.
12. Also sea-surface temperature and state of the sea, or the significant wave height, from offshore structures in accordance with regional air navigation agreement.
13. Report if RVR and/or VIS < 1 500 m, limits for assessments 50 and 2 000 m.
14. For landing at aerodromes with precision approach runways and with the threshold elevation ≥ 15 m below the aerodrome elevation, the *threshold elevation* to be used as a reference.
15. Measured in 0.1 hPa.

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APPENDIX D

AMENDMENT TO THE TEXT OF PANS-ATM, CHAPTER 7, PARAGRAPH 7.2.6 AS PRESENTED TO THE AMOFSG

Editorial Note.— New text is highlighted and deleted text is ~~struck out~~.

. . .

7.2.6 Noise abatement shall not be a determining factor in runway nomination under the following circumstances:

. . .

e) when the crosswind component, including gusts, exceeds 28 km/h (15 kt), or the tailwind component, including gusts, exceeds 9 km/h (5 kt), unless the following requirements are met, in which case noise abatement can be the determining factor in runway nomination to a maximum crosswind component, including gusts, of 37 km/h (20 kt), or a maximum tailwind component of 13 km/h (7 kt) including gusts:

i) The wind reporting system for the touchdown and take-off area, incorporating implementation of additional wind measuring sensors and data processing, interpretation, and dissemination, meets the operational accuracy specified in Annex 3, Attachment A;

ii) A procedure is in place to monitor and compare flight data with data derived from the wind reporting system in e) i) as part of a continuous safety risk assessment process to ensure that aeroplanes do not exceed demonstrated crosswind values or certified tailwind limits;

iii) Precision approach guidance is available for the runway in use;

iv) Arriving and departing aeroplanes are advised as part of the landing or take-off clearance, when variations from the mean wind speed, including gusts, exceed 9 km/h (5 kt);

v) The current surface wind is reported by ATC to aeroplanes on final approach after entering the Final Approach Segment or equivalent position;

vi) Reported braking action remains “good”; and

vii) At aerodromes with multiple runways, the wind information for each separate runway in use is included in the information provided by the automatic terminal information service (ATIS).

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APPENDIX E

AMENDMENT TO THE TEXT OF PANS-ATM, CHAPTER 7, PARAGRAPH 7.2.6 AS AMENDED BY THE AMOFSG

Editorial Note.— New text is highlighted and deleted text is ~~struck out~~.

. . .

7.2.6 Noise abatement shall not be a determining factor in runway nomination under the following circumstances:

. . .

e) when the crosswind component, including gusts, exceeds 28 km/h (15 kt), or the tailwind component, including gusts, exceeds 9 km/h (5 kt), unless the following requirements are met, in which case noise abatement can be the determining factor in runway nomination to a maximum crosswind component, including gusts, of 37 km/h (20 kt), or a maximum tailwind component of 13 km/h (7 kt) including gusts:

i) The wind reporting system for the touchdown and take-off area, incorporating implementation of additional wind measuring sensors and data processing meets the following accuracy of measurement criteria;

1) Mean Surface Wind Direction: ± 10º

2) Mean Surface Wine Speed: 0.5m/s (1kt) up to 5 m/s (10 kt) and ± 10% above 5 m/s (10 kt)

3) Variations from the Mean Surface Wind: ± 1 m/2 (2 kt), in terms of longitudinal and lateral components;

ii) A procedure is in place to monitor and compare flight data with data derived from the wind reporting system in e) i) as part of a continuous safety risk assessment process to ensure that aeroplanes do not exceed demonstrated crosswind values or certified tailwind limits;

iii) Precision approach guidance is available for the runway in use;

iv) Arriving and departing aeroplanes are advised as part of the landing or take-off clearance, when variations from the mean wind speed (gusts) exceed 9 km/h (5 kt);

v) The current surface wind is reported by ATC to aeroplanes on final approach after entering the Final Approach Segment or equivalent position;

vi) Reported braking action remains “good”; and

vii) At aerodromes with multiple runways, the wind information for each separate runway in use is included in the information provided by the automatic terminal information service (ATIS).

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APPENDIX F

SUPPORTING THE MET SECRETARIAT ON THE MIGRATION TOWARDS TABLE DRIVEN DATA REPRESENTATION AND MET SUPPORT TO ATM

Chapter 1 Background

AMOFSG/9 discussed in detail the significant impact expected on ICAO, States, Meteorological (MET) Service Providers and Users by the introduction of a data-oriented environment for Meteorology. Furthermore, intensive discussions were conducted on the topic of MET information to support ATM[11], the underpinning user requirements, the respective interfaces with users and with appropriate ICAO Groups.

Consequently, AMOFSG/9 proposes that a dedicated Project Team (PT) will be established to support the MET secretariat in a number of activities related to MET Information Exchange and MET information support to ATM. It is envisaged that the proposed PT will migrate into a stand-alone Study Group (SG).

This discussion paper provides a first indication of activities envisaged for the PT, including a preliminary assessment of deliverables and associated milestones. Furthermore with respect to MET Information Exchange, it includes a draft text for inclusion in Amd 76 to Annex 3 to reflect the first roadmap step; the introduction of xml/gml to replace Traditional Alphanumeric Codes –TAC- (METAR, SPECI, TAF, SIGMET).

Chapter 2 Proposed title for Project Team

ICAO Meteorological Aeronautical Requirements and Information Exchange Project Team (MARIE-PT)

Chapter 3 Proposed membership

The proposed members for the PT are: Bill, PW, Colin, Herbert, Jun, Steve, Keith, Jan, Michael and Dennis (rapporteur).

IATA, IFATCA, IFALPA and CANSO will be invited to join the PT.

Chapter 4 Proposed working arrangements

The PT will meet by correspondence and by using tele- and videoconferencing facilities. Face to face meetings will be kept to the absolute minimum. When face to face meeting will be convened, the meeting location should respect the geographical spread of the members.

Chapter 5 Meteorological Information Exchange

1.1 Draft text amd. 76

Modification of APP 3-1 §2.1.3:

2.1.3 METAR and SPECI should be made available, under bilateral agreement between States in a position to do so, in digital form, in addition to the dissemination of the METAR and SPECI in accordance with 2.1.2.

[11] When the term 'MET (information) support to ATM' is used, it includes the support required for Performance Based Navigation

2.1.4 METAR and SPECI in digital form shall be formatted in accordance with a globally interoperable information exchange model[12] and shall use the extensible markup language (XML)/geography markup language (GML).

2.1.5 METAR and SPECI in digital form shall be accompanied by the appropriate metadata.

Note 1.— Guidance on the information exchange model, XML/GML and the metadata profile is provided in ICAO Doc #### Manual on the Digital Exchange of Aeronautical Meteorological Information.

Similar text proposals need to be developed for TAF and SIGMET.

Manual on the Digital Exchange of Aeronautical Meteorological Information

Proposed structure

- Logical Data Model
  - *Introduction (primer)*
  - *Dynamic or static reference to specification*
- Physical Data Model
  - *Dynamic or static reference to exchange schema*
    - Xml/gml schema
    - Other
- Metadata (profile)
  - *Dynamic or static reference to metadata profile*
- Implementation considerations
  - *Xml/gml conversion*
  - *'Portrayal' rules (METAR, SPECI, TAF, SIGMET)*
  - *Fulfilling metadata requirements*

Main support activities of PT with respect to Meteorological Information Exchange

The Project Team supports the MET Secretariat with:

- Developing subsequent proposals to amend Annex 3 with respect to the migration to a data-centric environment for:
  - TAC;
  - Other relevant ICAO products;
  - New user requirements.
- Developing the 'Manual on the Digital Exchange of Aeronautical Meteorological Information'
  - Coordinating the development of the underpinning specifications on:
    - Logical Data Model;
    - Physical Data Model(s);
    - Metadata profile.
  - Developing guidance on implementation considerations
- The SWIM integration of Meteorological information
- Promoting the migration towards a data-centric environment

[12] Text currently proposed for Annex 15, by AIS/AIMSG; Information Exchange Model = Logical Data Model.

Deliverables & Milestones → 2014

Deliverable	Target Date	Remarks
Skeleton Manual on the Digital Exchange of Aeronautical Meteorological Information	December 2011	
Logical data model covering at least METAR, SPECI, TAF and SIGMET	April 2012	
Primer for Logical data model	June 2012	
XML/GML Schema covering at least METAR, SPECI, TAF and SIGMET	July 2012	
Metadata profile to support METAR, SPECI, TAF and SIGMET exchange	July 2012	
Initial draft Implementation Considerations	August 2012	
Consolidated draft Manual on the Digital Exchange of Aeronautical Meteorological Information	September 2012	
Release version Manual on the Digital Exchange of Aeronautical Meteorological Information	November 2012	Mature version available for stakeholders
Publication version Manual on the Digital Exchange of Aeronautical Meteorological Information	July 2013	November 2012 version plus update based on first user feedback
Initial proposal for inclusion of 'other' information in the logical data model, the physical data model(s) and associated code formats	October 2013	Input to secretariats' proposal for MET div. mtg.

Chapter 6 Meteorological Support to ATM

Main support activities of PT with respect to Meteorological Support to ATM

The Project Team supports the MET Secretariat with:

- Liaising with the appropriate Groups to consolidate user requirement for MET support to ATM;
- Liaising with WMO on the meteorological capabilities in support of meeting the foreseen consolidated user requirements
- Developing subsequent proposals to amend Annex 3 with respect to user requirements related to MET Support to ATM;
- Developing proposals for Procedures, Manuals or other guidance in support of MET Support to ATM;
- Promoting the notion of MET support to ATM.

Deliverables & Milestones → 2014

Deliverable	Target Date	Remarks
Presentation of MARIE-PT at ATMRPP	November 2011	
MET capability demonstration	July 2012	
Initial set of functional requirements for meteorological elements related to ATM	July 2012	
Initial set of performance metrics for meteorological elements related to ATM	July 2012	
Presentation of MARIE-PT at ATMRPP	September 2012	Presentation of the initial functional req. and performance metrics
CONOPS for MET support to ATM	February 2013	
Guidance on MET support to ATM	July 2013	
PANS-MET Major Release version 1	October 2013	

— END —