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SHIP OBSERVATIONS TEAM

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ITEM I-4

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REPORTS AND RECOMMENDATIONS BY THE TASK TEAMS

(Submitted by the Secretariat)

Summary and purpose of the document

This document provides for the reports of the Chairpersons of the SOT Task Teams.

ACTION PROPOSED

The Team will review the information contained in this report, and comment and make decisions or recommendations as appropriate. See part A for the details of recommended actions.

Appendices:
- A. Report by the Task Team on Satellite Communication Systems
- B. Report by the Task Team on SOT Iridium Pilot Project – Part 1
- C Report by the Task Team on SOT Iridium Pilot Project – Part 2
- D. Report by the Task Team on ASAP
- E. Report by the Task Team on VOS Recruitment and Programme Promotion
- F. Report by the Task Team on Metadata for WMO No. 47
- G. Report by the Task Team on Coding
- H. Report by the Task Team on Instruments Standards
- I. Report by the Task Team on Call sign masking and encoding
- J. Report by the Task Team on the VOS Climate Project (VOSClim)

- A - DRAFT TEXT FOR INCLUSION IN THE FINAL REPORT

I-4.1 Task Team on Satellite Communication Systems

I-4.1.1 The Chairperson of the SOT Task Team on Satellite Communication Systems, Ms Sarah North (Met Office, United Kingdom), reported on the activities of the Task Team since the last SOT Meeting. At SOT-IV, the remit of the Team was amended by removing the word "costs" from its title and it was tasked with evaluating the operational and cost-effective use of satellite data telecommunication systems for the real-time collection of VOS data in support of the World Weather Watch, GOOS, and GCOS. It also monitors the cost implications of Inmarsat satellite communications sent by Code 41, and takes into account related work undertaken by the Task Team on SOT Iridium and the DBCP Iridium Pilot Project.

I-4.1.2 The Task Team has produced a spreadsheet prepared by the E-SURFMAR programme, which compares the relative cost advantages and limitations of Inmarsat, Iridium, and Meteosat transmission systems proposed for Automatic Weather Stations. Short Burst Data (SBD) transmission costs associated with the Iridium system currently offer notable savings when compared to other systems. The Iridium, with a two-way communication ability and global coverage, is now being used for a number of different shipborne AWS systems.

I-4.1.3 With respect to Inmarsat, the Team noted that the use of data compression could result in significant cost savings (e.g. as used with BATOS AWS systems). The messages are emailed on by the Land Earth Stations to the processing centre(s). Decoding software is then used to prepare the FM-13 SHIP (or FM-96 BUFR) reports for insertion on the GTS.

I-4.1.4 Another factor that will have a bearing on transmission costs in the coming years is the migration to Table Driven Codes, such as BUFR. However, it is anticipated that the growing use of shipborne AWS systems is also likely to give rise to a variety of proprietary transmission formats, the relative merits and cost benefits of which will need to be investigated by the Team in the coming years.

I-4.1.5 The Team agreed that the first task of the Task Team Terms of Reference should be broadened to clearly include the real time collection of satellite data in support of SOOP (***action, TT Satcom, SOT-VI***). The Team updated the Terms of Reference accordingly.

I-4.1.6 As reported at SOT IV Goonhilly LES was effectively closed in November 2006 and the Inmarsat C services were transferred to Burum LES in the Netherlands. Although, this transition was supposed to be flawless, and the Goonhilly LES ID numbers were continued, it nevertheless resulted in serious data transmission losses and significant data delays, including for the ASAP data. However, E-ASAP vessels are now using a new dedicated email system whereby the TEMP messages are mailed direct to DWD, who currently manage the programme. This has resulted in a marked drop in the cost of Code 41 transmissions via Goonhilly.

I-4.1.7 The Team noted that the number of manually reporting VOS, sending their weather observations direct by email, rather than via Code 41, had continued to grow since SOT IV, thereby reducing the burden of transmission costs faced by the meteorological services. This trend is expected to continue in the coming years, as broadband communication systems become more widely available on merchant ships. The Team advised VOS operators, whenever possible, to encourage their manually reporting VOS, to consider moving to the use of email to send their weather reports in lieu of using Inmarsat Code 41 (but subject to individual ship-owners being willing to absorb the costs) (***action, VOS operators, ongoing***).

I-4.1.8 To ensure that data losses are not experienced in future, the Team reiterated the recommendations made at SOT IV, (i) that suitable emergency back-up arrangements may be needed, whereby data can be transferred to another LES/Supplier, and (ii) that there was a need to have a clear mechanism to keep LES ID numbers up to date with ownership of the list clearly assigned to

ensure that any changes are promulgated swiftly to VOS focal points and thence to observing ships. The Team requested its members to communicate any changes to the WMO Secretariat for updating the list maintained there1 (***action, TT Satcom, ongoing***).

I-4.1.9 The Team noted that since SOT IV a number of changes to the Code 41 list had arisen (i.e. changes to Vizida listed ID series) that could possibly result in some additional delays in data availability. To prevent such delays occurring, the Team recommended that relevant ships should switch to using the X04 ID Series codes (list available on the WMO web site[1]). Because many non US operated VOS also send their observations via US based LES it is therefore incumbent on individual VOS operators to make the changes known to their VOS fleets (***action, VOS operators, ongoing***).

I-4.1.10 The fact that code 41 observations are now routed globally from all Inmarsat satellite footprints, now brings into question the principle laid down in WMO guidance that weather reports should be sent to the nearest LES. Clearly, this is not happening nowadays and can be complicated by the fact that some ships may be instructed by their shipping companies to use only prescribed LES suppliers. Also, because the majority of LES that accept Code 41 observations are located in the Northern hemisphere it can be difficult to be sure which LES is the nearest. However, recent changes proposed to the TurboWin program (Version 4.5 beta) included a facility to recommend which LES should be used for sending observations.

I-4.1.11 The Team recognized that the current trend to conglomerate LES service providers thereby reducing the overall number of available Code 41 LES, inevitably adds to the unfairness of the Code 41 reverse charging system. Introducing new ID number series also introduces new risks of increased charges being incurred by a smaller number of national meteorological services

I-4.1.12 The Team requested the Secretariat to update the list of LES on the WMO web site according to the updated list presented by the Task Team (***action, Secretariat, ASAP***). It recommended that a new column should be added to the list to clarify which national met services are incurring the costs (***action, TT Satcomm,)***.

I-4.1.13 The Team recalled that in 2003, the Task Team originally undertook an initial review of Inmarsat costs borne by National met services whose countries host LES. Given the significant changes that have taken place since that time, as outlined above, the Team instructed the Task Team to undertake a further review to determine the actual costs currently be faced by individual members in order to help guide future decisions about reducing the Inmarsat cost burden (***action, TT Satcomm, ASAP***).

I-4.1.14 The Team recommended that the Code 41 list in WMO Publication 9 Volume D should be revised to reflect the updated list of LES that accept Code 41 messages. Details should be promulgated by WMO to all VOS operating countries listed WMO Publication No 47 (***Action, Secretariat, end 2009***).

I-4.1.15 The Team noted that there had been several instances reported recently where observations sent to certain LES at non-standard hours, or in certain geographic areas, had not been inserted on the GTS. This not only represented wasted observation data, but also wasted costs. Accordingly, the Team further recommended a review should be undertaken of relevant GTS bulletins for ship observations as listed in WMO Volume C1 (Catalogue of Meteorological Bulletins) (***action, Secretariat, end 2009***).

I-4.1.16 Given the value of all real-time observations, and the fact that SOLAS requires ships to undertake more frequent observations when in the vicinity of tropical cyclones, the Team requested the WMO Secretariat to invite members to check the accuracy of their entries in WMO Volume C1 to ensure that all ship observations are circulated on the GTS irrespective of the hour that they are sent

1 http://www.wmo.int/pages/prog/amp/mmop/inmarsat_les.html

or the geographical area they are sent from (***action, Secretariat, ASAP***).

I-4.1.17 The Team noted with appreciation, that although Automatic Identification System (AIS) carried by VOS were not presently capable of transmitting weather data, and recent developments within the IMOs correspondence group on AIS appeared, to have accepted that weather data should be included in one of the proposed future binary message formats (see also agenda item III-4.4).

I-4.1.18 The Team noted that since SOT IV, the Met Office had been circulating BBXX coding/transmission error lists to VOS operators via the JCOMMOPS PMO and VOS mailing lists so that remedial action can be taken. Recognising the need to minimise such errors the Team invited other National Met Services that host LES to consider circulating similar information via the JCOMMOPS mailing lists (***action, relevant NMHSs, ongoing***).

I-4.1.18 The Team noted that current trials of call sign masking methods would also have potential implications for determining Inmarsat satellite communication costs. If call signs were masked by securely held, but unique, generic identifiers, it would still be possible to assign individual ship communications costs back to the originating VOS operating countries. This will be necessary for programmes like E-SURFMAR, where participating countries are compensated for the communication costs incurred by their VOS (and for costs incurred by non European VOS that are paid by E-SURFMAR members). Where the non-unique identifiers disguise ships identities such as 'SHIP' it will be more difficult to correctly, assign the costs associated with individual ships, unless the Inmarsat numbers of all the ships that use a particular LES are known. The use of 'SHIP' on European VOS would make it extremely difficult for the E-SURFMAR program to arrange compensation for its member countries.

I-4.1.19 The complete Task Team report is provided in *Appendix A*.

I-4.2 Task Team on SOT Iridium Pilot Project

I-4.2.1 Ms Gerie Lynn Lavigne (Meteorological Services, Canada) reported on behalf of the Chairperson of the SOT Task Team, on SOT Iridium Pilot Project, Ms Yvonne Cook (Meteorological Services, Canada), on the activities of the Task Team since the last SOT Meeting. The SOT-IV established a Task Team on SOT Iridium Pilot Project to guide, in close cooperation with the Task Team on Satellite Communications System, the SOT Iridium Pilot Project in evaluating and demonstrating the operational use of Iridium Satellite data telecommunication technology for the real-time collection of VOS and SOOP data in support of the WWW, GOOS, GCOS and Natural Disaster Prevention and Mitigation applications.

I-4.2.2 Ms Lavigne summarized the results of the pilot project based on data transmissions from the prototype Iridium-based Automatic Voluntary Observing Ship (AVOS) system installed onboard the Canadian Coast Guard (CCG) research vessel, Amundsen from July 2007 – November 2008, as well as of the ship Nunakput in the summer of 2006. Results were also presented from Météo-France and NOAA who are participating in the Iridium Pilot Project.

I-4.2.3 The meeting noted that the Iridium transmissions were reliable in the Canadian Arctic. This was concluded, based on 90 % data availability. The 10% data unavailability was mostly due to problems unrelated to Iridium transmissions. Nonetheless, the Iridium Pilot Projects have demonstrated a significant improvement in reliability of communications in Northern waters.

I-4.2.4 In addition to improved performance, the Team also noted the significant cost savings versus the current INMARSAT arrangement Canada has with NOAA. Cost savings will continue to be realized with the Iridium even if the frequency of AVOS observations is increased to hourly in all areas.

I-4.2.5 In addition, the Iridium communication solution also offers the following benefits:

- capability for 2-way communications, allowing for direct connection with hardware on AVOS to assist with troubleshooting and diagnostics. Our current platforms do not support this, however next generation AVOS payload will offer this functionality;
- processing of FM13 SHIP messages will be directly handled by The Canadian Metrological Centre (CMC) in Canada, removing the dependency on NOAA;
- the option for IP data routing means there would no longer be the requirement to decode binary satellite messages directly; and
- the Iridium solution allows more control of AVOS data routing, which is important as Coast Guard continues to be concerned with release of complete AVOS reports to the public.

I-4.2.6 However, the team noted the following risks and challenges of adopting Iridium:

- Dependency on American-based commercial satellite provider for both data reception and processing. Note, however, this dependency is also an issue with current INMARSAT AVOS.
- All MSC AVOS data will be routed through the Iridium data centre before delivery to CMC. Could be security concerns from CCG and others.
- No guarantee that SBD data costs will remain at current rates; price increases are likely over time.
- Integration of Iridium transmitter may lead to increase in data outages as any initial bugs are worked out. Lessons learned from pilot project on Amundsen should help mitigate this.

I-4.2.7 The complete Task Team report is provided in *Appendix B* (Real-time Data Collection Performance - Amundsen AVOS), and *Appendix C* (Position Data Accuracy Amundsen AVOS).

I-4.3 Task Team on ASAP

I-4.2.1 The SOT Task Team Chairperson on ASAP, Mr Rudolf Krockauer (DWD, Germany), reported on the activities of the Task Team since the last SOT Meeting. The SOT-IV, amongst other things, decided to establish a Task Team on ASAP to coordinate the overall implementation of the ASAP, including recommending routes and monitoring the overall performance of the programme, both operationally and in respect of the quality of the ASAP system data processing. The Team is also tasked to arrange for and use funds, and contributions in kind needed for the procurement, implementation and operation of ASAP systems, and for the promotion and expansion of the programme, as may be required by some members. The Team is currently coordinating the exchange of technical information on relevant meteorological equipment and expendables, development, functionality, reliability and accuracy, and survey new developments in instrumentation technology and recommended practices.

I-4.2.2 Mr Krockauer reported that there were only two significant ASAP programmes, the European programme E-ASAP with 12-16 ships in 2007-2008 and the Japanese programme with 5 ships. The Japanese ASAP stations are operated on research vessels. He further explained that the Task Team report was focusing on EUMETNET ASAP (E-ASAP), since the European programme is the only a programme which is predominantly based on a fleet of merchant ships (with the exception of two ships). The Team noted that reducing the loss ratio (difference between number of launches on board the ships and number of soundings received on the GTS) remains a challenging task for ASAP operations on board of merchant vessels. The number of ships, which routinely provide upper air soundings on the GTS throughout the year, is about 20 worldwide. Occasionally, some research vessels, which perform soundings during certain research campaigns. However, these activities are usually limited to a few weeks.

I-4.2.3 The Team noted that E-ASAP decided to change the satellite communication from Inmarsat-C to Iridium. First implementations and tests showed promising results, and for transmission of high-resolution BUFR data.

I-4.2.4 The Team noted with concern that the conditions to involve merchant vessels in ASAP operations have significantly deteriorated due to the global financial crisis, which came up in 2008. The shipping industry reacts with shorter charter contracts and reduced line services. Three ships of the E-ASAP fleet were lost in Nov/Dec 2008 due to changes in the sailing routes. The current financial crises has a high impact on the shipping business and many shipping companies are not able to provide ships for ASAP operations on long term line services in dedicated ocean regions. The limited space on board can partly be overcome by choosing open deck launchers instead of container launchers. However, long time services are essential for regional programmes like E-ASAP. Installation and de-installation require financial and managerial efforts, which are not worth for line services of less than six month.

I-4.2.5 The Team noted that an impact study of the Norwegian Meteorological Institute in 2007 showed a significant and positive impact from the E-ASAP network on the NWP results in Europe. A worldwide ASAP programme would have more options to find participating ships since the sailing routes are not bound to specific regions. However, this requires clear agreements on the financing (taking into account the uneven spatial distribution of soundings and possible changes in the sailing routes) and management (in case that technical maintenance has to be transferred to other countries due to changed sailing routes).

I-4.2.6 ASAP monitoring issues are discussed under the VOS Panel session in agenda item III-3; and ASAP Trust Tund issues discussed under agenda item I-7.2.

I-4.2.7 The complete Task Team report is provided in *Appendix D*.

I-4.4 Task Team on VOS Recruitment and Programme Promotion

I-4.4.1 Julie Fletcher (Met Service New Zealand), Chairperson of the SOT Task Team on VOS Recruitment and Programme Promotion, presented the report on behalf of the Task Team. The SOT-IV re-established the Task Team on VOS Recruitment and Programme Promotion, which was mainly tasked to further the promotion of VOS activities, and to develop the generic pre-installation design standards that will eventually be available to ship builders and classification societies.

I-4.4.2 The meeting noted the following achievements of the Task Team during the last inter-sessional period:

(i.) Submitted the ‘Generic Design Installation’ document to WMO.

(ii.) Compiled a list of documents providing impact assessments on the use of VOS data.

(iii.) Designed the new PowerPoint presentation “Partnership between Marine Industry and Marine Meteorological and Oceanographic Communities V3 2008”.

(iv.) Reviewed the VOS Framework document.

(v.) Developed new VOS Recruitment and metadata collection tools in conjunction with the TT on Metadata for WMO No. 47

(vi.) Revised the old MSC Circ 1017, New MSC Circular MSC.1/Circ.1293 issued by IMO 10/12/2008.

(vii.) Reviewed the SOT certificate of appreciation for ships participating in the various voluntary observing programmes and proposed set of guidelines and issuing criteria[2].

2: http://www.bom.gov.au/jcomm/vos/information.html

(viii.) Updated reference material on the VOS website

I-4.4.3 The meeting agreed that the following Task Team items still requiring action:

(i.) The 'Generic Design Installation' document requires review and completion, and discussion with ICS/IMO how to progress it.

(ii.) The Certificate of Appreciation is ready for use pending WMO advice to PRs that the certificate is available.

I-4.4.4 The meeting endorsed the two recommendations proposed by the Task Team:

(i.) Removing reference to the year of issue from Task number 5 in the current Terms of Reference (***action, Secretariat, ASAP***).

(ii.) That WMO, in support of PMO activities, commit to holding an International PMO Meeting (PMO-IV) in 2010 (***action, WMO Secretariat, early 2010***).

I-4.4.5 The complete Task Team report is provided in *Appendix E*.

I-4.5 Task Team on Metadata for WMO No. 47

I-4.5.1 The Chairperson of the SOT Task Team on metadata for WMO Publication No. 47, Mr Graeme Ball (BOM, Australia), presented the report on behalf of the Task Team. The SOT-IV re-established its Task Team on WMO Publication No. 47, which was tasked amongst other things to regularly review the Pub. 47 metadata requirements and make recommendations, as appropriate. The Task Team is also monitoring the receipt of regular Pub. 47 updates at WMO from participating VOS members. The report highlighted the activities of the Task Team during the inter-sessional period. The report also presented three recommendation regarding the presentation and availability of WMO No. 47 on the WMO website, and four recommendations for changes to metadata requirements.

I-4.5.2 During the inter-sessional period, the Task Team monitored the submission of Pub. 47 reports to WMO and these were presented in tabular form by year since SOT-V. The Task Team was pleased to note that the majority of contributing countries are now using the XML metadata exchange format.

I-4.5.3 The Task Team updated Code Table 1801 during the inter-sessional period to reflect a change by the ISO to its list of 2 letter country codes. The revised WMO No. 47 Metadata Version 03 document (version 3.3) was uploaded to the VOS website on 3 June 2008.

I-4.5.4 The Task Team made five recommendations regarding the presentation and availability of WMO No. 47 on the WMO website. These were:

(i.) That WMO commits to update Pub. 47, a mandatory WMO publication, on the WMO website each quarter within 2 months of the due date for submission by members (WMO website updated by 15 March, 15 June, 15 September and 15 December).

(ii.) That WMO routinely forwards national Pub. 47 submissions to JCOMMOPS for operational use by the VOS community.

(iii.) JCOMM and CBS discuss the future management of observing platform metadata as part ofthe WIS.

(iv.) That WMO commits to display all Pub. 47 metadata, including all footnotes, on the WMO website.

(v.) That WMO commits to urgently, improve the usability of the Pub. 47 metadata presented on the WMO website.

I-4.5.5 The Task Team made seven recommendations to the Team concerning changes to metadata requirements or improvements to the documentation:

(i.) To remove CR – Chart Room from Code Table 0204 – Location of the barometer. The TaskTeam considers that in most cases the chart room and the wheelhouse are connected.

(ii.) To (a) remove SL - Sling psychrometer and (b) rename W - Whirling psychrometer to W - Whirling or Sling psychrometer in Code Table 0801 - Exposure of the hygrometer and Exposure of the dry bulb thermometer. The Task Team considered these two instruments to be same and recognised that the names are used interchangeably.

(iii.) To introduce 30 – VOSClim, for a VOS Climate Reference Ship, as a new class of meteorological reporting ship in Code Table 2202. The Task Team recommended this new VOS class to differentiate ships operating and reporting to VOSClim standard from the regular VOS.

(iv.) To introduce an AWS sub-class within each of the VOS classes as follows: 15 – Selected (AWS), 35 – VOSClim (AWS), 45 – Supplementary (AWS) and 75 – Auxiliary (AWS) in Code Table 2202. The Task Team recognised there is a need to be able to (1) differentiate between the levels of sophistication of AWS installed on ships, and (2) differentiate between AWS owned and installed by an NMS as opposed to an AWS installed and owned by the ships as this has potential maintenance implications.

(v.) To permit multiple Pub. 47 entries from one ship if multiple observing systems are fitted and operate completely independently of each other. The Task Team considers in such cases that each observing system is an independent observing platform with unique metadata and each should therefore be reported individually.

(vi.) To improve documentation by adding the full definitions of each VOS Class to Code Table 2202.

(vii.) To make mandatory for all ships classified as VOSClim: (1) the full suite of recommended digital images and (2) all suggested sketches and drawings.

I-4.5.6 The complete Task Team report is provided in *Appendix F*.

I-4.6 Task Team on Coding

I-4.6.1 Mr Hester Viola (SOT Technical Coordinator) reported on behalf of the Chairperson of the SOT Task Team on Coding, Mr Craig Donlon (European Space Agency), reported on the activities of the Task Team since the previous SOT Meeting. The SOT-IV re-established its Task Team on Coding primarily to compile table driven coding requirements for ship based observations, for all relevant applications, and submit them in a consolidated way to the DMPA Task Team on Table Driven Codes.

I-4.6.2 Ms Viola presented a progress report on compiling requirements for table driven coding of ship-based observations. She also presented the requirements for inclusion of more metadata in the XBT BUFR template, as well as the progress of submission of the XBT template to the JCOMM DMPA Task Team on Table Driven Codes (TT-TDC). The changes proposed to the WMO Expert Team on Data Representation and Codes (ETDR&C) were outlined, namely that the XBT template had been submitted and was almost ready for resubmission to the ETDR&C based on review now underway by the TT-TDC. Some updates to the BUFR definitions affecting the VOS template/s were also presented.

I-4.6.3 Following Task Team recommendations, the SOT in turn suggested that SOT members requesting changes or additions to BUFR tables (definitions or templates) should consult the SOT representative on the DMPA TT-TDC (Frits Koek) or JCOMMOPS, who can relay the SOT input to the DMPA Task Team on Table Driven codes (TT-TDC) (***action, SOT members, ongoing***).

I-4.6.4 Based on a recommendation made by the JCOMM Data Management Coordination Group (DMCG), the Team reconsidered the role of its Task Team on coding, and agreed to submit its requirements through the DMPA TT-TDC. The Team agreed that having only one JCOMM group to deal with CBS on table driven code issues was more appropriate, as these issues span all Programme Areas. The DMPA Task Team Terms of Reference are included in *Annex 1* of *Appendix G*. The Team therefore decided to re-instate the SOT Task Team on Coding but changed its Terms of Reference to reflect its new advisory capacity. The Team proposed additional membership of the Chairs of VOSP, SOOPIP and TT-ASAP, to provide guidance and or new requirements to the SOT representative.

I-4.6.5 The meeting agreed on the following:

(i.) Requirements for VOS messages represented in BUFR have been defined; however, these need to be finalized by the SOT Task Team on Coding or its representatives, including the requirements developed by the PMO workshop in 2007. There is a need to assess whether one comprehensive template can be developed or if more than one is needed. The results of this work need to be passed to the DMPA TT-TDC. – VOS representatives on the Task Team and VOS members, JCOMMOPS – before next WMO ET/DR&C meeting (no date set) (***action, SOT TT on coding, ASAP***)

(ii.) The XBT BUFR template needs to go through a final review by the Task Team and SOOPIP/GTSPP representatives before being re-submitted for validation to the ET/DRC through the DMPA TT-TDC (***action, SOT TT Coding, next ET-DRC meeting***)

(iii.) The Team asked the SOT TT on Coding to forward SOT related Master Table 10 requirements from ocean forecasting system operators (GODAE) including ecosystem modellers, and other appropriate user communities to the DMPA TT-TDC (***action, SOT TT coding, next ET/DR&C meeting***). The team noted that once submitted by the DMPA TT-TDC, Master Table 10 would then have to be validated by the ET/DR&C, via ECMWF and one other centre.

(iv.) A requirements document, for inclusion of Meta-T metadata, needs to be prepared for ASAP and GOSUD (TRACKOB) data flows. Additionally, the XBT BUFR template originally included XCTD data elements within it, but recently they have been separated out. The requirements for XCTD data to be included in the Table Driven Code Forms should be assessed (this platform type was not considered in the newest version submitted for the XBT BUFR Template). These requirements should be assessed in liaison with SOOPIP/GTSPP representatives. (***action, SOT TT Coding, next ET/DR&C meeting***)

I-4.6.6 The complete Task Team report is provided in *Appendix G*.

I-4.7 Task Team on Instruments Standards

I-4.7.1 The SOT Task Team Chairperson on Instrument Standards, Mr Robert Luke (NOAA/NDBC, USA), reported on the activities of the Task Team since the previous SOT Meeting. The SOT-IV re-established its Task Team on Instrument Standards, which was tasked mainly to compile information on existing activities, procedures and practices within JCOMM relating to instrument testing, standardization and intercalibration, as well as the standardization of observation practices and procedures. The report addressed the key issues assigned to the Team in its Terms of Reference and identified the key areas where progress has been made since SOT IV. Taking into account the work undertaken by the ETMC and the new crosscutting ETMC-SOT Task Team on Delayed Mode VOS

Data (TT-DMVOS), the report invited the Team to consider carefully how the project should develop in the future, so that it can help to raise the climate quality of data within VOS, and thereby contribute to the Global Climate Observing System (GCOS).

I-4.7.2 The Team noted that the Task Team had produced "Instrument Standards Guidelines" which include a list of corresponding WMO, IOC, and national publications for each of the SOT programme components. A status report on instrument standards equipment was also presented.

I-4.7.3 As requested by SOT-IV, the Task Team has also been conducting an inter-comparison of Electronic Logbooks and the results and recommendations were presented to the meeting. In general, there was close agreement between the observations output by the 3 E-Logbook types (TurboWin, SEAS and OBSJMA). All E-Logbook software types have built in checks and balances, and sample observation number 3 tested the inter-dependency between various elements. All E-Logbook types required the wet bulb to be lower than or equal to dry bulb. All E-Logbook types recognized the relationship between present weather and cloud, between cloud amount, type and height, and between tendency code 4 and nil pressure change. In these cases, the E-Logbooks prompted the observer to amend the entry before the programme would move forward. The significant variations between the 3 E-Logbook types were related to the measurement of dew point temperature, the calculation of Apparent Wind Speed and Direction to True, the use of wind Speed Units, the calculation of MSL Pressure, and inter-dependability of measurements.

I-4.7.4 The Team noted that in the feedback that followed the circulation of the Inter-Comparison Report, there was considerable discussion about the coding of swell, in particular the need to differentiate between swell not observed (i.e. no data) and no swell (calm sea). The Inter-Comparison revealed that the 3 E-logbook types coded these differently. There was also discussion about the need to transmit groups containing no data, with a strong plea to reduce the number of groups transmitted to save on communications costs.

I-4.7.5 The 'E-Logbook Inter-Comparison Results' report was sent to the three E-logbook manufacturers (KNMI for TurboWin, JMA for OBSJMA and NOAA for SEAS) and the members of TT on Instrument Standards, on 2 September 2008, seeking feedback on how the Recommendations might be implemented. E-Logbook Manufacturers Responses were presented to the meeting.

I-4.7.6 The Team endorsed the following recommendations from the Task Team as proposed in the Electronic Logbook Inter-Comparison Report:

(i.) That all E-Logbook software report Dew point to one decimal place.
(ii.) That the algorithm for calculating Dew point be standardised between E-Logbooks.
(iii.) That all swell coding options should follow the guidelines in *Appendix H*.
(iv.) That TurboWin and SEAS software implement a QC check to correlate the reported wind speed with wind wave height.
(v.) That all E-Logbook software provides more information on screen to aid in the selection of correct code figures for Visibility (VV) and Height of base of lowest cloud (h) when the ranges and heights are at the boundaries of the levels. Refer to WMO manual on Codes (WMO No 306) FM13-XII Ext. SHIP. For VV refer to WMO code table 4377 and note that if the distance of visibility is between two of the distances given, the code figure for the smaller distance shall be reported. For h refer to WMO code table 1600 and note that a height exactly equal to one of the values at the ends of the ranges shall be coded in the higher range.
(vi.) That SEAS and TurboWin prompt for the entry of ship speed if it is not entered.

I-4.7.7 The Team asked members in charge of E-logbook developments to implement these changes (***action; e-logbook developers; ASAP***). Electronic logbook software (including TurboWin, SEAS, and ObsJMA) issues are also being discussed under agenda item III-2.1.

I-4.7.8 Taking into account, the work undertaken by the Expert Team on Marine Climatology (ETMC) and the new cross-cutting (ETMC-SOT) Task Team on Delayed Mode VOS Data (TT-DMVOS), the Team considered how the project should develop in the future, so that it can help to raise the climate quality of data within VOS, and thereby contribute to the Global Climate Observing System (GCOS). The Terms of Reference of the Task Team as well as its membership were updated to reflect those discussions. In particular, the team agreed with the replacement of Yvonne Cook (Environment Canada) with Gerie-Lynn Lavigne (Environment Canada) in the Task Team Membership.

I-4.7.9 The Team noted that the Task Team together with the JCOMM focal point on the WMO Commission for Instruments and Methods of Observation (CIMO) matters, Dr. Chung-Chu Teng (NOAA, National Data Buoy Center, USA), reviewed the ISO Standard 10596:2009(E) "Ships and marine technology — Marine wind vane and anemometers" which was prepared by Technical Committee ISO/TC 8, Ships and marine technology, Subcommittee SC 6, Navigation. Numerous items did not match with the WMO Guide on Meteorological Instruments and Methods of Observation (WMO No. 8) even though the ISO 10596 used the WMO No. 8 as one of its main references. The Task Team proposed some changes to the standard in an effort to ensure continuity and quality of worldwide-fielded wind equipment. Based on the Task Team recommendations, the SOT proposed the following:

1. That the WMO Secretariat contact the ISO TC 8/SC 6 group and request the following (***action; WMO Secretariat; ASAP***):

    a) The changes proposed by the Task Team on Instrument Standards should be reviewed by the ISO TC 8/SC 6 for possible inclusion into the ISO 10596.
    b) Ensure that the changes to Section 7 are incorporated into ISO 10596 or proper response provided to the WMO Secretariat and SOT as to why the variance of WMO No. 8 Requirements cannot be implemented.
    c) A proper revision of ISO10596 is promulgated for review and publication within normal WMO/ISO channels.

2. That the SOT national focal points coordinate nationally with their ISO/TC or SC representative to ensure proposed changes are incorporated (***action; SOT NFPs; ASAP***).

I-4.7.10 The Team noted that efforts of developing high quality best practices for the VOF with the goal of publishing them as a JCOMM Technical Report were still ongoing. The Team requested the Task Team to continue its efforts and report at the next SOT meeting (***action; TT IS; SOT-V***).

I.4.7.11 The Team noted that there was still a need to investigating how the different publications or technical documents dealing with best practices could be better integrated into less number of documents or into existing ones had not started. This issue will also be discussed under agenda item I-5.3 (WIGOS).

I-4.7.12 The Team encouraged its members to continue to update their equipment information and Instrumentation standards (including Automated Weather Stations (AWS)) to the Task Team on Instrument Standards (***action; SOT members; ongoing***).

I-4.7.13 The complete Task Team report is provided in *Appendix H*.

I-4.8 Task Team on Call sign masking and encoding

I-4.8.1 Mr G. Ball (BOM, Australia), Chairperson of the Task Team on Callsign Masking and Encoding, presented the report on behalf of the Task Team. SOT-IV established the Task Team to oversee the implementation of MASK[3], ENCODE[4] masking schemes, and develop guidelines as

3: MASK - Unique, repeating identifier. The masking identifier is assigned by the NMS that recruited the ship.

necessary. It was also tasked to review and approve national MASK schemes to ensure they remain unique and do not impinge on (1.) the ITU callsign series allocated to a country; or (2.) any other marine or oceanographic identification scheme used by WMO, e.g., buoy identification numbers.

I-4.8.2 The Team reviewed the status of ship masking schemes implemented by Members in line with WMO Executive Council Resolution 27 (EC-LIX). During the inter-sessional period, the Task Team:

(i.) Prepared instructions for members considering implementing a MASK callsign-masking scheme.

(ii.) Contributed to a WMO letter to the PRs of Japan and the USA regarding (1) maintaining a national archive of unmasked VOS data, and (2) advising when these unmasked data can be released to international archives.

(iii.) Developed rules for accessing the MASK vs. REAL[5] information at JCOMMOPS. These rules were incorporated in a letter from WMO to PRs regarding callsign-masking schemes.

(iv.) Approved the MASK scheme proposed by Australia.

(v.) Established a log of national MASK schemes, including MASK-like schemes operated by E-Surfmar, E-ASAP and SeaKeepers.

(vi.) Participated in a discussion pursuant to the establishment of a WMO numbering system for underway sampling reports (TESAC) from seals.

(vii.) JCOMMOPS, as an interim step, has developed a flat file containing the MASK V REAL metadata provided by members, which is available by secure FTP. Upgrading of the JCOMMOPS system to provide a secure database solution should be completed by SOT-V.

I-4.8.3 Mr Ball reported that whilst no action had occurred during the inter-sessional period regarding the ENCODE callsign masking scheme; this would be the Task Team's focus during the coming inter-sessional period.

I-4.8.4 The complete Task Team report is provided in *Appendix I*.

I-4.9 Task Team on the VOS Climate Project (VOSClim)

I-4.9.1 The Chairperson of the SOT Task Team on the VOS Climate Project (VOSClim), Ms Sarah North (Met Office, United Kingdom), presented a review of the activities of the Task Team since SOT-IV and consideration of its assigned tasks. The SOT-IV re-established a Task Team on VOS Climate Project (VOSClim) which was tasked to: (i.) coordinate, maintain, promote and enhance the VOS Climate project, monitor its performance and encourage increased participation; (ii.) revise the VOS Climate project document to reflect the current procedures and to clarify and revise where necessary the responsibilities of the VOSClim data centres; (iii.) review all relevant JCOMM Publications to make sure they are kept up-to-date and comply with Quality Management terminology; and (iv.) prepare a report to SOT-IV on, inter-alia, the some over-arching VOSClim issues (Should VOSClim be continued as a project, Is the high-quality dataset a valuable resource, How can the lessons of VOSClim be used to improve data quality in the wider VOS).

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4 : ENCODE - Unique, non-repeating identifier. The identifier is derived from encrypting elements in the message, e.g. callsign + latitude + longitude.
5: REAL - Official ITU callsign of the ship.

I-4.9.2 The team noted that the target of 250 participating ships has now been reached and encouraged SOT members to upgrade, wherever possible, all their existing VOS to VOSClim standards (***action, SOT members, ongoing***). The Team noted with appreciation that the VOSClim project was now operationally mature with many of the obstacles identified at previous sessions of the SOT having been overcome. Levels of ship participation set by the SOT have been met and the data flow processes are now operating as required with the relevant datasets readily available to users via the project website.

I-4.9.3 However, whilst the implementation phase of the project has now been completed, there has been limited progress with the evaluation stage, which is intended to demonstrate the added value of the VOSClim datasets.

I-4.9.4 Taking into account the work undertaken by the ETMC and the new crosscutting Task Team on Delayed Mode VOS Data (TT-DMVOS), the Team agreed that the time was now right to extend the good practice established for VOSClim ships to the wider VOS community in order to raise the climate quality of data from the wider VOS on a sustained basis, and thereby contribute to the Global Climate Observing System (GCOS). The Team agreed that the VOSClim should be now be discontinued as a separate 'project' and could start upgrading, whenever possible, all existing VOS to VOSClim standards. This issue is further addressed under agenda items III-4.1 (implications for the wider VOS) and III-4.5 (review of VOS categories).

I-4.9.5 The team agreed that the requirement for Port Met Officers to additionally fill in the new hardcopy recruitment/update form (VOSP002) could be waived for those ships where the required Pub 47 metadata is collected on board using electronic logbooks such as TurboWin (***action, PMOs, ongoing***).

I-4.9.6 The Team recalled discussions under agenda item I-4.5, and requested the Secretariat to ensure that the Pub 47 metadata available on the WMO website is regularly updated, or alternatively to consider a more appropriate method of hosting the metadata so that it is readily available to users of the project datasets (***action, Secretariat, ASAP***).

I-4.9.7 The Team also clarified where the digital images associated with the collected metadata should be archived. ***[decision from the Team to be added here]***.

I-4.9.8 The team requested the Task Team on Instrument Standards to undertake an intercomparison study of the algorithms associated AWS observation coding software, in order to resolve any potential inconsistencies (***action, TT Instr Std., SOT-VI***).

I-4.9.9 The Team agreed with the recommendations made by the scientific advisers concerning the future need to link the VOSClim data flow to that being proposed by TT-DMVOS.

I-4.9.10 The Team agreed to revise the Task Teams Terms of Reference, to reflect the proposed changes to the project, and pending discussions under agenda item III-4.1. [*new Terms of Reference to be included as an Annex to the final report of the Session*].

I-4.9.11 The complete Task Team report is provided in *Appendix J*.

I-4.10 Terms of Reference and membership of the Task Teams

I-4.10.1 The Team reviewed the Terms of Reference and Membership of its Task Teams. The new agreed upon Terms of Reference and membership are provided in Annex IV [*ToR to be discussed at the meeting, and this annex will be included at a later stage in the final report of the Session*].

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Appendices: 10

APPENDIX A

REPORT BY THE TASK TEAM ON SATELLITE COMMUNICATION SYSTEMS

(report submitted by Sarah North, Chairperson, Task Team on Satellite Communication Systems)

Background & Introduction

1. The Task Team was originally established, at the first session of the Ship Observations Team (SOT-I Goa, February-March 2002); in response to concerns raised at JCOMM-I (Akureyri, June 2001) regarding the acceptance of Special Access Code 41 weather observations by some Inmarsat Land Earth Stations.

2. The Team's original remit was to consider how to address the disparity in Inmarsat costs, which are borne only by those National Meteorological Services that host LES and accept Code 41 messages, ideally with a view to developing a more equitable form of cost sharing

3. At SOT-II (London, July – August 2003), it was recognized that there was a risk that National Met Services faced with significant costs might decide to impose restrictions on the volume of Code 41 data that they are prepared to pay for, and this could have a consequential impact on the level of real time data availability.

4. Accordingly, the Task Team proposed several ways to address the problem, whilst maintaining the Code 41 principle that the costs should not have to be borne by the ship owners or managers. In particular, it was considered that some form of global cost-sharing scheme, financed through a single common fund presented the best approach. The fund could possibly be administered by WMO or by a single national service on behalf of all.

5. Proposals made by the team were subsequently referred to the JCOMM Management Committee (MAN-III, Geneva, March 2004) and thereafter brought to the attention of the WMO Executive Council (EC-LVI June 2004). However, the Council considered that the problem might best be addressed on a regional basis, and referred the issue back to SOT for further information before taking any decisions.

6. As a consequence of the Council's advice, the Task Team revisited the issue and proposed an alternative approach whereby an Accounting Authority could be assigned to oversee the payment of Code 41 satcom costs and act as the billing intermediary between the LES service providers and the NMS's that operate code 41 VOS. Whilst this approach was considered in detail at SOT-III (Brest, March 2005), it was generally considered that there were too many issues that would need to be resolved if it were to have any chance of success, and decided against pursuing an Accounting Authority solution.

7. Although the problem of fairly distributing VOS transmission costs was unresolved, the Task Team reported on several new developments at SOT IV (Geneva 2007) that were helping to reduce the burden of transmission costs borne by certain National Meteorological Services. In particular it was noted that:

   - The E-SURFMAR programme had established contractual arrangements with its member National Met Services to increasingly, compensate them, subject to budget provisions, for their VOS communication costs. This compensation had helped, to some extent, to alleviate the unfair burden borne by its members that host Inmarsat LES i.e. France, Netherlands, Greece and UK. Furthermore the compensation takes into account Inmarsat costs borne by European LES continues that are generated by both E-SURFMAR and non-E-SURFMAR ships.

   - The E-SURFMAR programme team had also developed technical innovations to reduce Inmarsat transmission costs arising from both manned VOS and Automatic Weather systems. For manned VOS E-SURFMAR Programme team had successfully developed a "half

compressed" system of transmitting weather messages via Inmarsat which reduced the size of the message from five blocks to only two, resulting in a corresponding reduction in the transmission costs i.e. ~0.32 €* per message (i.e. assuming two blocks of 32 bytes), compared with approximately 0.80 €* for a standard VOS message. A facility to send messages in half-compressed format is included in the latest version of the TurboWin electronic logbook. However, because the 'half compressed' message system requires the use of new Special Access Codes (e.g. SAC 412 if sent via Aussaguel LES), and dedicated software to uncompress the messages, only a small number of ships have adopted this system *(and only one ship was still using it at January 2009)*

- Recognising the increasing costs arising from the use of Automatic Weather Stations sending hourly data, Météo France had developed new compression software to enable messages from BATOS AWS systems to be sent via the Inmarsat-C Data Reporting Service. Because this new compression software resulted in a significant reduction in transmission costs (~ 0.145 €* per report) it was being rolled out to all BATOS ships. BATOS AWS messages are sent to the LES (currently only France-Telecom/Aussaguel and Stratos/Burum may receive the data) and are then routed by email to Météo-France for processing and insertion on the GTS.

- The E-ASAP programme had been active in addressing the need to reimburse the cost of ASAP TEMP messages sent via Inmarsat. TEMP code messages are comprised of four parts, and are significantly larger than SHIP code messages, so the transmission costs involved are significantly larger than standard VOS messages. Because the majority of these messages were historically sent via Goonhilly LES, the costs had traditionally been borne by the Met Office. At the time, arrangements were therefore made for participating E-ASAP countries to reimburse the Met Office for these costs. However, the transmission problems experienced following the closure of Goonhilly resulted in the discontinuation of this arrangement,and introduction of a new E-ASAP Satcom transmission system to email the TEMP messages via Inmarsat.

- Bilateral arrangements had also been established to reimburse costs e.g. between the German Weather Service, Deutscher Wetterdienst (DWD) and those NMSs who pay the additional communications costs caused by the closure of Raisting LES, and the consequential re-routing of German VOS messages via Burum and Goonhilly LES.

- With the increased use of Shipborne AWS systems, there was a notable move towards the use of alternative satellite transmission systems, in order to reduce costs. In particular, the Iridium satellite system not only offered global satellite coverage but substantial cost savings if the Short Burst Data transmission system is used. . Moreover, transmission delays, such as those associated with Argos transmissions used by MINOS AWS systems, were avoided and the system could provide two-way communication. Noting that the Iridium system was being evaluated under the DBCP's Drifter Iridium Pilot Project, it was decided at SOT IV to establish a new Iridium Task Team under SOT.

  [Note - Typical costs for an iridium message from the BAROS iridium AWS systems are currently ~0.07 €* per message (including monthly fees and assuming 6000 reports per year). Additional charges are incurred if the message length extends beyond the maximum allowed 32 bytes size for an Inmarsat C report e.g. if the Baros message exceeds its 30 Byte block size Vizada would, for instance, make a further charge for the second 30-byte block, while other providers charge by the addition bytes used.]

- A growing number of VOS were now willing to absorb the costs of sending their weather observations via email rather than using the traditional Code 41 systems. In addition, almost all the manually reporting offshore installations recruited by the Met Office in the North Sea had migrated to the use of email communications and many government service vessels and Antarctic survey vessels were now using email to send their observations.

8. Having considered the above issues and developments it was decided at SOT IV to re-establish the Task Team with a modification to its name and Terms of Reference as shown at *Annex 1*. The Teams report on the tasks assigned to them is in *Annex 2*.

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ANNEX 1

TASK TEAM ON SATELLITE COMMUNICATION SYSTEMS

Tasks:

1. Evaluate the operational and cost-effective use of satellite data telecommunication systems for the real-time collection of VOS data in support of the World Weather Watch, GOOS, and GCOS;

2. Work closely with the Task Team on SOT Iridium and the DBCP Iridium Pilot Project;

3. Continue to monitor the cost implications of Inmarsat satellite communications sent by Code 41

4. Review all relevant JCOMM Publications to make sure they are kept up to date and comply with Quality Management terminology;

5. Report to the next SOT Session on any relevant issues/proposals

Members:

- Sarah North (TT Chairperson, United Kingdom)
- Frits Koek (the Netherlands)
- Robert Luke (USA)
- Derrick Snowden (USA)
- Pierre Blouch (France and E-SURFMAR)
- Toshifumi Fujimoto (Japan)
- Michael Myrsilidis (Greece)
- Representatives of countries where LES
- accepting Code 41 are located
- A representative of RA III

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ANNEX 2

REPORT ON THE TASKS ASSIGNED TO THE TASK TEAM ON SATELLITE COMMUNICATION SYSTEMS

Task 1 - Evaluate the operational and cost-effective use of satellite data telecommunication systems for the real-time collection of VOS data in support of the World Weather Watch, GOOS, and GCOS;

In addition to the use of Inmarsat satellite communications, which is required by the SOLAS Convention for most ocean going merchant ships, and which has been traditionally used for manually reporting VOS, a variety of different satellite systems are now available. As reported at SOT IV, these primarily include Iridium, Argos and Meteosat, which are increasingly being used in connection with shipborne AWS and databuoy systems.

Considerable work has been undertaken since SOT IV by the E-SURFMAR Programme to evaluate the relative merits of different satellite communication systems. This work will help to guide the work of the E-SURFMAR Task Team on AWS, which is aiming to develop a suitable specification for ship borne AWS systems for use on European VOS. A spreadsheet produced by E-SURFMAR comparing the relative cost advantages and limitations of Inmarsat, Iridium, and Meteosat transmission systems proposed for Automatic Weather Stations is in *Annex 3*. To provide a more accurate comparison of the operating costs of each system the spreadsheet also takes into account the amortization of relevant transmitter costs over 5 years.

It will be noted from this spreadsheet that the Short Burst Data (SBD) transmission costs associated with the Iridium system currently offer notable savings when compared to other systems. Additionally, Iridium is increasingly replacing Argos as the preferred method of transmitting drifting buoy messages. Iridium, with two-way communication ability and global coverage, is also now beginning to be used for a number of different shipborne AWS systems. In particular, it is used for the simple BAROS AWS systems that are being fitted to the majority of the upper air E-ASAP ships to assist with data targeting exercises, and is being considered as a replacement for the more complex BATOS AWS systems that currently use Inmarsat. Other shipborne AWS systems being tested with Iridium transmitters include the MetPod AWS and the Viasala MAWS systems and, in addition, Iridium is increasingly being employed on moored buoys that contribute to the E-SURFMAR programme. The iridium message is typically received as an email attachment that can be sent to a number of mailboxes.

Argos continues to be used as the transmission system for a number of MINOS simple AWS systems. The advantages of the Argos system are the low cost of the transmitters and the low power consumption. However, this is counterbalanced by the fact that transmissions depend on the location of the polar orbiting satellites relative to the ground receiving stations, which can result in significant transmission time delays. For this reason it is anticipated that there will be only very limited use of Argos for shipborne AWS in the coming years. Service Argos who prepares the FM-13 SHIP messages for insertion on the GTS (through Météo-France or NOAA) processes raw data from the NOAA satellites that host Argos systems.

Meteosat DCP's continue to be used on a number of MILOS AWS systems, such as those fitted on German VOS, and on moored buoy AWS systems. The messages are received at Darmstadt and then sent onto the GTS. Whilst this system has the notable advantage that it is free of charge for EUMETSAT members, the transmitters are very expensive and the system is subject to allocated time slots. Users must also manage the integrity of the data to reduce transmission errors, and ongoing availability of suitable analogue and digital DCPs could be a problem. It is also unclear whether the use of DCP's is suitable for round the world ships when data would need to be sent via Meteosat, GEOS and GMES. Many moored buoys operated by the Met Office have now been fitted with dual

Meteosat and iridium transmission systems

With respect to Inmarsat, it will be noted from the spreadsheet at *Annex 3* that the use of data compression can result in significant cost savings. This has already been demonstrated for ships fitted with BATOS AWS systems that are sending their observations using the Inmarsat Data Reporting Service. The messages are emailed on by the Land Earth Stations to the processing centre(s). Decoding software is then used to prepare the FM-13 SHIP (or FM-96 BUFR) reports for insertion on the GTS.

There are several other systems that could potentially be used by VOS or SOOP ships, including Globalstar (which was tested on E-ASAP ships, but discontinued, as it did not offer a full global coverage) and Orbcomm. However, the team has not addressed the merits of these systems in this report.

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Another factor that will have a bearing on transmission costs in the coming years is the migration, away from alphanumeric WMO code formats such as FM13-SHIP to new binary WMO formats such as FM96-BUFR, which will allow for the reporting of additional parameters and associated metadata. However, the use of BUFR is primarily for the international exchange of data between national Meteorological Services, and is not considered a requirement for the real time transmission of observed data from ships. Accordingly, it is anticipated that the growing use of shipborne AWS systems is likely to give rise to a variety of proprietary transmission formats, the relative merits and cost benefits of which will need to be investigated by the Team in the coming years

In considering this Task, the team noted that the remit only made mention of VOS data and did not directly include SOOP data. SOT is invited to agree that this task should be broadened to clearly include the real time collection of satellite data in support of SOOP. *[Action]*

Task 2 - Work closely with the Task Team on SOT Iridium and the DBCP Iridium Pilot Project;

Several members of the Team have experience with iridium communication systems and been in contact with the SOT and DBCP iridium teams. Following the successful use of Iridium for transmitting short burst data from drifting buoys, Météo France in particular have been investigating and developing its use for both simple and complex shipborne AWS systems i.e. Baros and Batos systems respectively.

Twelve Baros stations reporting only hourly pressure measurements have already been built since the SOT IV meeting. A first prototype Baros system was installed by Météo France on a trawler from October 2007 to August 2008 and reported 4690 observations before being removed when the trawler was sold. By mid-February 2009, four Baros AWS were in operation on E-ASAP ships and eight others were ready to be installed. The data format is 15-byte long, and includes the observation time, the ship's heading and speed, the GPS latitude and longitude, the sea level pressure and its tendency over the past three hours. Data timeliness is excellent with the observation being received as an email only a couple of minutes after transmission. The data is then processed (FM13-SHIP and FM94-BUFR code) and then inserted onto the GTS (FM13-SHIP only for the moment).

Météo-France is also investigating interfacing an Iridium SBD modem in place of an Inmarsat-C one. The data format will be the same as that used for Inmarsat-C Data Reporting (32 bytes) allowing it to report a complete FM13-SHIP data set. Although the length of binary reports was limited to these 32 bytes with Inmarsat, the limitation will be higher with Iridium SBD, allowing the possibility of adding extra parameters to the message (e.g. wind gust, salinity, CO2 pressure, irradiances) Although communication costs are already low with the Inmarsat-C data reporting service (~0.15 € per report) they will be half as much again with Iridium i.e. provided that only one 30 byte block of data is needed for the message.

The Met Office have installed iridium deck drifters on two vessels (a research ship and a ferry) reporting pressure only. These are essentially identical to SVP-B drifting buoys, but with the drogues removed and the sea temperature readings disabled from going onto the GTS. Data quality is good although it is understood that if a GPS position fix is not made the previous position is kept for the observation. Although this is acceptable for a drifting buoy, it is not for a ship, which moves more quickly. (Note - New Iridium drifting buoys report the time of the last GPS fix, which could possibly be used to filter the GTS data transmission in the case of deck drifters put on board a ship). The Met Office is also testing a Vaisala MAWS automatic weather station fitted with Iridium, prior to putting it on a suitable ship.

Task 3 - Continue to monitor the cost implications of Inmarsat satellite communications sent by Code 41

As reported at SOT IV Goonhilly LES was effectively closed in November 2006 and the Inmarsat C services were transferred to Burum LES in the Netherlands. This followed the take over of Xantic (the company that previously operated Burum) by Stratos.

Although this transition was supposed to be seamless, it resulted in serious data transmission losses, message header format issues, and significant data delays. It also impacted on the issuance of SafetyNet broadcasts and warnings. The problem was caused by the inability of Burum LES to re-route the received observations back to the Met Office by the same telex routes as had previously been used. Following meetings with representatives from Burum LES, these problems where mostly resolved and data timeliness has now improved

However this change had a notable impact on the timeliness and availability of upper air TEMP code data from E-ASAP ships causing the E-ASAP Programme team to instruct its participating ships to switch their satcom configurations to use alternative Inmarsat LES (such as Aussaguel LES). However, in the last couple of years all the E-ASAP ships, which previously sent their messages via Goonhilly LES using code 41, have transferred to the use of a dedicated new E-ASAP email system whereby the TEMP messages are mailed direct to DWD, who currently manage the programme. This has resulted in a marked drop in the cost of Code 41 transmissions via Goonhilly.

Although Goonhilly has effectively closed, the Goonhilly ID numbers have been continued by Stratos, and the Met Office continues to bear the costs of VOS observations. In effect, Goonhilly is therefore now a ‘virtual’ LES in that all VOS traffic is now routed to Burum.

The problems experienced with the closure of Goonhilly highlighted the need to be able to ensure continuity of Inmarsat data traffic (both SHIP and TEMP) in order to meet E-SURFMAR and E-ASAP objectives, as well as the wider global forecasting and climate objectives. To ensure that such data losses are not experienced in future it was suggested at SOT IV that suitable emergency back-up arrangements may be needed, whereby data can be transferred to another LES/Supplier.*[Action]* It was further suggested that there was a need to have a clear mechanism to keep LES ID numbers up to date with ownership of the list clearly assigned to ensure that any changes are promulgated swiftly to VOS focal points and thence to observing ships.*[Action]* Unfortunately no progress was made on either of these points, and SOT is invited to reconsider them.

Since SOT IV, a number of further changes to the Code 41 list have arisen. Firstly, Vizada Satellite Communications, the primary provider of satellite communications for the U.S. notified their intention to make changes to their listed ID series in order to expedite their data routing systems. Consequently, all weather observations previously transmitted to the x01 series ID would be directed to the upgraded x04 series IDs. Although traffic from the x01 series IDs will continue to be processed, Vizada advised that transmission delays were increasingly likely and that it was therefore, imperative that ships should switch to using the X04 ID Series, i.e. switching from ID codes 001, 101, 201 and 301 to the following codes;

Operator	Service		AOR-W	AOR-E	POR	IOR
VIZADA	**C**	**004**		**104**	**204**	**304**
VIZADA	**C (Amver/SEAS)**	**004**		**104**	**204**	**304**

[Note - According to Vizada ships observers should follow the instructions provided by the mobile terminal manufacturer to change LES IDs for Ship-Shore calls- although there will be a few different solutions for how this is accomplished, depending on the terminal manufacturer. LES IDs x01 and x04 are selectable in all ocean regions and there are, no manufacturers that limit the selection to strictly x01. No 'bulletin board' changes are therefore required to support the changes.].

These changes to Vizada operated LES not only affect the US based LES (i.e. Southbury and Santa Paula) but also the Norwegian hosted LES (Eik). It is understood that NOAA will continue to collect the charges for all messages sent to Santa Paula and Southbury, and presumably also for Eik. (However, several VOS operators advise their VOS to avoid using this LES due to previous billing problems). Because many non US operated VOS also send their observations via US based LES it is therefore incumbent on individual VOS operators to make the changes known to their VOS fleets *[Action – VOS Operators].* The way in which Vizada promulgated the change highlights the need for responsibility for the code 41 list to be clearly assigned. *[Action]*

Contact was also made with Vizada to clarify whether the LES operated by France Telecom provided global coverage and consequently whether ID numbers 021 (AOR-W) and 221 (POR) could be added to the list. Although Vizada subsequently confirmed that it was also possible to send code 41 messages via these ID numbers it remains to be confirmed whether Météo France, as the host LES country national met service will be willing to pay the costs associated with messages sent via IDs 021 and 221.

The fact that code 41 observations are now routed globally from all Inmarsat satellite footprints now brings into question the principle laid down in WMO guidance that weather reports should be sent to the nearest LES. Clearly, this is not happening nowadays and can be complicated by the fact that some ships may be instructed by their shipping companies to use only prescribed LES suppliers. Also, because the majority of LES that accept Code 41 observations are located in the Northern hemisphere it can be difficult to be sure which LES is the nearest. However, recent changes to the TurboWin program (Version 4.5 beta) to recommend the LES to send observations to could help in this respect. A map showing the distribution of Code 41 LES recommended in the TurboWin program is attached at *Annex 5*.

In this respect, it is also recalled that Arvi LES that imposes geographic limitations (e.g. based upon Metarea) on the areas from which they will accept Code 41 observations (e.g. Arvi).presumably to limit the costs incurred.

Confirmation has also recently been received from Stratos that ID X02 series supports SAC 41 in all four ocean regions and consequently that LESID numbers 302 (for the IOR region) and 202 (for the POR region) could be added to the list as stations that accept, or relay, Code 41 messages. Although these messages are now actually handled by Burum rather than Goonhilly it is believed that the costs associated with messages sent to ID 302 and 202 would still be collected by the Met Office. Accordingly, to avoid confusion it is suggested that these LES should be listed as Goonhilly/Burum in the LES list.

Because of company mergers in recent years, it should be noted that there are now essentially only two main providers of Code 41 LES stations. These two providers are Stratos (which acquired Xantic in February 2006 and adds to the previous mergers of BT, KPN, Telstra and Teleglobe) and Apax Partners (which bought out France Telecom in July 2006, purchased Telenor Satellite Services in October 2006, and incorporated them under the Vizada brand in 2007). Conglomerating LES services

in this way, and reducing the overall number of Code 41 LES, inevitably adds to the unfairness of the Code 41 reverse charging system. Introducing new ID number series also introduces new risks of increased charges being incurred by a smaller number of national meteorological services

A revised LES list to reflect the above-mentioned changes is attached in *Annex 4* for consideration and agreement at SOTV *[Action].* Changes made since SOT IV are indicated in red. Once this list has been agreed it is recommended that a new column should be added to the list to clarify which national met services are incurring the costs,

The Task Team originally undertook an initial review of Inmarsat costs borne by National met services whose countries host LES in 2003. Given the significant changes that have taken place since then, as outlined above, SOT is invited to instruct the Task Team to undertake a further review to determine the actual costs currently being faced by individual members in order to help guide future decisions about reducing the Inmarsat cost burden *[Action]*

In considering this Task members may wish to note that there Resolution A707 (19) issued by the International Maritime Organisation's Assembly in 1991 recommended '*… that States make every effort, consistent with domestic laws and policies, to arrange that meteorological reports, ship position reports and medical advice and assistance messages …. Shall be free of charge to shipping*'

Task 4 - Review all relevant JCOMM Publications to make sure they are kept up to date and comply with Quality Management terminology;

The Task Team recommends that the Code 41 list in WMO Publication 9 Volume D should be revised to reflect the updated list of LES that accept Code 41 messages at *Annex 4*. Details should be promulgated by WMO to all VOS operating countries listed WMO Publication No 47 *[Action]*

Details of the Code 41 list maintained on the WMO website (http://www.wmo.int/pages/prog/amp/mmop/inmarsat_les.html) should also be updated *[Action]*

A review of relevant GTS bulletins for ship observations listed in WMO Volume C1 (Catalogue of Meteorological Bulletins) may also be needed – see Task 5 below *[Action]*

Task 5 - Report to the next SOT Session on any relevant issues/proposals

The following issues have arisen since SOT IV, which are relevant to the work of the Task Team…

1. **GTS Bulletins for Inmarsat Code 41 observations**

It recently became known that if non-standard hour observations are sent to certain LES, or are sent from certain geographical areas, there is a possibility that they will not be inserted on the GTS and, consequently, the cost of the observations will have been wasted.

Initially it was discovered that observations sent to Burum LES from a research ship operating in Antarctica below 60 deg South weren't being put into a bulletin for transfer on the GTS. Following contact with the Dutch met service (KNMI) this situation has now been resolved and bulletins are now issued

Following further investigation it also became apparent that certain countries that host LES accepting Code 41 observations might not be putting observations sent at intermediate or non-standard hours onto the GTS. This appears to be borne out by examination of WMO Volume C1 (Catalogue of Meteorological Bulletins) which lists the following bulletins

Australia - Perth : ABRF, ADRM, APRF, APRM, AMMC, AMRF, ASRF
Non standard hour bulletins not issued

Japan - Yamaguchi : RJTD
Non standard hour bulletins issued

Singapore - Sentosa : WSSS
Non standard hour bulletins and intermediate hour bulletins not issued

Arvi - India :
No Information available

Thermopylae - Greece : LGAT
Non standard hour bulletins not issued

Aussaguel - France : LFPW, LFVW
Non standard hour bulletins issued

Southbury and Santa Paula - USA : KBIX, KGWC, KWBC, KWAL, KNHC,
Non standard hour bulletins issued

Station 12 Burum - Netherlands : EHDB
Non standard hour bulletins not issued outside North Atlantic

Goonhilly - United Kingdom : EGRR
Non standard hour bulletins issued

It therefore appears that non-standard hour observations sent to Perth, Sentosa, Thermopylae and Burum LES may not always be circulating on the GTS (although in the case of Perth it is understood that the non-standard hour observations may be sent with later collectives). Given the value of these observations in real time, and the fact that SOLAS requires ships to undertake more frequent observations when in the vicinity of tropical cyclones, it is suggested that the WMO Secretariat should invite members to check the accuracy of their entries in WMO Volume C1 to ensure that all ship observations are circulated on the GTS irrespective of the hour that they are sent or the geographical area they are sent from *[Action]*

2. AIS

Although, the AIS systems carried by VOS are not presently capable of transmitting weather data, recent developments within the IMOs correspondence group on AIS, appear to have accepted that weather data should be included in one of the proposed future binary message formats [this issue will be considered separately by the VOS Panel]

In a separate but related development, space-based initiatives to extend AIS vessel tracking capability are currently being investigated by a number of countries. In particular, in 2004 the US Coast Guard established a contract with Orbcomm to develop and build the capability to receive process and forward AIS signals from space via an AIS receiver onboard their communications satellites. .At the start of 2009 Orbcomm's constellation of more than 30 spacecraft included six recently-launched satellites carrying AIS receivers, making it the first commercial provider of globally collected AIS data from space. (Lloyd's Register – Fairplay has signed a global distribution agreement with ORBCOMM to allow it to distribute information obtained from ORBCOMM's AIS equipped satellite constellation).

3. Coding and Transmission errors

As reported at SOT IV there are a substantial number of observations received by Goonhilly LES that are rejected for a variety of coding errors e.g. BBXX or call sign missing, empty transmissions with no data, use of O (i.e. the letter O) instead of 0 (i.e. the digit zero), incorrect code group lengths etc. Whilst these errors represent wasted communications costs, their number has reduced since SOT IV, possibly due to the quality control checks in e-logbooks like TurboWin and increased use of AWS systems. Details of such transmission errors arising from Goonhilly LES continue to be circulated by the Met Office to VOS operators via the JCOMMOPS mailing lists, so that remedial action can be taken. It is proposed that the SOT invites other National Met Services that host LES toconsider circulating similar coding/transmission error lists *[Action]*

4. Broadband/email

The number of manually reporting VOS sending their weather observations direct by email, rather than via Code 41, has continued to grow since SOT IV, thereby helping to reduce the burden of transmission costs faced by meteorological services. This trend is expected to continue in the coming years as broadband communication systems become more widely available on merchant ships. These systems will also allow the use of web based electronic logbook software such as that currently being developed for the TurboWin program

SOT is invited to advise VOS operators, whenever possible, to encourage their manually reporting VOS to consider moving to the use of email to send their weather reports in lieu of using Inmarsat Code 41 (but subject to individual ship-owners being willing to absorb the costs) *[Action]*

5. Masking of ship's call signs

The current trials of call sign masking methods will also have potential implications for determining Inmarsat satellite communication costs. If call signs were masked by securely held, but unique, generic identifiers, it would still be possible to assign individual ship communications costs back to the originating VOS operating countries. This will be necessary for programmes like E-SURFMAR, where participating countries are compensated for the communication costs incurred by their VOS (and for costs incurred by non European VOS that are paid by E-SURFMAR members)

Where the non-unique identifiers such as ‘SHIP’ disguise ships identities it will be more difficult to correctly, assign the costs associated with individual ships, unless the Inmarsat numbers of all the ships that use a particular LES are known. The use of ‘SHIP’ on European VOS would make it extremely difficult for the E-SURFMAR program to arrange compensation for its member countries.

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ANNEX 3

ADVANTAGES AND DRAWBACKS OF SOME COMMUNICATION SYSTEMS

FOR AUTOMATED WEATHER STATIONS

Caution: *indicative costs given below (in Euros) only are provided for comparison purposes and exclude Value Added Tax. They cannot therefore be guaranteed and should only be considered as indicative costs*

	Inmarsat C		**Meteosat DCP**		**Iridium SBD**	
Type	GEO		GEO		LEO	
Coverage	Limited to 70N-70S		Limited to 60N-60S		Yes	
Transmitter + antenna cost	2,200 €		5,500 €		850 €	
Timeslots	No		Yes		No	
Risk to have a mask during transmission	Yes		Yes		Weak	
Transmission integrity	Ensured by the system		To be managed by the user ??		Ensured by the system	
Data format	Text (***)	Binary (DR)	Text	Binary	Text (***)	Binary
Data processing	Required for BUFR	Required	Required for BUFR	Required	Required for BUFR	Required
In use	Yes	Yes	Yes	??	??	Yes
Operating (*) cost/report	0.39 €	0.12 €	0 €	0 €	0.13 €	0.06 €
Total (**) cost/report	**0.46 €**	0.19 €	0.18 €	0.18 €	0.16 €	**0.09 €**

(*) Monthly fees included if any
(**) Assuming an amortization over 5 years and 6,000 reports per year.
(***) for Inmarsat C text and Iridium text messages, the table assumes only three 32-byte blocks (96 characters maximum) per report. Reports from AWS systems that contain no visual observations will require less than 96 characters.

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ANNEX 4

PROPOSED REVISIONS TO THE CODE 41 LIST

ATLANTIC OCEAN REGION-EAST (AOR-E)		
Name of station	**Country**	**ID number**
Aussaguel	France	121
Goonhilly/Burum	United Kingdom	102
Southbury	USA	104
Burum	Netherlands	112
Thermopylae	Greece	120
ATLANTIC OCEAN REGION-WEST (AOR-W)		
Name of station	**Country**	**ID number**
Goonhilly/Burum	United Kingdom	002
Southbury	USA	004
Burum	Netherlands	012
Aussaguel	France	021
INDIAN OCEAN REGION (IOR)		
Name of station	**Country**	**ID number**
Arvi	India	
Aussaguel	France	321
Eik (Oslo)	USA	304
Sentosa	Singapore	328
Burum	Netherlands	312
Thermopylae	Greece	305
Yamaguchi	Japan	303
Goonhilly/Burum	United Kingdom	302
PACIFIC OCEAN REGION (POR)		
Name of station	**Country**	**ID number**
Santa Paula	USA	204
Sentosa	Singapore	210
Burum	Netherlands	212
Yamaguchi	Japan	203
Goonhilly/Burum	United Kingdom	202
Aussaguel	France	221

Note 1: Arvi will accept code 41 reports from within Metarea VIII (N) only.
Note 2: Ships previously reporting through Perth (renamed to Station 12) must use SAC 1241 when sending weather reports through POR/212 or IOR/312.
Note 3: Vizada Satellite Communications, the primary provider of satellite communications for the U.S. VOS program has recently upgraded their system to expedite communication traffic flow. As with most technological advances, some older systems become less productive. In order to ensure expedited routing, all communication normally transmitted to any x01 series ID should be directed to the upgraded x04 series IDs. While the x01 series IDs will continue to process any communication traffic received, transmission delays will become more and more likely. Therefore, it is imperative that everyone start switching their INMARSAT addresses over to the X04 Series, i.e. switching from codes AOR-E/101, AOR-W/001, and POR/201 to AOR-E/104, AOR-W/004, and POR/204 respectively.
Note 4 As the Inmarsat Access Control and Signalling Equipment (ACSE) previously located in Goonhilly Land Earth Station has now been physically relocated to Burum, this service is now effectively operated from Burum. However, the ID Numbers associated with Goonhilly (i.e. the X02 series) remain in use.

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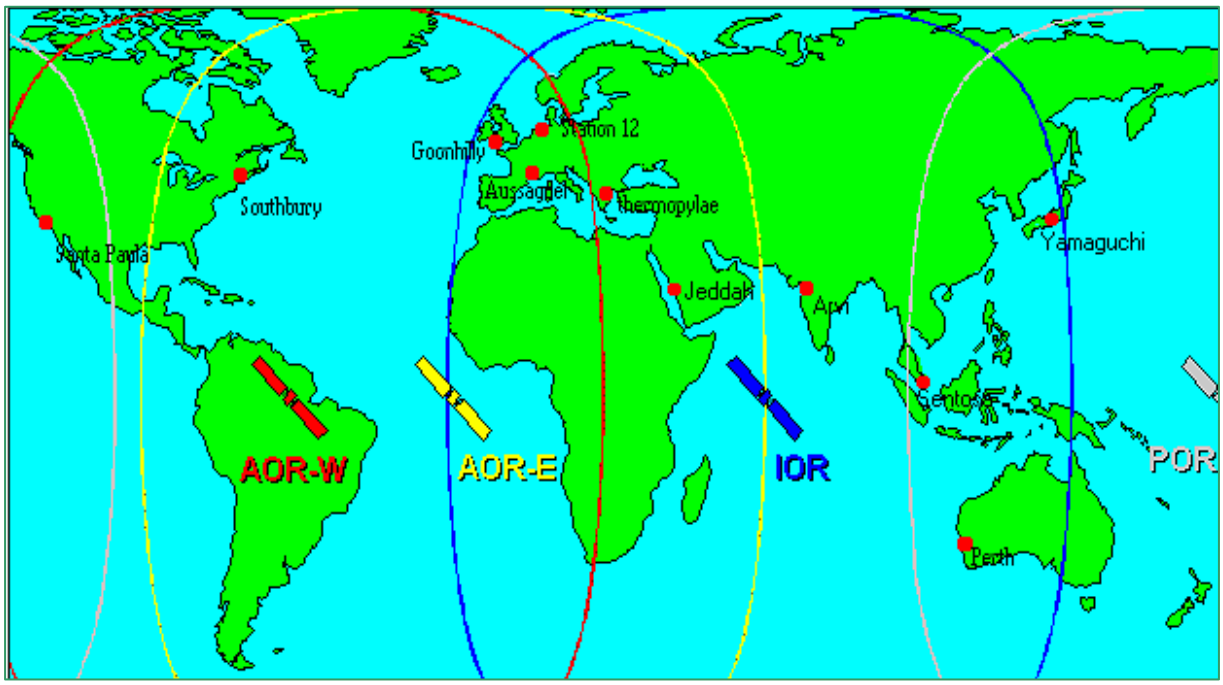
ANNEX 5

DISTRIBUTION OF RECOMENDED CODE 41 LES WITH INMARSAT SATELLITE FOOTPRINTS
(From TurboWin Program)



[Note - Norwegian LES Eik is not shown on the above map]

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APPENDIX B

REPORT BY THE TASK TEAM ON SOT IRIDIUM PILOT PROJECT – PART 1

Iridium Pilot Project Report – Real-time Data Collection Performance
Amundsen AVOS

Performance analysis, results and illustrations by:
Champika Gallage, Standards Officer, Marine Networks
Contributors: Dale Boudreau, A/Manager National Marine Networks
Chris Marshall, Manager National Marine Networks
Yvonne Cook, Former LCM Surface Networks
Weather and Environmental Monitoring Directorate
Meteorological Service of Canada (MSC), Environment Canada

1.0 Background

It has become apparent that the present INMARSAT telecommunication service does not perform well for VOS and AVOS (Automated VOS) travelling in northern areas (i.e. north of 55°N). A large percentage of AVOS data is not transmitted in real-time, which reduces the amount of expected data in already very data sparse regions. The current hypothesis is that the INMARSAT satellite footprint does not adequately cover the Polar Regions, as it is a geosynchronous satellite positioned over the equator. As ships travel north, they are further and further away from the satellite. This is compounded by signal attenuation caused by weather (e.g. clouds and precipitation), as well as terrain, due the low angle of the satellite signal.

To address the above issue, as well as other issues such as data throughput, reliability, cost-effectiveness, etc., an action item came out of the SOT meetings in Geneva, Switzerland April, 2007 to establish an Iridium Task Team to evaluate and demonstrate the operational use of Iridium technology for the real-time collection of VOS data. The Canadian marine program, a participating member of the project, offered a prototype Iridium-based Automatic Voluntary Observing Ship (AVOS) system onboard the Canadian Coast Guard (CCG) research vessel, Amundsen. This report summarizes the results of the pilot project based on data transmissions from the Amundsen from July 2007 – November 2008.

To supplement the Amundsen results, *Annex 1* contains a summary for a previous pilot project initiated by Canada using the ship Nunakput in the summer of 2006. Furthermore, ***Météo-France*** and NOAA are also participating in the Iridium Pilot Project and have provided a brief update on their findings in terms of operability and cost. A summary of their work is in *Annex 2* and *Annex 3*.

2.0 Purpose & Scope

The purpose of the pilot project is to determine whether Iridium communication is a reliable replacement for the INMARSAT communications, which is currently being used on the AVOS ships travelling to the Canadian Arctic. This document will report on the findings of data availability, and provide a comparison between position data from the Iridium communications equipment and the position data extracted from each AVOS observation sent from the ship. It is important to note that the ship's observer is capable of augmenting AVOS weather observations, but not position data associated with the observation.

3.0 Design

The Amundsen was selected, as its intention was to travel to the Canadian arctic during the winter of 2007-2008 and remain frozen into the ice pack, and gather data in support of the International Polar Year project. The Canadian arctic is a data sparse area, which does not have consistent, reliable

coverage through standard INMARSAT communications, which the rest of the AVOS network enjoys in the more southern latitudes.

Data receipt from the Amundsen commenced July 11, 2007 while travelling in the St. Lawrence River. The ship continued down the St. Lawrence River, along the south coast of Québec, north along the east coast of Labrador and continued into the Hudson Bay, making cargo drops along way to the various northern ports. It then continued its journey towards the western Arctic, eventually spending some time in the eastern Beaufort Sea before cruising back through the Canadian Arctic waters and returning to Québec City along the St. Lawrence River in November of 2008 (see Figure 1).

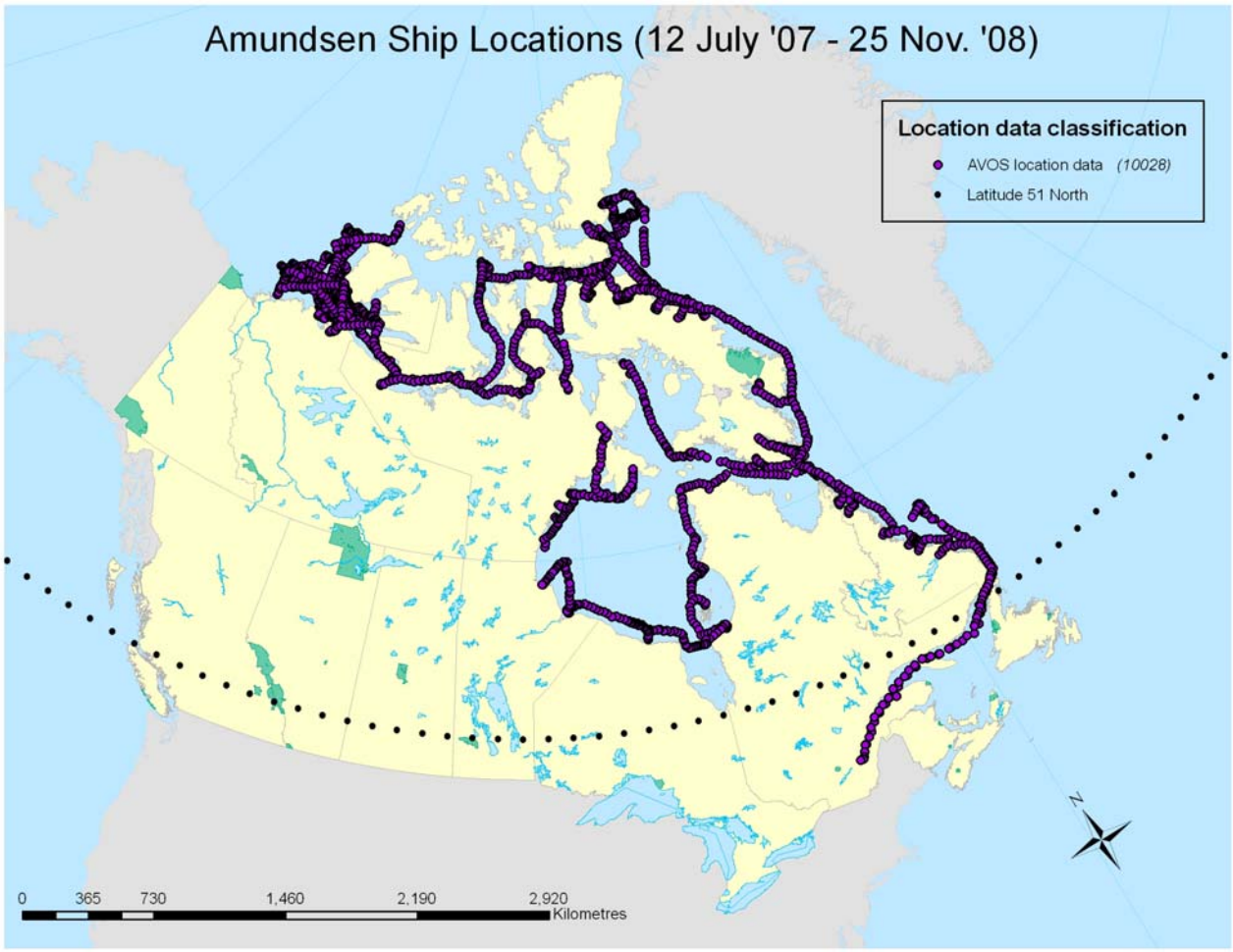

Figure 1. AVOS position data from July 12, 2007 to November 25, 2008

Stratos http://www.stratosglobal.com/ provided the Iridium transmitter licensing and an account, as well as 5 email address destinations for the received observations. The number of observations transmitted from the AVOS over a period of 24 hours is dependant on its position off the coast of Canada.

4.0 Equipment

Comprised a modified AVOS system including standard data acquisition unit and sensor suite, prototype Iridium communications kit installed by Axys Technologies Inc., bridge PC for manual augmentation of automatic weather observations, UPS and standard Environment Canada Marine tilt pole. See Table 1 for more detail.

Table 1. Equipment on Amundsen belong to Environment Canada

DESCRIPTION	SENSOR SPECS/MODEL #'S	Serial Number
Air Temp/RH	Rotronics MP101A-T7, Probe 0.1V, T-7 (-40>+60)	40326
Radiation Screen for Air Temp/RH	ROSMP41002; Natural Aspiration Shield for MP101A	N/A
Water Temperature	AXYS Water Temperature - HATS, c/w 2m cable	190
Barometer, Pressure (1)	Vaisala PTB210B1T1B, TTL, 500-11003	80530012
Anemometer, RM Young 05103	RM Young 05103	
Iridium Transceiver Unit	Sailor ST4120	5737336
GPS Antenna	Garmin GPS Receiver, Model GPS-36	81120586
Compass and Ships Gyro	KVH Fluxgate Compass, Model Autocomp1000	050300340
UPS for AVOS Bridge PC	APC SU700X93	
AVOS Sentinel	EC Basic System	AVI100500
Bridge PC	Poseidon 150/P4	M960200118

5.0 Analysis

5.1 Overview

10028 observations, collected from July 12, 2007 to November 25, 2008, were analysed. MS excel was used for processing data and ArcView V9.2 was used to plot the data. The number of observations expected from AVOS while a vessel is underway is dependant on the following criteria:

The AVOS system transmits at one of three intervals depending on position.

1. **One Hour Transmissions (HLY) in Data Sparse Areas (two areas)**
    1. Northern Canada Data Sparse region defined as: West of 50°W, East of 170°W **and** North of 51°N
    2. Antarctic Data Sparse Region defined as: South of 50°S
2. **Three Hour Transmissions (EPD) inside North America 200 Mile Zone (South of 51°N)**
3. **Six Hour Transmissions (FPD) for the remainder of the world**

The following is an example of the received Iridium message in email format:

From: sbdservice@sbd.iridium.com[SMTP:SBDSERVICE@SBD.IRIDIUM.COM]
Sent: Thursday, September 27, 2007 11:05:24 PM
To: Hung, Derek [Ontario]
Subject: SBD Msg From Unit: 300003000926000 Auto forwarded by a Rule

MOMSN: 19
MTMSN: 0
Time of Session (UTC): Fri Sep 28 03:05:20 2007 Session Status: 00 - Transfer OK Message Size (bytes): 93

Unit Position: Lat = 74.429912 Long = -91.735705 CEPradius = 3

Sample of an attachment received together with the above message:

BBXX CGDT 28034 99744 70919 46/// /3113 11033 21046 40074 58005 7//// 8//// 22223 01000 2////

Data received from Amundsen ship was analyzed in two different streams

1. Data availability
2. Iridium position data accuracy

5.2 Data availability

A key assumption is that the ship was underway at all times during the analysis period and was not in "Hove to" mode at any time.

Data availability was calculated based on the maximum number of data points possible during the period under consideration.

Based on the above assumption, the maximum number of data expected during 12 July 2007, and 25 November 2008 is 11113 and the total number of data received during the same period is 10028. This shows 90% data availability during the specified period.

Data availability in the Arctic region, i.e. north of 51^0, was considered separately. The Amundsen was sailing in the Arctic region (North of 51^0) from July 28, 2007 to October 13, 2008. The maximum number of observations expected during this period was 10636 and 9558 messages were received, maintaining the data availability in Northern regions at 90% (see Figure 1).

5.3 Missing observations

There were some identified and unidentified reasons for missing data. A log was maintained to capture the details of all missing data events during the trial period. According to the service provider, the missing data were a result of the AVOS not attempting a transmission. Upon further investigation by Environment Canada and shipboard staff, in some cases, the AVOS did create an observation but did not attempt to transmit a message. In other cases, the AVOS system had been powered down or was non-responsive. This was confirmed by checking the error message file onboard the AVOS bridge computer. Axys Technologies, the AVOS system manufacturer, is investigating the problem. In some cases, data were not available due to loose connections in the system. This is due to the high amount of vibration associated with ice breaking activities.

6.0 Telecommunication costs

6.1 AVOS Scenarios

There are both ongoing communication charges, as well as one-time implementation costs that need to be assessed to determine the cost-effectiveness of Iridium technology for the Canadian AVOS fleet. Charges for ongoing communication costs have been obtained from 3 different Iridium VARs (Value Added Resellers). It is anticipated that improved pricing may be possible via "bulk" or multi-year data contracts resulting from a competitive bid process.

Table 2. Sample one-time and ongoing costs based on VAR survey

Description of item	Unit cost (USD)*
(One-time costs)	
Iridium SBD transmitter	$500
Integration of Iridium transmitter with existing AVOS WM100 system (AXYS quotation)	$1500
Iridium account set-up fee	$50
(Ongoing communication costs)	
Monthly account fee	$16
Per message SBD charge (assumes 100 Byte messages)	$0.13/message

* Information utilized in costing model (U.S. Dollars)

Table 3. Communications cost estimate for Iridium equipped AVOS

	Scenarios	Number of observations per year per ship	Annual Cost* for 1 ship
1	Observations every hour (assumes ship transmits every hour) - This is theoretical maximum possible cost. Would never occur, as ships do not spend 100% of the year at sea.	**8760**	$1,331
2	Observations every 3 hours (assumes observations available every 3 hours year round)	**2920**	$572
3	Observations every 6 hours (assumes observations available every 6 hours year round)	**1460**	$382
	Estimates based on actual AVOS Observation Counts		
4	Review of AVOS observation count over past 3 years suggests that maximum number of obs is 400-600/month. Extrapolated over an entire year results in ~6000 obs. This should be considered a liberal estimate (high end) for costing purposes. Note that the Amundsen reported ~6200 observations last year via Iridium, with data transmitted each hour.	**6000**	$972
5	A much more realistic number of observations is likely in range of 1500-3000 (even with hourly data transmission)	**3000**	$582
6	The past 12 months saw AVOS report nearly 70,000 observations from 43 ships, so the total cost for one year per ship would be about:	**1650**	$407

* Information utilized in costing model (U.S. Dollars)

For the Canadian AVOS fleet, this would result is savings of over 60% based off the amount currently budgeted for the INMARSAT telecommunication solution. In addition, it is apparent that even with hourly transmission from all AVOS in all locations, the annual cost will be less than what is presently paid for INMARSAT, with the added benefit of much better performance in Arctic waters, and more frequent observations in other areas.

6.2 One time costs (retrofitting existing AVOS)

Table 4 provides an estimate of the costs associated with retrofitting the existing AVOS network with Iridium transmitters. Note that the salary and O&M costs associated with deploying the systems have not, been considered in this estimate. Additional details would be required regarding the complexity of the on-ship installation and testing.

Table 4. Costs of retrofitting AVOS

Item	Unit cost	Cost* for 44 AVOS
Iridium transmitter	$500	$22,000
Retrofit if existing AVOS payload to Iridium (work to be done by AXYS)	$1,500	$66,000
Iridium account activation	$50	$2,200
Total	$2,050	**$90,200**

* U.S. Dollars

6.3 Duplication of Communications Costs

Should Canada decide to proceed with deployment of Iridium for the AVOS network, it must be understood that until the implementation is complete, it will be necessary to pay both annual INMARSAT charges, along with new Iridium charges. This would likely be an issue for 2 concurrent fiscal years, depending on the speed of the Iridium transmitter deployment schedule.

6.4 Summary of cost estimates

Based on the estimates presented in the preceding tables, an AVOS network equipped with Iridium transmitters offer a more cost effective solution that the current INMARSAT service. Depending on the scenario, selected, annual cost savings are in the range of $20,000 to $40,000 USD. This would equate to a 2-3 year payback on the initial investment of $90,000 (to equip current AVOS with Iridium). As noted above, there would also be a “bow wave” of costs due to required duplication during the system implementation, which may extend the payback closer to 4 years depending on the time required to deploy Iridium on all AVOS.

7.0 Other benefits of Iridium

In addition to improved data reception rates at high (Southern and Northern hemisphere) latitudes, and potential cost savings, the Iridium communication solution also offers the following benefits:

- capability for 2-way communications, allowing for direct connection with hardware on AVOS to assist with troubleshooting and diagnostics. Our current platforms do not support this, however the next generation AVOS payload will offer this functionality;
- processing of FM13 SHIP messages will be directly handled by The Canadian Metrological Centre (CMC) in Canada, removing the dependency on NOAA;
- the option for IP data routing means there would no longer be the requirement to decode binary satellite messages directly; and
- the Iridium solution allows more control of AVOS data routing, which is important as Coast Guard continues to be concerned with release of complete AVOS reports to the public.

8.0 Risks and challenges of adopting Iridium

- Dependency on American-based commercial satellite provider for both data reception and processing. Note, however, this dependency is also an issue with current INMARSAT AVOS.
- All MSC AVOS data will be routed through the Iridium data centre before delivery to CMC. Could be security concerns from CCG and others.
- No guarantee that SBD data costs will remain at current rates; price increases are likely over time.
- Integration of Iridium transmitter may lead to an increase in data outages as any initial bugs are worked out. Lessons learned from pilot project on Amundsen should help mitigate this.

9.0 Conclusions

Based on the analysis carried out on Amundsen data received from 12 July 2007 to 25 November 2008, the following conclusion can be made.

> Iridium transmissions are reliable in Canadian Arctic. This was concluded based on 90 % data availability. The 10% data unavailability was mostly due to problems that were unrelated to Iridium transmissions. Therefore, it is fair to conclude that iridium transmission in Canadian Arctic is near perfect.

Additionally, the Iridium Pilot Projects have demonstrated a significant *improvement in reliability* of communications in Northern waters. In addition to improved performance, there are *significant cost savings* versus the current INMARSAT arrangement Canada has with NOAA. Cost savings will continue be realized with Iridium even if the frequency of AVOS observations is increased to hourly in all areas.

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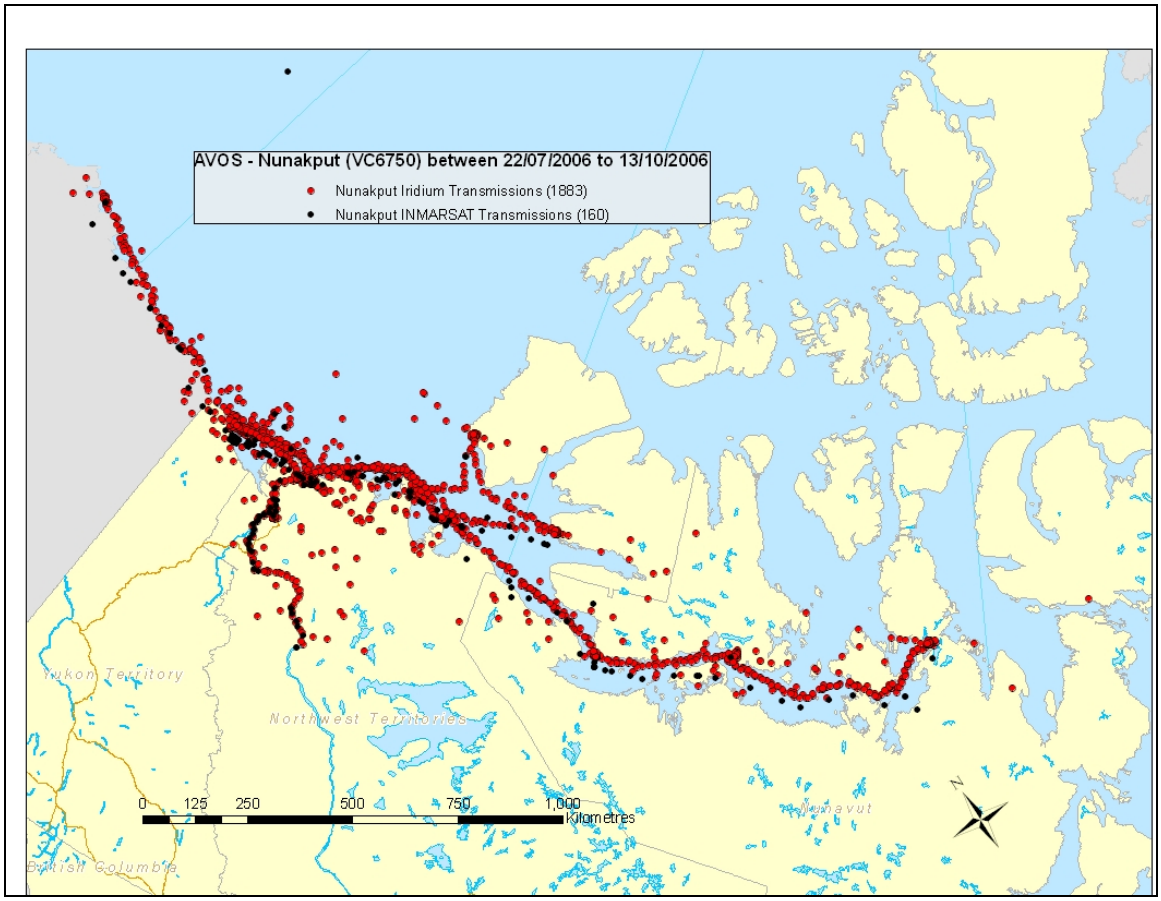
ANNEX 1

Nunakput Iridium Pilot Project Summary

Following the identification of data reception problems in Northern waters, a trial of Iridium communications was conducted in the summer of 2006. The Nunakput (VC6750) was equipped with an Iridium transmitter to operate in parallel with the standard INMARSAT system on the AVOS. The Iridium transmitter was not integrated into the AVOS, and was configured to send hourly position using the SBD (short burst data) service provided by Iridium. The resulting data allowed for a side-by-side comparison of the two systems, and a means to evaluate how well the Iridium transmitter performed in the Northwest Arctic. The following map provides a plot of the INMARSAT messages received, as well as the Iridium position reports during the nearly 2-month trial.



Note: The Iridium transmitter was not connected to a GPS, so position reports were based on estimates provided by Iridium, meaning that in some cases the position can be wrong by many hundreds of kilometres. Each Iridium message is accompanied by a score, which rates the confidence in the position report. In our AVOS applications, a GPS is utilized, so the Iridium position reports are not being used in the observation data.

Summary of Nunakput Trial:

- The INMARSAT system on Nunakput reported **160** observations during the 83 days of the trial;
- The Iridium transmitter delivered **1883** messages during this time;
- A limitation of the trial is that it was not possible for the Iridium transmitter to stop sending reports while the AVOS was in “hove to” mode (i.e. in port and not transmitting). In addition, it is not possible to know if there were other technical problems with the AVOS, which limited the number of observations delivered;
- Position data derived from Iridium was not nearly as accurate as that obtained using GPS technology or the ship’s navigational equipment (INMARSAT reports);
- Main conclusion—the Iridium transmitter delivered 92% more messages than the INMARSAT system.

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ANNEX 2

Summary of the *Météo-France* Iridium Trial

Update provided by: *Pierre Blouch*, **Météo-France**
E-SURFMAR Programme Manager
*Centre de M**été**orologie Marine, France*

Since Iridium Short Burst Data (SBD) demonstrated its ability to efficiently, report drifting buoy data, developments are underway at ***Météo*-*France*** to use this communication system on Baros (basic) and Batos (complex) ship-borne Automatic Weather Stations (AWS).

Twelve Baros stations have been built. These are only reporting hourly pressure measurements. A first prototype (BARFR00) correctly worked on a trawler from October 2007 to August 2008. It reported 4690 observations in all and it was removed after the trawler was sold. By mid-February, four Baros AWS were in operation on E-ASAP ships (call signs are BAREUxx) and eight others were ready to be installed. Although equipping E-ASAP ships is a priority, E-SURFMAR recently invited NMS from Southern Europe to recruit ships, which could host a Baros.

The Baros data format is 15 bytes long, which includes the observation time, the ship's heading and speed, the GPS latitude and longitude, the sea level pressure and its tendency over the past three hours.

As for Iridium drifting buoys, the data from Baros are received at ***Météo***-France through emails within a few of minutes after transmission. They are then uncompressed, coded accord to WMO formats and put onto the GTS in real-time (FM13-SHIP for the moment, FM94-BUFR soon). **The timeliness is excellent**.

Work is ongoing at ***Météo***-France to interface an Iridium SBD modem to a Batos AWS instead of the INMARSAT-C transmitter. The data format will be the same as that used by the INMARSAT-C data reporting (DR) service (32 bytes), allowing a complete FM13-SHIP data set to be reported. Although the length of the binary reports was limited to these 32 bytes with INMARSAT, the limitation will be higher with Iridium SBD. **Having, more reportable parameters is desirable**, e.g. wind gust, salinity, CO2 pressure, irradiances, etc.

Communication costs were already low with INMARSAT-C DR (~0.15 € per report), but **with Iridium SBD the costs can be lowered** further to as much as 50% of INMARSAT.

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ANNEX 3

Summary of the *NOAA/AOML-USA* Iridium Trial

Update provided by: Derrick Snowden
NOAA Climate Program Officer, Climate Observation Division
Silver Spring, MD USA

NOAA/AOML has been experimenting with using Iridium telecommunications to transmit Ship of Opportunity data to shore. This particular usage differs from the applications reported on by the DBCP Iridium Pilot Project in that the typical XBT and TSG message size is much larger than the typical data buoy message or weather message. This increased size, necessitates using a different communications protocol with different performance characteristics. For example, the size of an XBT message is approximately 2.5 Kb and a typical drifting buoy message is closer to 100 bytes. Drifting buoy messages are typically sent using the Iridium Short Burst Data (SBD) protocol. For XBT and TSG messages, AOML has been experimenting with the Direct Internet Connection protocol. The Direct Connection protocol is a dial-up internet connection similar to a terrestrial landline dial-up service in which connection to an Internet Service Provider is negotiated through a modem. The Direct Connection protocol provides for larger data throughput, which allows for the transmission of XBT and TSG messages as attachments to email.

The expected cost to transmit an XBT profile is approximately 1.50 USD and is based entirely on the advertised throughput of the Iridium data system. The actual cost, including taxes, overhead and monthly service fees, is between 2 and 5USD. This large variation in costs per profile is mainly due to difficulties in maintaining the internet connection during the transmission of the relatively large XBT file.

During the course of this experiment, we have learned several things that may help lessen the cost of the per profile transmission rate including:

• Configuring the data collection software to attempt transmission only when the signal strength is full • Keeping the cable run between the Iridium modem and antenna as short as possible. We have built a weatherproof package with a 6” connecting low loss cable, and, are researching future off-the-shelf options for an integrated modem/antenna package. Our original installations had 60’ cable runs and we had many unnecessary retransmission attempts due to signal degradation.
• Power cycling the Iridium modem at least once per day. Again, there are now hardware options where this function is built into the system. On our shipboard systems, we currently have digital timers that automatically power cycles the systems.
• Ensuring that Windows auto update is off on any computers connected to an Iridium transmission system.

We work with NAL Research as our Iridium service provider. They provided us with several months of detailed call logs, allowing us to observe the actual record of transmissions going through Iridium. Unfortunately, this service was temporary and we no longer have access to the detailed call logs. AOML recommends that anyone considering using Iridium in a somewhat experimental fashion should negotiate with the Iridium Service Provider to receive detailed logs containing information about each transmission that is crucial for troubleshooting.

We anticipate that the actual cost for an XBT transmission, including overhead and flat fees will not fall lower than $2.00 USD.

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APPENDIX C

REPORT BY THE TASK TEAM ON SOT IRIDIUM PILOT PROJECT – PART 2

Iridium Pilot Project Report – Position Data Accuracy
Amundsen AVOS

Analysis by:
Champika Gallage, Standards Officer, Marine Networks
Weather and Environmental Monitoring Directorate
Meteorological Service of Canada, Environment Canada

Background: For accurate drifting buoy position, a GPS unit is required, which can add significantly to the overall cost. It has been suggested that this requirement can be eliminated if the Iridium-determined position is found to be of sufficient accuracy. Although this is not a concern for ship data since the precise ship location is used, for drifting buoys the possibility of eliminating the GPS requirement is very significant. The Iridium Pilot Project provided the opportunity to investigate the feasibility of using the Iridium-derived position rather than the surface-based GPS since AVOS is essentially a buoy on a ship. This report merely analyses the data and presents the results. It does not make any specific judgements on whether the Iridium position is of "sufficient accuracy" since that will need to be determined by the various client communities.

Iridium position data accuracy: Position data obtained from the Iridium message (Figure 1) was compared against corresponding position data extracted from the AVOS message. Distance between the two respective position data points was calculated based on the formula in Appendix A. Data points extracted from the AVOS were considered as the reference and a 20 km radius was used as an acceptable distance between two respective position data points. Table 1 shows a sample of a distance analysis between two data sets. Iridium position data not within the 20 km agreement radius with the AVOS position data have their rows highlighted in yellow for the given sample in Table 1.

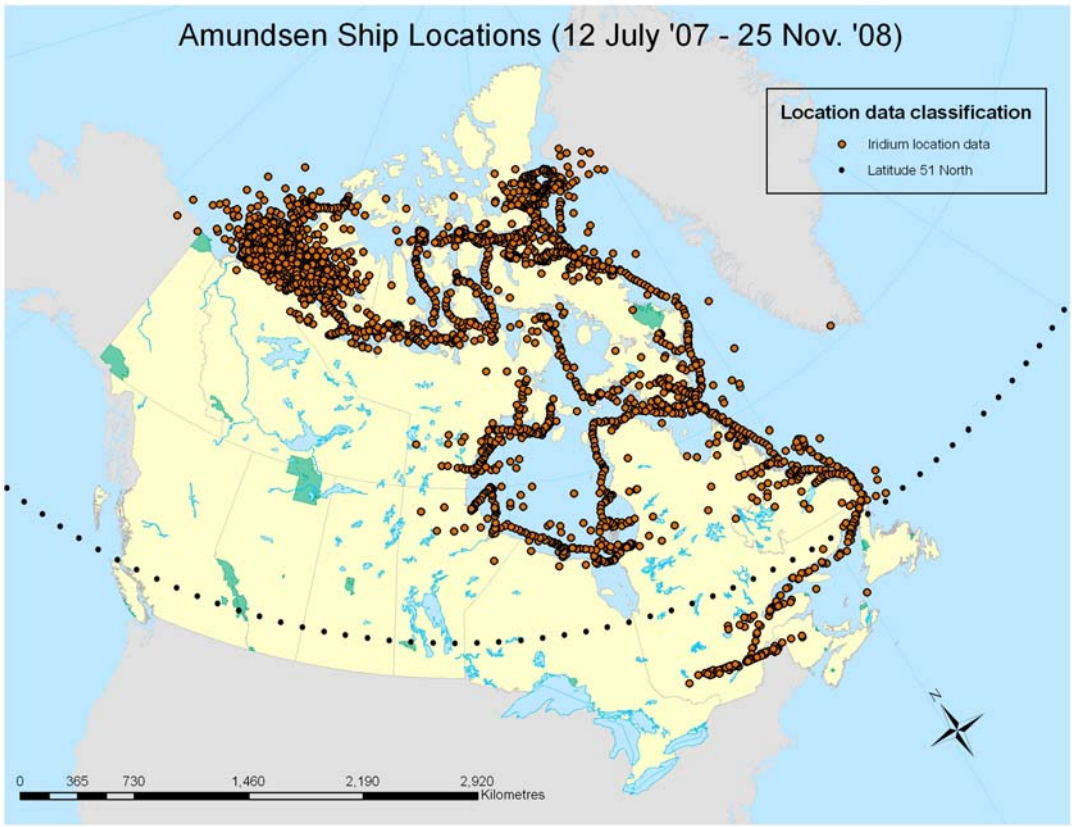

Figure 1. Iridium position data July 12, 2007 to November 25, 2008

Table 1. Distance analysis between AVOS and Iridium position data points (sample)

Date	Year	Time	*Position from AVOS Message*		*Position from IRIDIUM Message*		*CEP radius*	*Point-to point distance*
			Latitude	Longitude	Latitude	Longitude		
Sun Jul 29	2007	0:05:20	51.5	-56.4	51.5	-56.4	3	0.0
Sun Jul 29	2007	1:05:21	51.7	-56.1	51.7	-55.3	99	55.0
Sun Jul 29	2007	2:05:18	51.8	-55.8	51.8	-55.8	2	0.0
Sun Jul 29	2007	3:05:22	51.9	-55.6	52.0	-56.6	166	69.3
Sun Jul 29	2007	4:05:20	52.1	-55.3	52.1	-55.3	2	0.0
Sun Jul 29	2007	5:05:17	52.3	-55.3	52.3	-53.4	140	128.9
Sun Jul 29	2007	6:05:17	52.5	-55.3	52.6	-55.2	6	13.0
Sun Jul 29	2007	7:05:18	52.7	-55.3	52.8	-53.0	179	154.8
Sun Jul 29	2007	8:05:25	52.9	-55.3	53.0	-55.3	4	11.1
Sun Jul 29	2007	9:05:18	53.2	-55.3	53.2	-55.3	5	0.0
Sun Jul 29	2007	10:05:19	53.4	-55.2	53.4	-55.2	3	0.0
Sun Jul 29	2007	11:05:19	53.6	-55.3	53.6	-55.3	3	0.0
Sun Jul 29	2007	12:05:18	53.8	-55.4	53.8	-55.4	6	0.0
Sun Jul 29	2007	13:05:18	53.9	-55.6	54.0	-55.7	7	12.9
Sun Jul 29	2007	14:05:27	54.2	-55.7	54.2	-55.7	2	0.0
Sun Jul 29	2007	15:05:19	54.3	-55.9	54.3	-55.8	5	6.5
Sun Jul 29	2007	16:05:24	54.5	-56.1	54.6	-56.1	2	11.1
Sun Jul 29	2007	17:05:32	54.7	-56.3	54.6	-67.1	30	692.6
Sun Jul 29	2007	18:05:20	54.9	-56.4	54.9	-56.4	3	0.0
Sun Jul 29	2007	19:05:22	55.1	-56.6	55.1	-56.6	3	0.0
Sun Jul 29	2007	20:05:24	55.3	-56.7	55.3	-56.7	5	0.0

Sun Jul 29	2007	21:05:22	55.4	-56.7	55.4	-56.8	5	6.3
Sun Jul 29	2007	23:05:24	55.8	-57	55.8	-57.1	3	6.2
Mon Jul 30	2007	0:05:27	55.9	-57.2	56.0	-57.1	6	12.7
Mon Jul 30	2007	1:05:22	56.2	-57.3	56.2	-58.0	73	43.2
Mon Jul 30	2007	2:05:25	56.3	-57.4	56.3	-57.4	4	0.0
Mon Jul 30	2007	3:05:20	56.3	-57.4	56.2	-55.6	128	111.5
Mon Jul 30	2007	4:05:23	56.4	-57.5	56.5	-57.5	2	11.1
Mon Jul 30	2007	5:05:17	56.6	-57.6	56.7	-57.7	32	12.7
Mon Jul 30	2007	6:05:20	56.8	-57.7	56.8	-57.6	2	6.1
Mon Jul 30	2007	7:05:18	56.6	-57.5	56.5	-57.6	4	12.7
Mon Jul 30	2007	8:05:19	56.3	-57.4	56.3	-57.4	3	0.0
Mon Jul 30	2007	9:05:18	56.5	-57.4	56.5	-57.5	4	6.1
Mon Jul 30	2007	10:05:18	56.7	-57.6	56.7	-57.5	6	6.1
Mon Jul 30	2007	11:05:18	56.9	-57.6	56.8	-57.6	8	11.1
Mon Jul 30	2007	12:05:19	56.7	-57.5	56.6	-57.4	2	12.7
Mon Jul 30	2007	13:05:24	56.5	-57.3	56.4	-57.3	1	11.1

All Iridium position data not within a 20 km radius of AVOS position data are displayed in Figure 2. Out of 10028 Iridium position data points received, 1522 or 15% are not within a 20 km radius of AVOS position data. The results also show that 66% of data were received while the Amundsen ship was underway in the Beaufort Sea, an area covering latitudes 68° to75° and longitudes -110° to -145°.

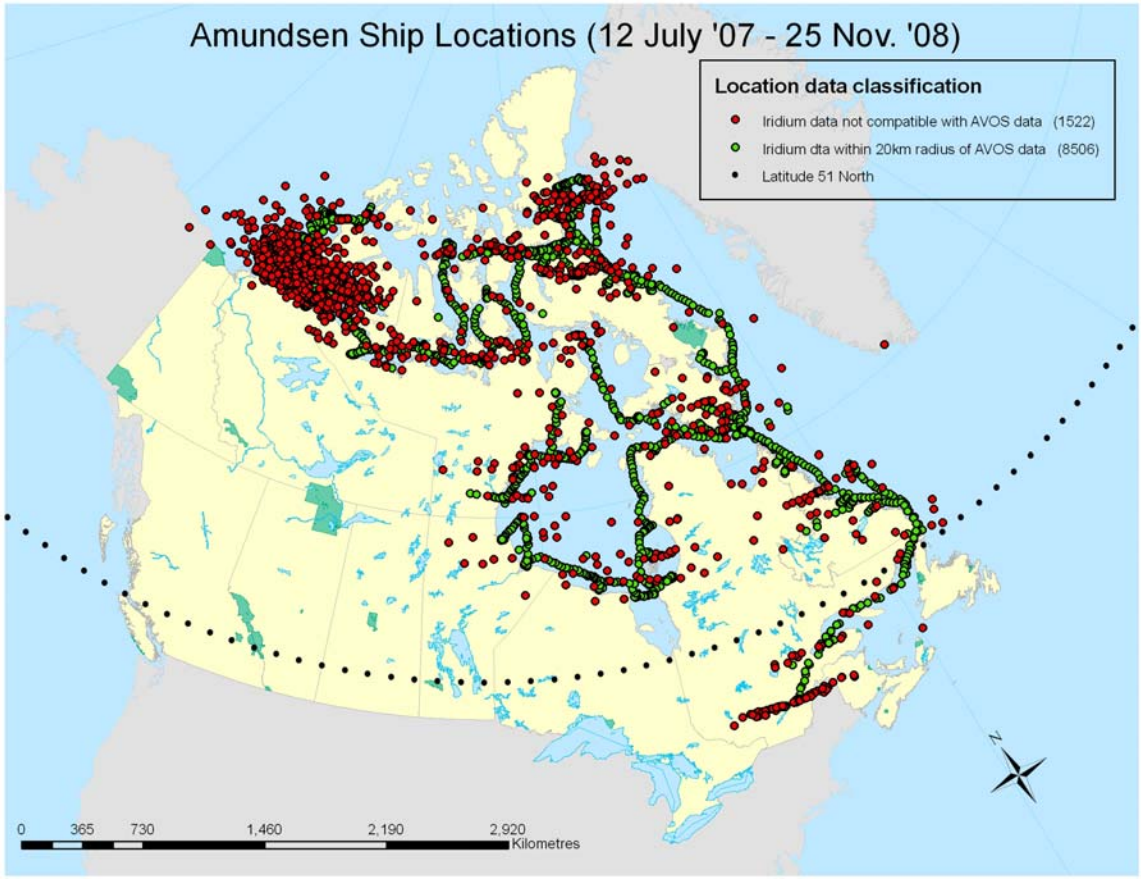

Figure 2. Compilation of AVOS and Iridium position data (from July 12, 2007 to November 25, 2008)

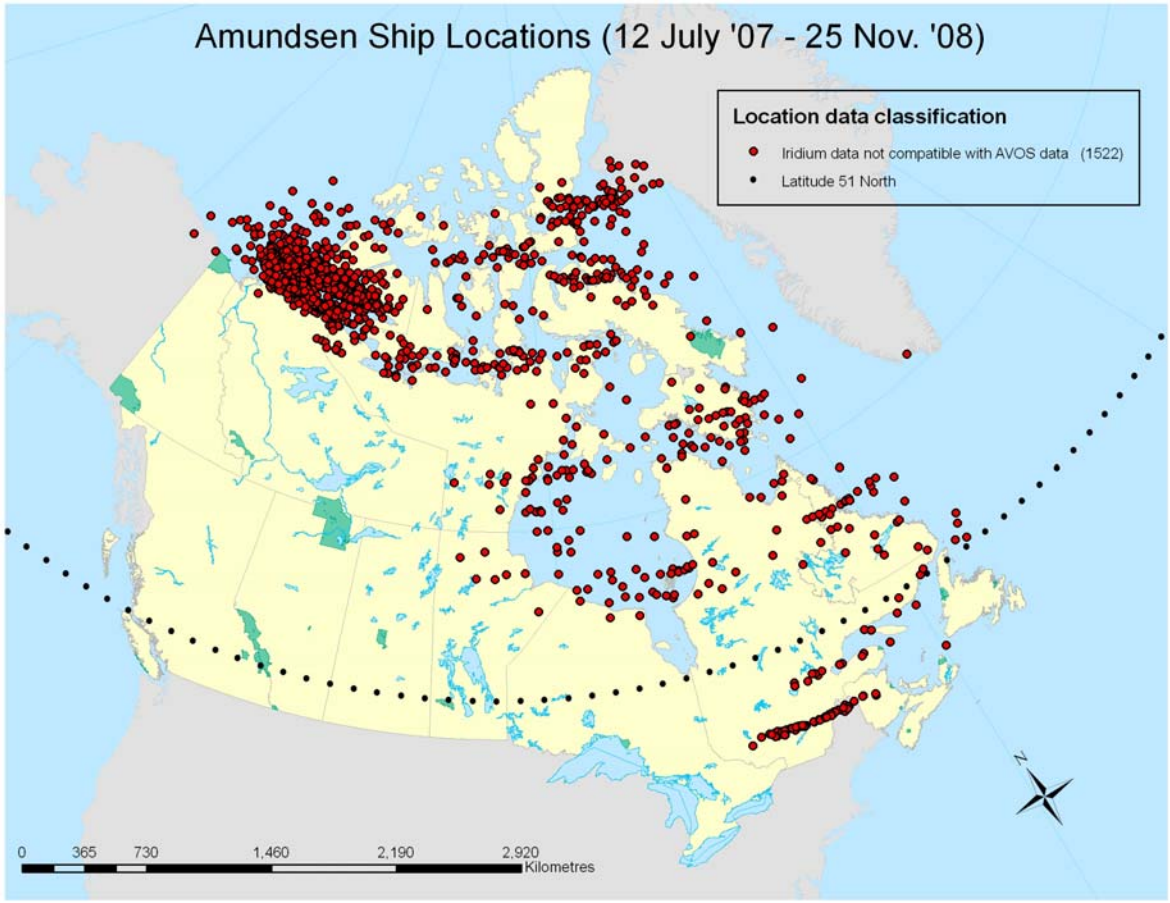

Figure 3. Iridium position data differing with respective AVOS position Data

Figure 3 shows all the position data not compatible with AVOS position data. Error data concentration in Beaufort Sea area is due to the Amundsen ship being in that area most of its sailing time.

Analysis were carried out to discover any relationships/trends between Position distance error and Latitudinal value (Figure 4), or Longitudinal value (Figure 5).

According to Figure 4 & 5, there is no detectable relationship (or trend) between distance error and longitudinal values or latitudinal values. Data concentration in Figure 4 & 5 (circled data points) is because Amundsen ship spent 66% of its time in the Beaufort Sea area (Figure 2 & Figure 3).

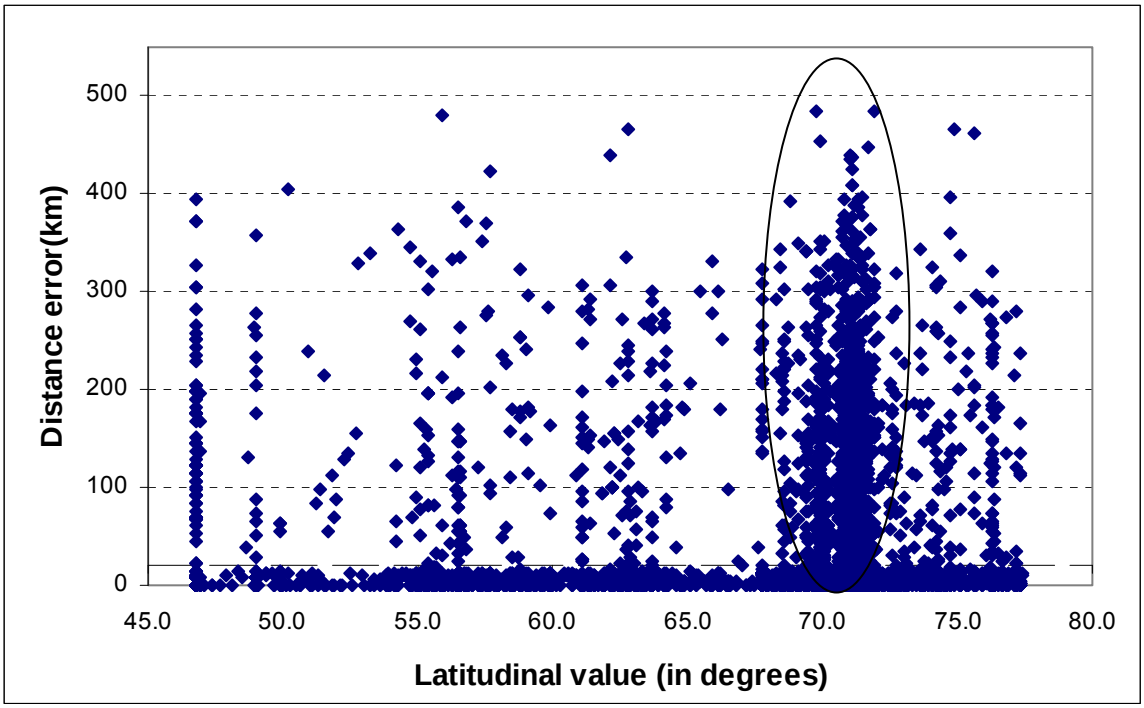

Figure 4. Relationship between Latitudinal value (degrees) and distance error (km) between AVOS position and Iridium position data

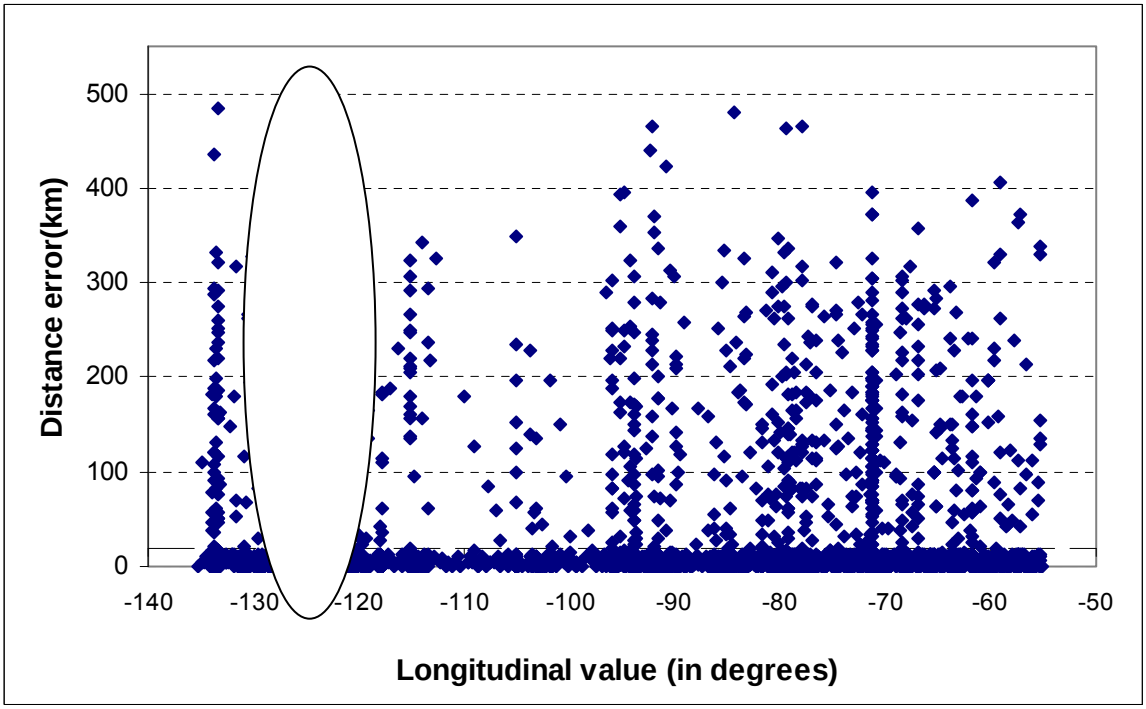

Figure 5. Relationship between Longitudinal value (degrees) and distance error (km) between AVOS position and Iridium position data

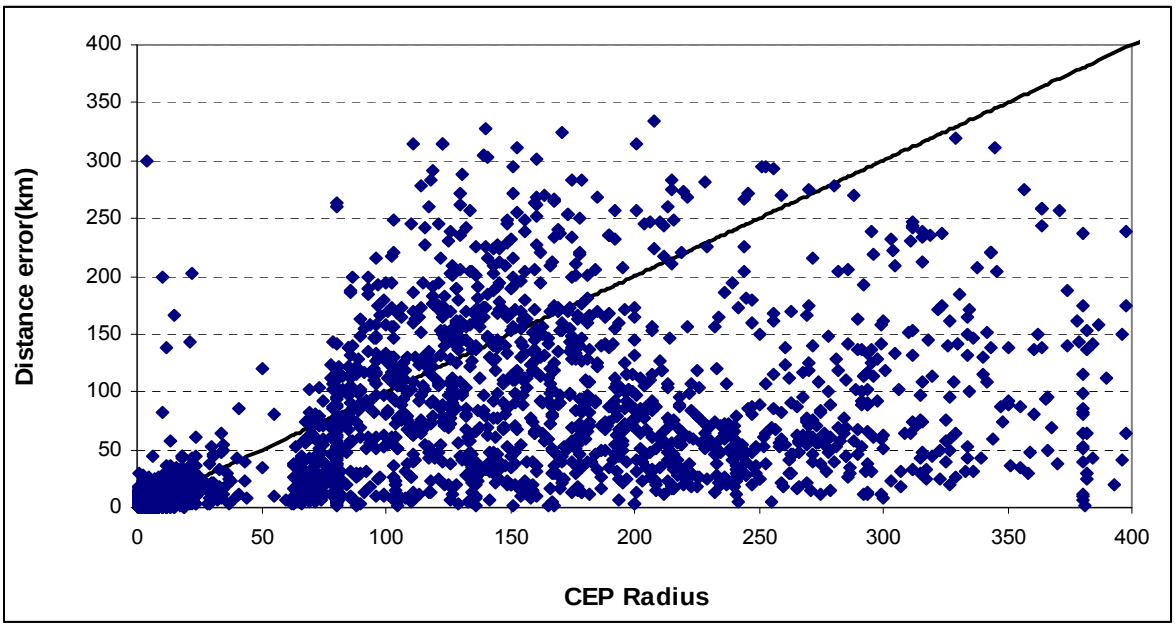

Figure 6. Relationship between CEP radius and distance error (km) between AVOS position and Iridium position data

Definition of Circular Error Probable (CEP) radius: CEP radius is the value of the radius of a circle, centred at the actual position that contains 50% of the position estimates.
Figure 6 shows the relationship between CEP radius and position distance error. According to Figure 6, it is clear that more than 50% of position distance error data falls below 50% of CEP radius. This suggests that CEP radius is a more pessimistic value.

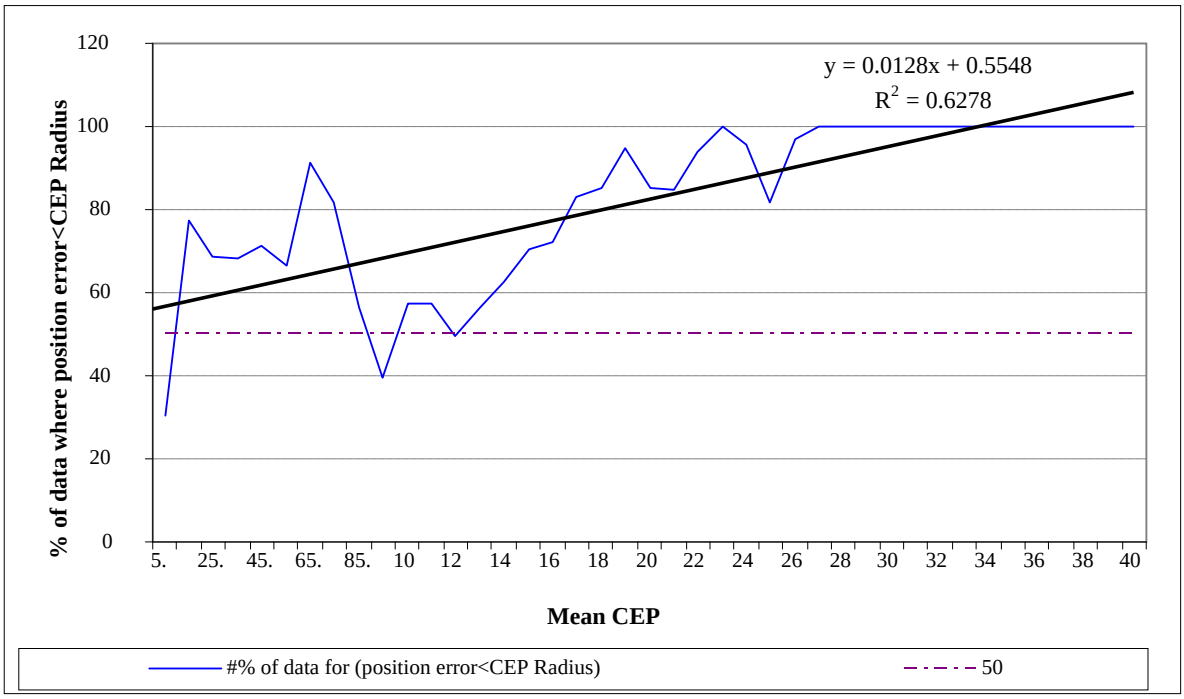

Figure 7. Relationship between mean CEP radius and % # of position error data less than CEP radius

Figure 7 (see Appendix B for data) shows the relationship between % number of position error data that is less than CEP radius and the mean CEP radius. According to the definition of CEP radius, the plotted data should closely follow the 50% data line. However, the actual data in Figure 8 shows a

trend of above the 50% level, with values increasing gradually with increasing mean CEP radius. This also confirms that CEP radius is an overestimation of position error data. The degree of overestimation is high when CEP radius increases.

Conclusion

- Based on the definition of CEP, the CEP radius for these data is a pessimistic value when analyzed against real position error data. This means that more than 50% of position estimates lie within the CEP radius. The number of data points lying within the CEP radius gradually increases with increasing CEP radius.
- Although the majority of the time the Iridium position is a close approximation of the actual location, outliers are commonly seen and this technique may not be appropriate for most drifting buoy applications. More study is required, but these preliminary results suggest that the GPS sensors will still be necessary for most drifting buoy applications pending improvements in satellite positioning technology and algorithms.

Annex 1: Point to point distance calculation in km
Annex 2: CEP radius analysis with regard to actual position distance error

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ANNEX 1

Point to point distance calculation in km

Length of 1 Degree of Longitude

If the Earth were perfectly spherical in shape, the distance between one degree of latitude would be constant everywhere on the Earth's surface. However, because of the slight flattening of the Earth at the poles, the length of one degree of latitude varies slightly with distance from the Equator, but averages approximately 111 km.

At Latitude	Length of 1 Degree of Latitude
0 - 1	110.567 km
39 - 40	111.023 km
89 - 90	111.699 km
Average	111 km

Since meridians of longitude converge at the poles, the distance between one degree of longitude varies from approximately 111 km at the Equator to 0 km at the poles. At any latitude, the width of 1 degree of longitude can be calculated by multiplying the width of 1 degree of longitude at the Equator by the cosine of the latitude.

At Latitude	Length of 1 Degree of Longitude
0	111.321 km
15	107.553 km
30	96.448 km
45	78.849 km
60	55.802 km
75	28.903 km
90	0 km

Great Circles

A great circle is defined by the intersection of a sphere with a plane passing through the centre of the sphere. Great circles have the following properties:

- great circles bisect the sphere, i.e. divide the sphere into two equal hemispheres
- intersecting great circles bisect each other
- arcs of great circles represent the shortest route between two points on the surface of the sphere

The Equator is a great circle and all meridians of longitude are arcs of great circles. An infinite number of great circles are possible since a plane passing through the centre of the Earth can be placed at any angle relative to the Equator, and not just north-south or east-west.

Great Circle Distances

The great circle distance, between two points is often difficult to measure on a globe and, in general, cannot be measured accurately on a map due to distortion introduced in representing the approximate spherical geometry of the Earth on a flat map. However, great circle distances can be calculated easily given the latitudes and longitudes of the two points, using the following formula from spherical trigonometry:

cos D = (sin a)(sin b) + (cos a)(cos b)(cos P)

where:

D is the angular distance between points A and B
a is the latitude of point A
b is the latitude of point B
P is the longitudinal difference between points A and B

In applying the above formula, south latitudes and west longitudes are treated as negative angles. Once **cos D** has been calculated, the angle **D** can be determined using the ARCOS function available on scientific calculators or in spreadsheet software such as Microsoft Excel. Note that these functions may expect angles measured in radians rather than degrees. Since π radians equal 180 degrees, you can convert degrees to radians by multiplying with π/180 or convert radians to degrees by multiplying by 180/ π.

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ANNEX 2

CEP radius analysis with regard to actual position distance error

(Assumption: CEP radius is in km)

CEP radius	CEP Radius (mean)	# % of data for (position error<CEP Radius)
1-10	5.5	30.57%
11-20	15.5	77.47%
21-30	25.5	68.52%
31-40	35.5	68.18%
41-50	45.5	71.43%
51-60	55.5	66.67%
61-70	65.5	91.18%
71-80	75.5	81.82%
81-90	85.5	56.34%
91-100	95.5	39.62%
101-110	105.5	57.33%
111-120	115.5	57.35%
121-130	125.5	49.40%
131-140	135.5	56.58%
141-150	145.5	62.67%
151-160	155.5	70.51%
161-170	165.5	72.22%
171-180	175.5	82.86%
181-190	185.5	85.11%
191-200	195.5	94.83%
201-210	205.5	85.42%
211-220	215.5	84.91%
221-230	225.5	93.75%
231-240	235.5	100.00%
241-250	245.5	95.45%
251-260	255.5	81.82%
261-270	265.5	97.14%
271-280	275.5	100.00%
281-290	285.5	100.00%
291-300	295.5	100.00%
301-310	305.5	100.00%
311-320	315.5	100.00%
321-330	325.5	100.00%
331-340	335.5	100.00%
341-350	345.5	100.00%
351-360	355.5	100.00%
361-370	365.5	100.00%
371-380	375.5	100.00%
381-390	385.5	100.00%
391-400	395.5	100.00%
401-410	405.5	100.00%

CEP radius data of up to 410 were taken into consideration. There are only 40 CEP radius values above 410, ranging from 416 to 996.

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APPENDIX D

REPORT BY THE TASK TEAM ON ASAP

(report provided by Rudolf Krockauer, Chairperson of the ASAP Task Team)

1. Introduction

The number of ships, which routinely provide upper air soundings on the GTS throughout the year, is about 20 worldwide. Occasionally there are some research vessels, which perform soundings during certain research campaigns. However, these activities are usually limited to some weeks.

There are only two significant ASAP programmes: The European programme E-ASAP with 12-16 ships in 2007-2008 and the Japanese programme with 5 ships. The Japanese ASAP stations are operated on research vessels. E-ASAP is the only programme worldwide which is based on a fleet of commercial vessels (except 2 ships). Therefore the report of the ASAP Task Team is focused on E-ASAP.

2. Basics

Following key differences to land based radiosonde stations shall be pointed out:

- Almost all ASAP, systems in the E-ASAP fleet are installed on commercial container vessels. The ships sail with 15-20 knots (producing strong turbulences at the launcher) and undergo heavy vibrations from the machinery (thus shortening the lifetime of the technical equipment). Routine maintenance is limited to short berthing times in the port.
- Transmission of sounding data to the NMS is only possible through satellite communication. Satellite communication is generally less reliable than land based cable connections.
- On merchant ships, ASAP systems are operated by, members of the ships crews, not by professional observers. Skill and experience depend on the respective operator/crew member.
- Japanese ASAP ships are research vessels of the JMA (Japan Meteorological Agency) and Japan Agency for Marine-Earth Science and Technology (JAMSTEC). Since skilled staff operates the stations there are less problems than in the E-ASAP fleet.

3. E-ASAP fleet

Table 1 shows a list of 16 stations which were in operation in the beginning of 2007. 10 out of 16 stations (ASEU-, ASDE-, and ASGB01) are operationally managed by E-ASAP. The NMS's of France (ASFR-), Denmark (ASDK-), Iceland (ASIS01), and Spain (ASES01) manage the other stations. The naming convention of the stations in the E-ASAP fleet is as follows:

Char	Content
1, 2	AS (fixed data type, i.e., 'Aerology' and 'Ship')
3, 4	ISO alpha-2 country code ('EU' for EUMETNET)
5, 6	Sequential number

This unambiguous naming convention could also be applied to other ASAP stations without the risk of name conflicts. Further, it prevents the unwanted identification of the ships on the internet.

Table 1: Ships in the E-ASAP fleet in Jan 2007

Station	Line service	Sounding equipment
ASEU01	Houston – East Coast US – Northern Europe	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). The second mate and third mate usually carry out launches.

Station	Line service	Sounding equipment
ASEU02	Houston – East Coast US – Northern Europe	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). The second mate and third mate usually carry out launches.
ASEU03	Western Mediterranean – Montreal	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21). Two cadets on board usually carry out launches.
ASEU04	Western Mediterranean – Montreal	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21). Two cadets on board usually carry out launches.
ASEU05	Western Europe – Halifax – Caribbean	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21). The master, chief mate and second mate usually carry out launches. The container is installed on a special rack.
ASDE01	Northern Europe – East coast US	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). Almost all crew-members are involved in launching operations.
ASDE02(*)	No dedicated route	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). A skilled observer of Deutscher Wetterdienst DWD carries out launches.
ASDE03	Houston – East Coast US – Northern Europe	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). The second mate and third mate usually carry out launches.
ASDE04	Northern Europe - Caribbean	The 20' container launcher is equipped with a Vaisala DigiCORA III (MW21). The master and the chief mate usually carry out launches. The container is installed on a special rack due to limited space on deck.
ASGB01	Montreal – Northern Europe	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21). Two cadets on board usually carry out launches. There is a deck launcher, which is used when the conditions are unfavourable for container launches.
ASDK01	Denmark – West coast Greenland	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21).
ASDK02	Denmark – West coast Greenland	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21).
ASFR1	North West Europe – French West Indies	The ship is equipped with a deck launcher and MODEM SR2K sounding system in the wheelhouse. The electricians usually carry out launches.
ASFR2	North West Europe – French West Indies	The ship is equipped with a deck launcher and MODEM SR2K sounding system in the wheelhouse. The electricians usually carry out launches.
ASIS01	Iceland - East coast US	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21). The container is installed on a special rack.
ASES01(**)	Off Mauretania and Canary Islands	The 10' container launcher is equipped with a Vaisala DigiCORA III (MW21).

(*) The research vessel FS METEOR (ASDE02) does not operate on fixed routes and is not bound to the EUCOS area of interest (70W-40E, 10N-90N).

(**) The hospital ship ESPERANZA DEL MAR (ASES01) follows the Spanish fishing fleet.

The number of stations declined from 16 in January 2007 to 12 in December 2008. Reasons were decisions by the shipping companies to take the ships out of the North Atlantic line service.

In June 2007 the ship SKOGAFOSS (ASAP station ASIS01) was sold and moved to another service. The Icelandic Met Services did not succeed to find the shipping company Eimskip could provide a replacement ship since no ship.
=> ASIS01 terminated ASAP operations in June 2007.

In July 2008 the charterer of the ship EWL CENTRAL AMERICA II (ASAP station ASEU05) went bankrupt and the North Atlantic line service was terminated without notice while the ship was off the coast of Guatemala. The ship entered a new charter as feeder ship in the Caribbean without any further Atlantic crossings. It was decided to remove the ASAP container and remaining helium cylinders from board in Kingston (Jamaica). The 10ft container unit was shipped to Germany and received in Hamburg in September. After complete refurbishment, the station ASEU05 was installed on the ship ATLANTIC COMPANION. The ship is a sister ship of the ATLANTIC COMPASS (ASAP station ASDE01) on the same line service Northern Europe – East coast US.
=> ASEU05 was successfully transferred to a replacement ship.

In October the ship manager at Maersk US informed that the SeaLand ships SL Performance (ASAP station ASEU01), SL Achiever (ASAP station ASEU02), and SL Motivator (ASAP station ASDE03) have to terminate all ASAP operations. The SL Performance and SL Achiever were serving the North America – Mediterranean route at the time. In November, both 10ft container units were discharged from the ships in Algeciras (Spain) and brought to Hamburg by overland transport. According to the ship manager, the SL Motivator is to be scrapped. Therefore, the 20ft container unit was removed from the ship in Bremerhaven (Germany) and brought to Hamburg in November. No replacement ships could be found so far.
=> ASEU01, ASEU02, and ASDE03 terminated ASAP operations in Oct/Nov 2008.

Figure 4 shows some photographs of the ASEU05 launcher before and after re-installation.

Figure 1: ASEU05 before and after refurbishment (upper left and upper right) and at installation on board the ATLANTIC COMPANION (lower left and lower right).

The E-ASAP fleet is to be extended by three stations in 2009:

- The Danish Met Service procured a GRAW sounding system (Graw Radiosondes GmbH & Co. KG., Germany). This is in line with the goal of E-ASAP to encourage competition on the market. So far, only Vaisala (Vaisala Oyj, Finland) and MODEM (France) are represented as suppliers of radiosondes and sounding systems in the E-ASAP fleet. The third Danish ASAP station ASDK3 commenced launching operations in Feb 2009 and serves the route Denmark – West coast Greenland.
- Meteo France will put two further stations into operation later in 2009. Both stations shall be equipped with MODEM sounding systems and will serve the route North West Europe – French West Indies.

4. Performance of the E-ASAP fleet

The performance of the ASAP stations is included in the national and E-ASAP SOT ASAP reports. Figure 2 shows the distribution of bulletins in 2008 on a 2x2° grid without interpolation.

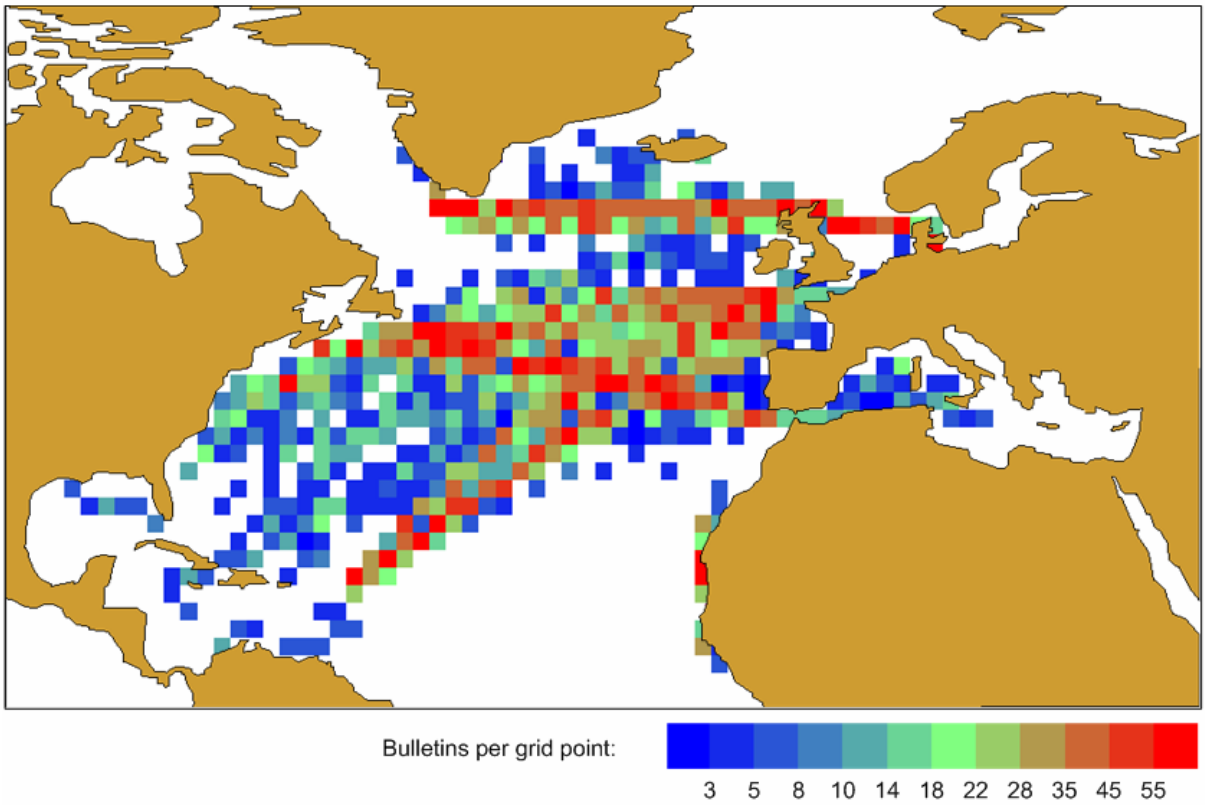

Figure 2: Distribution of TEMP bulletins in 2008 on a 2x2° grid without interpolation.

The distribution demonstrates the main trading lines of the participating container vessels. The individual performances differ widely from month to month and from ship to ship. Mean average over all stations is 19 soundings per month. Total number of soundings on the GTS was 3476 in 2008. Taking into account the total number of launches on board of the ships and received soundings on the GTS, the average GTS/Launches ratio is 84%. This is an improvement to previous years and was mainly achieved through better satellite communication. Nonetheless, several ships showed GTS/Launches ratios of < 75%. Unfortunately, many operators on board the container ships do not sufficiently check the proper automatic transmission of the data after the balloon is successfully launched.

The specific targets for timeliness, availability, and quality were not all achieved. There are many reasons for not achieving the targets. This shall be demonstrated with the example of the timeliness of the station ASDE04: The total average timeliness HH+100 for the station ASDE04 is 92% against the target of 95%. Figure 3 shows the timeliness from Jan-Dec 2008.

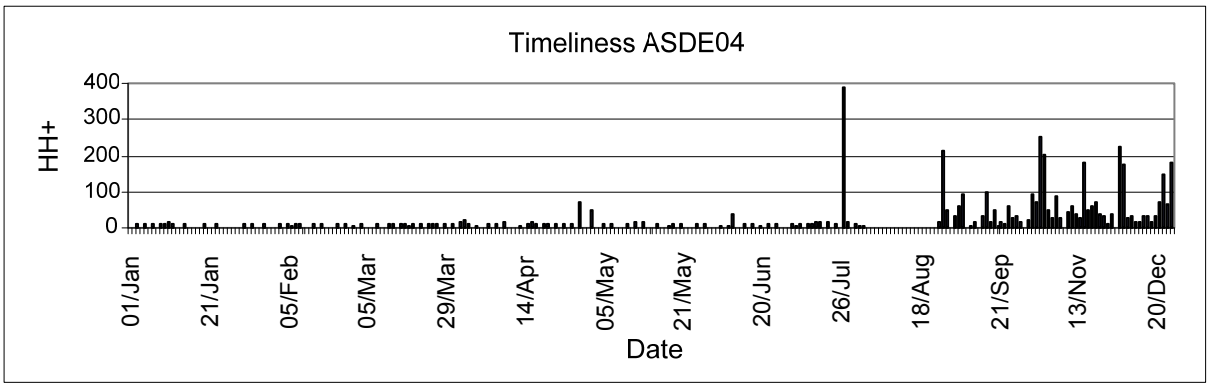

Figure 3: Timeliness of soundings from station ASDE04 in 2008.

In the period from Jan-Aug the timeliness target HH+100 was achieved to 99%. It is obvious that the timeliness decreased since September. The analysis of the problem was hampered by the fact that the ship does not call in ports with E-ASAP maintenance. Several actions were taken to improve the satellite communication. Eventually it turned out that the operators on board had changed and the new operator did not inflate the balloons properly to save helium. Thus, the ascent rate of the balloons was significantly less than 4-5 m/s and the soundings terminated very late.

5. Satellite communication and data format

Improving the satellite communication is one of the challenging technical tasks of E-ASAP. Most ship observations (SYNOP and TEMP) are transmitted via Inmarsat-C. However, transmissions via Inmarsat-C are expensive and limited to short data volumes. A low cost transmission system is required to transmit binary high-resolution BUFR data.

The first Iridium transmission system was installed on the ATLANTIC COMPASS (ASDE01) in July 2008.

Figure 4 shows the timeliness of the station ASDE01 before (96% within HH+100) and after (100% within HH+100) replacement of Inmarsat-C by Iridium.

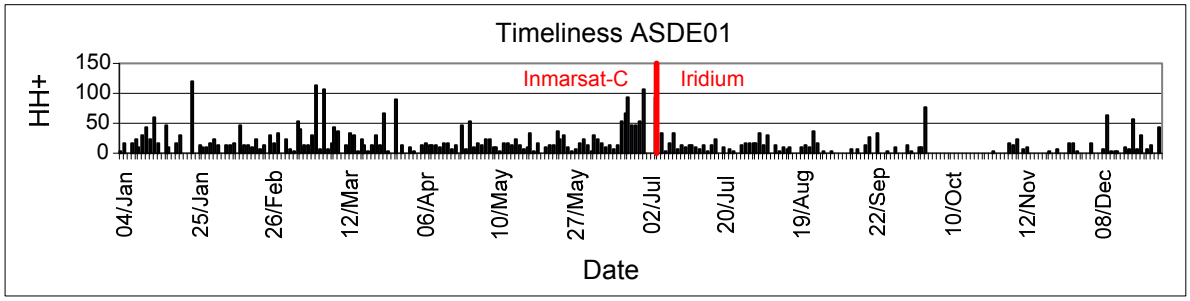

Figure 4: Timeliness of soundings from station ASDE01 in 2008.

The Vaisala DigiCORA software is ready to create high-resolution BUFR data. Thus, the station ASDE01 was configured to create BUFR with levels at 10 sec intervals. The files are transmitted over Iridium. The purpose of the 10 sec interval is to have file sizes of less than 20 Kbyte to keep the transmission time short. Additionally to the four TEMP parts, two BUFR files are transmitted per sounding:

- sounding data from surface to 100 hPa, and
- sounding data from surface to burst height.

6. Japanese ASAP fleet

Table 2 shows a list of the Japanese ASAP ships. The JMA routinely operates ASAP stations on four research vessels in the western north Pacific and seas adjacent to Japan. JAMSTEC operates a station on an oceanographic research vessel in variable areas based on its research purpose. The average ratio of GTS/Launches is more than 98%.

Ship name	Area	Sounding equipment
Ryofu Maru/JMA	North Pacific	Semi-automatic Container is equipped with GPS/Vaisala RS92-

		SGP.
Kofu Maru/JMA	Seas adjacent to Japan	Semi-automatic Container is equipped with GPS/Vaisala RS92-SGP.
Seifu Maru/JMA	Seas adjacent to Japan	Semi-automatic Container is equipped with GPS/Vaisala RS92-SGP.
Chofu Maru/JMA	Seas adjacent to Japan	Semi-automatic Container is equipped with GPS/Vaisala RS92-SGP.
Mirai/JMA	Variable areas	Semi-automatic Container is equipped with GPS/Vaisala RS92-SGP.

7. Risks

Unexpected termination of ASAP operations due to changes in the ship services etc. is a permanent risk. In 2008, this happened four times. Main impact of the current economic crisis is the shortening of charter contracts between shipping companies and the flexibility of line services. This implicates that many ship managers are reluctant to agree on their participation, if the ASAP activities are limited to long-term line services in certain regions like the North Atlantic.

Furthermore, many new ships have very limited free deck space to host an ASAP container launcher, even if it is a 10ft container. Open deck launchers provide better flexibility to be installed on board. In this case, less space on deck is required and the electronic equipment is installed inside the ship (e.g. wheelhouse). Figure 5 shows the open deck launcher, which is, installed on board the French ASAP ships.

Figure 5: Open deck launcher

A further risk is the shortage of helium on the world market. There are no options to store sufficient reserves at E-ASAP premises or in the ports of call. If helium cannot be delivered to the ship in time, then the ship will sail without re-supplies.

8. Conclusion

The conditions to involve merchant vessels in ASAP operations have significantly deteriorated due

to the global financial crisis, which came up in 2008. The shipping industry reacts with shorter charter contracts and reduced line services. The limited space on board can partly be overcome by choosing open deck launchers instead of container launchers. However, long time services are essential for regional programmes like E-ASAP. Installation and de-installation require financial and managerial efforts, which are not worth for line services of less than six month.

An impact study of Met Norway in 2007 showed a significant positive impact from the E-ASAP network on the NWP results in Europe. A worldwide ASAP programme would have more options to find participating ships since the sailing routes are not bound to specific regions. However, this requires clear agreements on the financing (taking into account the uneven spatial distribution of soundings and possible changes in the sailing routes) and management (in case that technical maintenance has to be transferred to other countries due to changed sailing routes).

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APPENDIX E

REPORT BY THE TASK TEAM ON VOS RECRUITMENT AND PROGRAMME PROMOTION
(Report submitted by Julie Fletcher, Chairperson of the SOT Task Team on VOS Recruitment and Programme Promotion)

1. Current Terms of Reference

Tasks:

Further, develop the generic pre-installation design standards that will eventually be available to ship builders and classification societies.

Review existing promotional aids (flyer, certificate) and recommend new promotional aids.

Promote the use of, and keep under review, the promotional presentation "The Partnership between the Maritime Industry, Marine Forecasting and Science".

Establish a store of newsworthy articles for use in a SOT or VOSClim Newsletter or in national newsletters.

Review the questionnaire used for the Marine Meteorological Services Monitoring Programme, and propose amendments, which should be reflected in the questionnaire survey to be conducted in 2008.

Review all relevant JCOMM Publications to ensure they are up to date and comply with Quality Management terminology.

TT Members:

Julie Fletcher (TT chairperson, New Zealand)
Graeme Ball (Australia)
Pierre Blouch (France)
Sarah North (United Kingdom)
Volker Weidner (Germany)
Gerie Lynn Lavigne (Canada)
Tom Rossby (URI, USA, advisor).

2. Status of Action Items from SOT-IV for TT-VRPP

I-4.1.4 - To approach the Maritime Safety Committee with a joint document from JCOMM (WMO-IOC) and the International Chamber of Shipping (ICS).

Status: Pending. There has been no high level WMO-IMO-ICS meeting since Feb 2007. Sarah North supplied a 'Generic Design Standards' document to WMO in Dec 2007.

I-4.1.5 - To consider producing a VOS training video

Status: After SOT-IV, WMO had some communication with JMA about updating a video that JMA had produced in the past but it appeared this was not feasible. Because VOS instrumentation and practices vary from country to country, the Task Team concluded that one video would not capture all of the regional and national differences, and it was therefore impractical to pursue the making of a video.

Some NMS however, might still wish to investigate making a video to be used as a training aid at nautical colleges and training institutions. Such a video would need to be made by a professional company. The E-logbook software e.g. TurboWin provides 'help' to observers on observing practices and can be used for training purposes.

IV-4.5.6 - To consider the editing of training materials such as CD-ROMs as well as the organization of training workshops

Status: Pending. An International PMO Meeting for 2010 is mooted, although funding is still an issue. WMO is investigating establishing a joint Meeting with Marine Services and WMO Regional Programme, where PMO would be part of it. The WMO is proposing to have it in North America (RA-IV), or Central America (RA-III), but there may be merit in holding it in a location where ships frequently visit but where there is currently no PMO coverage, e.g. China (RA-II), or a Mediterranean port in Italy or Spain (RA-VI) to try to encourage PMO activities in these regions. In view of the importance of PMOs to the VOS programme, the holding of an International PMO meeting should be strongly encouraged to provide PMO training and to allow PMOs to meet to strengthen the global PMO network.

IV-4.6.3 - To investigate the conduction of an impact assessment study of the VOF in liaison with other appropriate bodies and to report at the next SOT Session.

Status: Ongoing.
The documents below provide impact assessments on the use of VOS data.

(1) AOPC-XIV Document 27a Item 8.4 The Case for Maintaining Surface Meteorological Data Collection from Voluntary Observing Ships by Elizabeth Kent (Geneva, 21-25 April 2008). Final report from the meeting itself, can be found at:
http://www.wmo.int/pages/prog/gcos/Publications/gcos-122.pdf

Note paragraph 72 in particular.

(2) Statements of Guidance (SoG) for WMO applications:
http://www.wmo.int/pages/prog/sat/Refdocuments.html#SOG

These SoGs identify the observational gaps with respect to the requirements for a number of applications serving WMO Programmes and Co-sponsored Programmes. In particular, the following SoGs provide rationale for making observations from VOS:

Statement of Guidance for Global Numerical Weather Prediction (June 2008)
Statement of Guidance for Regional Numerical Weather Prediction (May 2008)
Statement of Guidance for Synoptic Meteorology (June 2008)
Statement of Guidance for Seasonal to Inter-annual Forecasts (April 2006/April 2008) Statement of Guidance for Ocean Applications (June 2008)

3. Progress by TT on Tasks defined at SOT IV

Task 1

Work in progress – Sarah North's 'Generic Design Installation' document was submitted to WMO in November 2007. See *Annex 1*.

Task 2

The promotional aids are on the VOS website and are being used.
http://www.bom.gov.au/jcomm/vos/information.html

The Certificate of Appreciation was approved at SOT-III, but, unknowingly at the time, still required JCOMM approval, which was received late in 2008. As at February 2009, WMO was preparing a letter for PRs informing them of the certificate. The Certificate was temporarily withdrawn from the VOS web site pending the issue of WMO's letter to PRs.

Task 3

Review of the PowerPoint presentation commenced in Nov 2007. The updated presentation entitled "Partnership between Marine Industry and Marine Meteorological and Oceanographic Communities V3 2008" was uploaded to the VOS website 10/6/2008 http://www.bom.gov.au/jcomm/vos/information.html

Task 4

Agreed to use the E-SURFAR Wiki website at SOT-IV

Task 5

Questionnaire was updated according to recommendations from SOT-IV (and ETSI) but was not issued in 2008. As at February 2009, the questionnaire is being translated into 6 languages by WMO for issue later in 2009.

Task 6

The SOT and VOSP Chairs reviewed the VOS Framework Document WMO/TD No 1009, in February 2008.

4. Summary of other work completed under the TT-VRPP

Initiatives

1. VOS Recruitment and metadata collection tools were developed in conjunction with the TT on Metadata for WMO No. 47, namely:
   VOSP002 – Metadata Collection Form
   VOSP002 Metadata Viewer
   Pub47 XML Generator

   These were placed on the VOS website May 2008
   http://www.bom.gov.au/jcomm/vos/resources.html

2. The MSC Circular 1017 was updated in Q3 2007. New MSC Circular MSC.1/Circ.1293 issued by IMO 10/12/2008.

3. The VOS website http://www.bom.gov.au/jcomm/vos/index.html
   is regularly updated and is a valuable resource for VOS Programme Managers and PMOs.

   In particular, attention is drawn to the VOS Quick Reference Guides for PMOs and National VOS Programme Managers. These guides are intended to standardize global VOS practices and to provide helpful guidelines for both existing and new PMOs and VOS Programme Managers. As well as providing information about ship recruitment and visiting, the Guides contain links to the VOS Quality Monitoring Tools and details the recommended international reporting requirements

for WMO, SOT, and other bodies on the status of National VOS.

5. Recommendations

The Task Team recommends:

(iii.) Removing reference to the year of issue from Task number 5 in the current Terms of Reference.

(iv.) That the WMO, in support of the PMO activities, commit to holding an International PMO Meeting (PMO-IV) in 2010.

6. Actions

1. Review and complete the 'Generic Design Installation' document, and with ICS/IMO decide how to progress this.

2. Review the Task Team membership and encourage new Task Team members

Annex 1: Proposed Generic Design [Standards] [Specifications] [Recommendations] for Voluntary Observing Ships and Ships of Opportunity
Annex 2: Generic Design [Standards] [Specifications] [Recommendations] for Voluntary Observing Ships (VOS) and Ships of Opportunity (SOOP) *(Draft)*

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ANNEX 1

Proposed Generic Design [Standards] [Specifications] [Recommendations] for Voluntary Observing Ships and Ships of Opportunity

Submitted by WMO & IOC Secretariats

1. Weather observations submitted by ships recruited to the World Meteorological Organisation's Voluntary Observing Ship (VOS) Scheme[1] are essential for the provision of quality marine weather forecasts and warnings, and also provide vital data for use in climate research and climate prediction studies

2. The importance of such observations for the safety of navigation is recognised in Regulation 5 of Chapter V of the SOLAS Convention which states that '*Contracting Governments undertake to encourage the collection of meteorological data by ships at sea and to arrange for their examination, dissemination and exchange in the manner most suitable for the purpose of aiding navigation'*

3. Unfortunately, the number of VOS being recruited worldwide has decreased in recent years and this has inevitably had a consequential effect on the number, and quality, of observations being received from observing ships. This is due, at least in part, to the changing dynamic of modern ship operations, with reduced manning levels, and sudden changes of vessel ownership, flag and trading patterns.

4. To some extent, this decline in observations can be overcome by the use of Automatic Weather Stations (AWS) installed on suitable host ships. However, whilst the number of such AWS ships has increased in recent years they only provide a limited number of measured and observed parameters, and should only be considered as supplementing the traditional manually reporting VOS (where ships' officers provide additional visual observations of clouds, weather conditions, and sea states).

5. When recruiting existing ships to the VOS Scheme, problems are often experienced by meteorological and oceanographic services when trying to install, and locate instruments to ensure that they have the correct exposure, or when trying to install cables and meteorological/ oceanographic sensors for automatic systems.

6. Such problems could be, largely avoided if meteorological and oceanographic observing considerations could be taken into account at the ships initial commissioning and new-build design stage. In the overwhelming majority of cases only minor design adjustments are likely to be needed, and should therefore have no appreciable impact on overall ship costs.

7. With a view to reducing, the impact of such downstream problems the JCOMM[2] Ship Observations Team has prepared initial draft generic [specifications] [standards] [recommendations] that are considered appropriate for new ships intending to perform meteorological or oceanographic observations. A copy of these draft specifications is annexed to this paper (*Annex 2*). These specifications have been categorised according to the type of meteorological or oceanographic observations that the host ship is recruited by the meteorological services to perform. They range from simply making provision for suitable space in the wheelhouse for positioning meteorological instruments, to providing extra cabling capacity for remotely sensed sea temperatures, or gyro output connections to provide compass data to our anemometers. [It is recognised that these draft specifications will require further development in concert with shipowners, and wider the marine community]

8. Because the observing scheme is entirely voluntary there should be no necessity to mandate the requirement for new ships to be designed for meteorological/oceanographic observing by introducing amendments to the SOLAS Convention. Clearly the meteorological services rely on the continued support of shipping companies and their officers and masters for the success of the VOS Scheme – and it is pleasing to note that many shipowners now pro-actively request their newly delivered ships to be recruited, as they recognise the merits of the VOS scheme

9. However, it would be helpful if, at the initial design stage, shipowners could, if they so wish, request that their vessels be designed and constructed to allow their future recruitment to perform meteorological/oceanographic observations. [One way in which this could perhaps be achieved could be through the development of optional 'weather ship' classification specifications or notations that could be requested by shipowners at the new build stage]. This would help to provide a future "pool" of potential VOS, which could be available, for future recruitment into the VOS Scheme].

10. Most ships that agree to participate in the VOS scheme are, provided with calibrated instruments by the national meteorological service that has recruited them, and transmit a full range of observed parameters. These are referred to as 'Selected' observing ships. However, in some cases, ships may be recruited by the national meteorological service to use their own ships instruments and to transmit a limited number of observed parameters. These ships are referred to as 'Auxiliary' observing ships and are often recruited because they operate in areas where data is in sparse supply

11. Many new ships are already being equipped by the shipowners themselves with modern weather observing equipment such as sonic anemometers, and in some cases automatic weather stations. Subject to the suitability of the instruments, being provided, such ships would lend themselves to recruitment as 'Auxiliary' observing ships. Development of specifications based on those annexed herewith, could therefore also be of assistance to shipowners and shipbuilders when determining the suitability of the ships meteorological arrangements. For instance, it is essential that ships anemometers be correctly exposed, ideally on the foremast, so that windage effects caused by the ship superstructure or other adjacent structures do not adversely affect them. Similarly, the quality of measurement using wet/dry bulb thermometers in a marine screen will diminish if the screen is not properly exposed e.g. if it is positioned under a ships overhang or adjacent to ship's vents

12. In addition to their value to the meteorological and oceanographic community, observations from ships at sea clearly have an important role to play in ensuring the ongoing safety of ships, their crews and their cargoes. The data provided by observing ships is needed for a variety of marine activities including having to deal with incidents such as search and rescue, marine pollution and safe weather routing of ships. The VOS Scheme therefore needs active support from the marine community, and particularly, support and assistance from shipowners, if we are going to reverse the current decline in ships weather data.

13. The Maritime Safety Committee is invited to consider the issues raised in this paper and to advise on the most appropriate way to proceed [refer this subject to the work programme of the Ship Design and Equipment Sub Committee with a view to developing appropriate [standards][recommendations][specifications] and that could then be issued as guidance to shipowners or be used as the basis of optional classification requirements].

1 http://www.bom.gov.au/jcomm/vos/
2 Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (http://www.jcomm.info/)

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ANNEX 2

Generic Design [Standards] [Specifications] [Recommendations]
For
Voluntary Observing Ships (VOS) and Ships of Opportunity (SOOP)
(Draft)

The following [Standards] [Specifications] [Recommendations] provide a basic guidance to shipowners, shipbuilders and classification societies concerning the design and construction arrangements that should be taken into account for new ships that will be engaged in undertaking meteorological or oceanographic observations.

Shipowners are encouraged to liaise with the national meteorological services concerning the level of observational activity they wish their vessels to become involved in, so these can be taken into account in the initial ship build specifications and design.

1. Selected Voluntary Observing Ship (VOS) - Basic

'Selected' ships recruited to participate in the VOS scheme are provided with range-calibrated instruments by the national meteorological services and transmit a full range of observed meteorological parameters. The following basic design requirements are therefore recommended to facilitate the installation of such instruments and to allow ships' officers to prepare their observations in a suitable environment that does not hamper other activities performed within the ships wheelhouse:

- A dedicated locker within the wheelhouse for storing spare meteorological equipment spares and stationery [dimensions approx 0.6m x 0.6m x 0.6m]
- A non-slip work surface for locating meteorological instruments supplied by the Meteorological Services (e.g. barograph, barometer, electronic logbooks) [dimensions approx 0.6m x 0.6m] with free area above for fixing instruments to bulkhead.
- A dedicated adjacent power socket to ships power supply (for use in connection with electronic logbooks or other digital observing instruments that require a power supply)
- Ability to pre-load electronic logbook software on to one of the ships bridge computers that is connected to the ships email system for transmitting observations to the national meteorological service, or which provides easy access for transferring the observations to the ships Inmarsat C equipment

2. Selected Voluntary Observing Ship (VOS) – Advanced

In addition to the basic provisions listed in para 1, 'Selected' ships recruited to participate in the VOS scheme may need additional arrangements to be taken into account, subject to the level of instrumentation being provided by the national meteorological service involved. These may include some or all of the following recommendations, which will need to be agreed with the national meteorological service involved:

- For ships provided by meteorological services with marine screens, containing wet/dry bulb thermometry of sensors - Two slotted vertical stanchions [approx 1m length] on the aft port and starboard bridge wings. To be located in a suitably exposed location and positioned so that screens can be fixed at a height above ships rails of [approx 1.6 m], but such that their position will not impair the taking of azimuth compass readings by navigating officers, or interfere with any other of the ships normal functions or requirements. For ships without bridge wings provision should be made for securing screens in alternative locations that are easily accessible from the ships bridge, but which are not, in so far as is reasonable and practicable, located under superstructure overhangs or adjacent to heat sources such as searchlights or ships vents.

- For ships provided by the meteorological service with a precision aneroid barometer located within a pressurised wheelhouse - a dedicated bulkhead penetration from the wheelhouse to the exterior atmosphere for leading a pressure static head tube [Dimensions approx 15mm].
- For ships provided by the meteorological service with electrical resistance thermometers or electrical humidity sensors - a bulkhead penetration to permit cables to be run from a digital indicator at the meteorological work surface in the wheelhouse (para 1 refers) to the marine screens located on either bridge wing [Dimensions approx 15mm]
- For ships provided by the meteorological service with hull contact sensors for measuring sea surface temperatures – a cable run from the digital indicator at the meteorological work surface in the wheelhouse (para 1 refers) to the hull contact sensor located in the engine room, or suitable void space, at a distance of [approx 1 metre] below the light waterline. Existing cable runs from the bridge to the engine control room, bus connector may be utilised if spare capacity is available
- For ships provided by the meteorological service with a dedicated anemometer for measuring wind speed and direction – a cable run and associated deck/hull penetrations from the meteorological work surface in the wheelhouse (para 1 refers) to the anemometer location on the foremast, mainmast or a dedicated meteorological mast, (as agreed with the meteorological services). To provide optimum exposure, free from obstructions, the preferred location for the anemometer will usually be on the foremast (i.e. for ships with aft accommodation superstructures).

3. Selected Voluntary Observing Ship (VOS) – Simple Automatic Weather Station (AWS)

The Ships recruited to participate in the VOS scheme, which are provided by the meteorological service with simple AWS systems, measuring a limited number of observed parameters e.g. pressure, temperature and humidity. Depending on the system provided the following arrangements be recommended for new build ships:

- For systems that rely on connection to the ships power supply – a dedicated power socket providing access to the ships power supply.
- For systems that incorporate a digital or visual readout unit on the bridge – a suitable installation location, or housing, on the ships bridge console or other suitable location within the wheelhouse or chartroom
- bulkhead or deck penetrations in the vicinity of the location chosen for the AWS installation for leading cabling, as necessary, to the wheelhouse power socket and/or digital readout
- A suitable location for securing the AWS to an adjacent handrail or bulwark together with a suitable securing bracket. As AWS systems will incorporate their own transmission systems, the position chosen should comply with specified electrical clearance distances to avoid interference from other ships antennae or electrical sources [4m from HF and 2m from VHF aerials ??]

4. Selected Voluntary Observing Ship (VOS) – Complex Automatic Weather Station (AWS)

The Ships recruited to participate in the VOS scheme which are provided, by the meteorological service with complex AWS systems, measuring a variety of meteorological parameters, including pressure, sea temperature, air temperature, humidity, wind speed and wind direction. Depending on the system provided by the meteorological service, the following additional arrangements may be needed for new build ships:

- When AWS sensors, transmission systems, and associated units are located on a dedicated small mast, the deck plating should be suitably strengthened. Deck securing points may also need to be provided to facilitate guy wires.
- When the meteorological sensors are distributed on the ships structure the following installation considerations should be taken into account
    - The position of transmission antennae should comply with specified electrical clearance distances avoid interference from other ships antennae or electrical sources [4m from HF and 2m from VHF aerials??] and should ideally be located on the mast in a position that will allow unobstructed line of sight to geostationary satellites.
    - The position of the anemometer should provide good exposure, free from any obstructions that may interfere with the airflow. The optimum location for the anemometer will usually be on the foremast (i.e. for ships with aft accommodation superstructures)
    - The position of the temperature/ humidity screen should provide good exposure to allow unobstructed airflow and to avoid radiation heat sources. They are usually located on the ships monkey island fixed by brackets to an adjacent handrail or bulwark.
    - The hull contact sensor for measuring sea surface temperatures should normally be located on the ships hull plating in the ships engine room or a suitable void space, and positioned [approx 1 metre] below the waterline at the ships lightest operating draft, free from any adjacent heat sources in so far as is possible
- bulkhead or deck penetrations should be provided to allow cables to be led from the AWS unit or sensors to the central bridge computer, display and electronic junction boxes (when applicable) which would normally be located at the meteorological work surface in the wheelhouse (para 1 refers), and will need a dedicated electrical socket to provide access to the ships power. Typical cable requirements include for example;
    - Wind Sensor - [8 core multi-strand shielded cable from wheelhouse to sensor location on the mast]
    - Gyro Compass - [2 core multi-strand shielded cable from wheelhouse to gyro room]
    - Sea temperature sensor - [4 core braid-shielded cable from wheelhouse to sensor location in engine room or void space]. Existing ships spare cable capacity to engine room may be useable
    - Transmission system - [dedicated cable dependant upon system used – Inmarsat, iridium etc – from wheelhouse to antennae location]
    - Pressure sensor (Barometer) - [4 core multi-strand shielded cable from sensor to wheelhouse (depending on location)]
    - [Data transfer logging cables – multi- strand shielded cable as required]
- Access to the ships gyrocompass or gyro-repeaters may be needed to provide directional values to the ships anemometer readings, although some AWS systems may incorporate built in magnetic or fluxgate compasses. Where connection to the gyro is needed it may be considered necessary to provide an optical isolator to ensure that there is no interference with navigational safety

5. Automated Shipboard Aerological Programme (ASAP) Ships

A small number of observing ships are recruited to provide upper air data from radiosonde balloons, and are provided by the meteorological services with equipment. These ships contribute to the ASAP programme. ASAP ships designs can be based upon a 'modular' configuration with all the ASAP systems housed within standard 10 or 20 foot shipping containers, or may use a 'distributed' configuration, where the ground station and associated transmission system can be located in the host

ship's wheelhouse. Depending on the arrangements provided by the meteorological Service, the following considerations should be taken into account in the ships initial design:

- Sufficient free deck space should be allocated for the [10 or 20 foot] shipping container, or any manual deck launching devices that may be provided by the meteorological services. The locations chosen for these launching systems should not interfere with the ship's emergency embarkation arrangements, fire protection or safety arrangements, or with safe navigation of the ship.

- Where manual deck launchers are used there should be sufficient free space available to enable the launcher to be transferred to either side of the ship (to facilitate launching in lee wind conditions)

- The launching area should permit, as far as is possible, the radiosonde balloon to be launched such that it will not snag the funnel or ships superstructure during its ascent

- Where containerised systems are used suitable deck securing points should be provided and the deck plating strengthened where needed

- Access to the ships power supply should be available to the container

- When they are not located in a dedicated container, a suitable locker or other suitable storage location should be provided for spare radiosondes and balloons [Dimensions??]

- A suitable free deck space [dimensions ?] for securing the helium gas bottle racks , ideally located close to the launching area, but positioned so that replacement gas bottles/pallets can be easily loaded and positioned using the ships lifting appliances

- Plastic or copper piping from the helium bottles to the launching container and/or deck launcher. The piping should not interfere with the ships working or safety arrangements

- A suitable location high up in the ship (usually the monkey island) may be needed to install the dedicated aerial for receiving the raw data from the radiosonde. (This could be a directional mushroom aerial or a multi-directional dipole aerial). Lugs may need to be welded to the deck and a stand plate may be needed to secure the aerial pedestal. Anti vibration, mountings may be needed.

- A suitable location may also be needed for installing a dedicated Inmarsat Sat C aerial or other transmission system aerial for transmitting the upper air observations back to the meteorological services i.e. if the ships transmission system is not used

- A suitable location for an independent GPS aerial for determining the relative position of the ship and radiosonde

- bulkhead or deck penetrations should be provided to allow cables to be lead from the ASAP ground station computer when located in the wheelhouse to the required antennae

- The position of ASAP transmission antennae should be located to avoid interference from other ships antennae or electrical sources [4m from HF and 2m from VHF aerials ??] and free of obstructions that could prevent them receiving or transmitting signals e.g. masts, large funnels containers etc

6. Auxiliary Voluntary Observing Ship (VOS)

Auxiliary ships recruited by the meteorological service to the Voluntary Observing Ship (VOS) Scheme use their own ships' instruments to prepare and submit weather observations. To ensure that new ships can be considered suitable for future recruitment to the VOS Scheme it is recommended that shipowners request that the instruments or automatic systems supplied, comply with the following design and construction standards

- [WMO Publication No 8]
- [ISO standards]
- [add resolution and accuracy requirements]

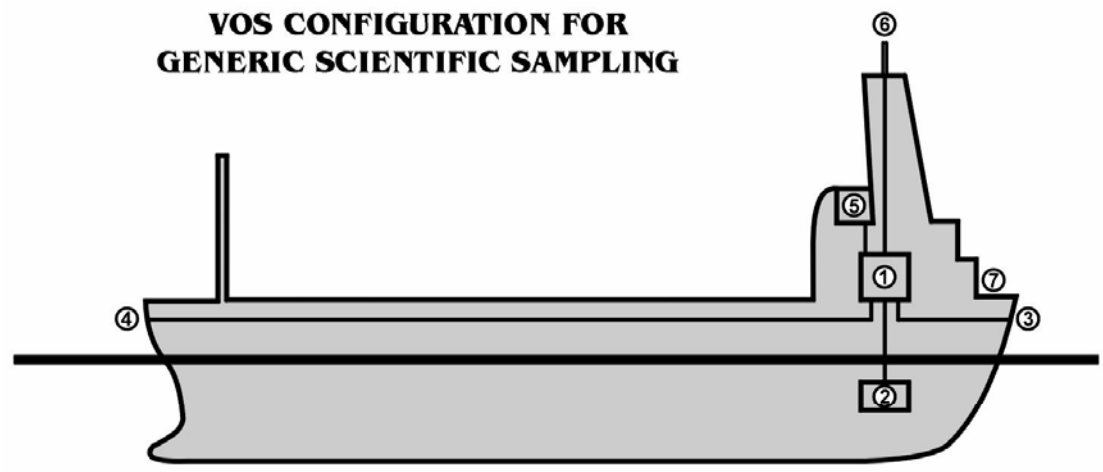
[Requires further consideration/development]

7. Ships Of Opportunity (SOOP)

[Someone else to add some basic requirements that will not scare the shipowners???]

……

In accommodating all the above [Standards] [Specifications] [Recommendations] shipowners, shipbuilders and naval architects shall ensure that the arrangements are in accordance with, and do not conflict with, SOLAS requirements applicable to new vessels. In particular, it should be ensured that SOLAS fire class division requirements are observed and that the arrangements do not interfere with any navigational or life-saving requirements that may be applicable



① Dedicated scientific space for electronics & ship rider.
② Source & exit of sea & fresh water in engine room.
Power, LAN & antenna cable runs to scientific space.
③ Power, LAN & antenna cable runs to stern through scientific space.
④ Power, LAN & antenna cable & air tube runs to bow through scientific space.
⑤ Power, LAN & antenna cable & air tube runs to bridge through scientific space
Bridge displays of appropriate sensors for ships use.
⑥ Antenna, GPS & power cable runs to bridge railing or stack area, for position & real-time data transmission.
⑦ Deck or interior storage space for XBTs / Drifter / Floats.

_____

APPENDIX F

REPORT BY THE TASK TEAM ON METADATA FOR WMO NO. 47

(Report submitted by Graeme Ball on behalf of the Task Team)

1. Current Terms of Reference

Tasks:

1. Prepare a submission to JCOMM-II regarding the proposed changes to WMO-No. 47 (Pub. 47) metadata based on the recommendations from SOT-III.

2. Prepare a consolidated list of ship routes in accordance with the submission to JCOMM-II for presentation at SOT-IV.

3. Regularly review the Pub. 47 metadata requirements and make recommendations as appropriate.

4. Monitor the receipt of regular Pub. 47 updates at WMO from participating VOS members.

5. Review all relevant JCOMM Publications to ensure they are up-to-date and comply with Quality Management terminology.

Members:

Graeme Ball (TT chairperson, Australia)
Pierre Blouch (France)
Yvonne Cook (Canada)
Julie Fletcher (New Zealand)
Elizabeth Kent (United Kingdom)
Robert Luke (USA)
Sarah North (United Kingdom)

2. Status of Action Items from SOT-IV

Nil action items.

3. Ongoing Activities / Standard Tasks

Task 1

1. This item was completed and reported at SOT-IV and is no longer applicable.

Task 2

1. This item was completed and reported at SOT-IV and is no longer applicable.

Task 3

1. The Task Team reviewed Code Table 1801, the list of 2 letter ISO Country Codes, and determined that changes were required to retain consistency with the official ISO list. The required changes were made to WMO No. 47, metadata version 03 (document version 3.3), and issued on 3 June 2008 and placed on the VOS website.

2. The Task Team considered Code Table 0204, Location of the Barometer, and recommends removing CR – Chart Room. See **5. Recommendations for Metadata Requirements** No. 1 for further details.

3. The Task Team considered Code Table 0801, Exposure of the hygrometer and Exposure of the dry bulb thermometer, and recommends removing the ambiguity between a Sling Psychrometer and a Whirling Psychrometer. See **5. Recommendations for Metadata Requirements** No. 2 for further details.

4. The Task Team, in consultation with the Task Team on VOSClim, recommends introducing a new class of meteorological reporting vessel in Code Table 2202 for VOSClim, a VOS Climate Reference Ship. See **5. Recommendations for Metadata Requirements** No. 3 for further details.

5. The Task Team, recognising (1) the increasing use of AWS, (2) the wide disparity in the level of sophistication between AWS systems, and (3) some AWS might not be owned, installed and maintained by an NMS, recommends introducing an AWS sub-class in each of the four VOS classes. See **5. Recommendations for Metadata Requirements** No. 4 for further details.

6. The Task Team, recognising the trend to equip a ship with an AWS but at the same time retaining the original manual system as a completely independent observing system, recommends permitting multiple entries in WMO No. 47 from the same ship for each independent observing system. See **5. Recommendations for Metadata Requirements** No. 5 for further details.

7. The Task Team, in an effort to continually, improve the Pub. 47 documentation, will add the VOS Class definitions to Code Table 2202.

8. The Task Team reviewed the minimum requirements for Vessel Digital Images, including suggested sketches and drawings, from the four main VOS Classes (VOSClim, Selected, Supplementary and Auxiliary) as described in WMO No. 47, Metadata Version Format 03, Annex 6, and recommends that all items be mandatory for VOSClim. See **5. Recommendations for Metadata Requirements** No. 6 for further details.

Task 4

1. The Task Team collated the information provided on the WMO website regarding all Pub. 47 submissions from members since SOT-IV until the end of 2008. This information is given in *Annex 1*. The Task Team is pleased to note most submissions are now in the XML metadata exchange format.

2. To assist members produce an XML file containing their national Pub. 47 metadata, the Task Team, in conjunction with the TT-VRPP, developed an Excel-based **Pub47 XML Generator** [6] tool. This tool is available for download from the VOS website.

Task 5

6: http://www.bom.gov.au/jcomm/vos/download/pub47-xml-generator.zip

1. No specific action during the inter-sessional period

4. General Issues and Recommendations

1. The Task Team remains extremely concerned about the excessive delay to post updated Pub. 47 metadata on the WMO website. At the time of writing (late February 2009), the most recent metadata available on the WMO website is from Q1 2008. The metadata contained in Pub. 47 is a valuable resource used by many groups and organisations, including PMOs, VOS Programme Managers, JCOMMOPS, RSMC, RTMC and the VOSClim DAC. Not having up-to-date metadata impacts particularly on (1) national operations, i.e. the ability to plan recruitments and schedule foreign ships visits, and (2) national and global quality monitoring, i.e. the ability to identify suspect ships and contact the appropriate VOS FP. For VOS Programme Managers it is extremely frustrating when the hard work required maintaining ships' records, and then preparing and submitting quarterly Pub. 47 reports appear wasted.

   These same issues were discussed at SOT-IV, culminating in a recommendation that JCOMMOPS: (1) receives the quarterly national Pub. 47 submissions, (2) prepare the quarterly global Pub. 47 report, and (3) hosts the Pub. 47 report on the JCOMMOPS website. There was good support for the recommendation from many areas, however the Secretariat informed the Panel that Pub. 47 is a mandatory WMO publication with specific rules governing its management and distribution.

   One option discussed by the Team, would be to ultimately, integrate Pub. 47 with a range of other WMO catalogues (WMO Publication No. 9, Volume A, Observing Stations and WMO Catalogue of Radiosondes) as part of the WMO Information System (WIS). The benefit of this for the SOT would be revised and hopefully more expedient distribution methods. The timetable for the change described above is not expected to be within the coming inter-sessional period and will therefore not benefit the SOT in the short-term

   The Team noted that the present content of Pub. 47 could be divided in two parts (i) the description of the format in which national submissions should be made and the Publication's format itself, and (ii) the database itself containing the ship metadata. The Team agreed that the format description part was indeed relevant to a WMO Publication as a standard but that the metadata parts was more relevant to the WMO Information System (WIS) and could be separated from the Publication.

   As a preliminary measure to improve the timeliness of delivery of the quarterly global VOS metadata to end users, the Task Team invited WMO to consider routinely forwarding national contributions to JCOMMOPS as they become available, and JCOMMOPS to compile an informal list of metadata to be used by VOS operators and PMOs in their daily operations. The Pub47 would continue to be produced normally although WMO is urged to make it available on the web site with minimal delays.

   As a longer-term measure, in order to permit more effective solutions for the management and timely delivery of the information to end users, the Task Team invited JCOMM to liaise with CBS on such observing platform metadata issues and consider recommending that WMO Congress change the status of Pub. 47 in such a way (i) that it would eventually be removed from the list of Mandatory Publications, (ii) that the regulatory part documenting the need for VOS metadata, metadata collection and exchange procedures and format would be included in the future manual on the WIS, and (iii) that the metadata/dynamic part of the Publication would be managed as part of the WIS and not regarded as a Publication anymore. The procedures and formats for collecting the metadata from Members, applying appropriate quality control, compiling the submissions into an integrated database, and distributing the

metadata will have to be discussed by the SOT in liaison with the CBS. The roles of the WMO Secretariat, Members, and JCOMMOPS - or any national centre willing to manage the VOS metadata database - will have to be clarified.

Recommendation

a. That WMO, either alone or in association with JCOMMOPS, commits to update Pub. 47, a mandatory WMO publication, on the WMO website each quarter within 2 months of the due date for submission by members, i.e. to update the WMO website by 15 May, 15 August, 15 November and 15 February.

b. That WMO routinely forwards national contributions to JCOMMOPS as they become available, and that JCOMMOPS compiles an informal list of metadata to be used by VOS operators and PMOs in their daily operations.

c. That JCOMM and CBS begin discussions regarding future management of observing platform metadata as part of the WIS.

2. The Task Team is also concerned that the CSV version of Pub. 47 provided on the WMO website is incapable of fully, and in complete detail, showing the footnotes provided in XML format by members. This is of particular concern because the majority of national submissions to Pub. 47 are now in XML exchange format (see *Annex 1*) with potentially more footnotes than previously. It is important that all of the supplied information is available to those groups and organisations that rely on Pub. 47.

Recommendation

That WMO commits to display all Pub. 47 metadata, including all footnotes and implied details, on the WMO website.

3. At SOT-II, WMO committed to improve the usability of Pub. 47 by (1) displaying the metadata in a more presentable format, and (2) providing a search facility. To date neither of these changes has been effected with the Pub. 47 metadata still presented in CSV format. As a result, only basic searches are possible and the non-alignment of fields makes comparing ships impossible. To fully utilise Pub. 47 it is necessary to download the file and parse it into a spreadsheet. This requires additional skills and knowledge of the structure of the CSV file to assign column headings to the tabulated metadata.

Recommendation

That WMO commits to urgently, improve the usability of the Pub. 47 metadata presented on the WMO website.

5. Recommendations for Metadata Requirements

1. **Code Table 0204 – Location of the Barometer**

Proposal

To remove CR – Chart Room.

Discussion

The Task Team considers this entry redundant as in most cases the Chart Room is connected to the wheelhouse.

Impact on Pub. 47

The resultant changes to Pub. 47 Code Table 0204 are given in *Annex 2*.

2. **Code Table 0801 - Exposure of the hygrometer and Exposure of the dry bulb thermometer**,

Proposal

To (a) remove SL - Sling psychrometer and to (b) rename W - Whirling psychrometer to W - Whirling or Sling psychrometer.

Discussion

The Task Team considers these two instruments to be the same, and is supported by the following extracts from the UK Met Office glossary:

> **sling thermometer**: *a thermometer mounted on a frame pivoted about a handle so that it can be whirled by hand, thus providing ventilation. If the bulb is shielded from direct solar radiation, satisfactory readings of air temperature can thus be obtained in a simple and inexpensive manner. A pair of thermometer, dry- and wet-bulb, similarly used constitutes a 'sling' or 'whirling' psychrometer.*
>
> **whirling psychrometer:** *'a psychrometer in which the thermometers are mounted on a frame which is rapidly rotated by hand in order to provide the required ventilation of the bulbs. It is also termed a 'sling psychrometer'*

Impact on Pub. 47

The resultant changes to Pub. 47 Code Table 0801 are given in *Annex 2*.

3. **Code Table 2202 – Type of Meteorological Reporting Ship (first proposal)**

Proposal

To introduce 30 – VOSClim, for VOS Climate Reference Ship, as a new class of meteorological reporting ship.

Discussion

The Task Team on VOSClim is expected to recommend under Item III-4.1, VOSClim Project Status and Implications, to terminate the project status of VOSClim and start applying the benefits learned to the wider VOS as happened following VOSP-NA, the predecessor to VOSClim.

The Task Team encouraged the upgrading of regular VOS to VOSClim standard wherever possible, and, in consultation with the Chairs of SOT and VOSP, is supporting the introduction

of a new class of meteorological reporting vessel to accommodate VOSClim standard ships.

The criteria for declaring a ship as VOSClim will be proposed under agenda item III-4.1, VOSClim Project Status and Implications, and will be confirmed under item III-4.5, Review of VOS Categories.

Impact on Pub. 47

The resultant change to Pub. 47 Code Table 2202 is given in *Annex 2*.

4. **Code Table 2202 – Type of Meteorological Reporting Ship (second proposal)**

Proposal

To introduce an AWS sub-class within each of the VOS classes:

15 – Selected (AWS)

35 – VOSClim (AWS)

45 – Supplementary (AWS)

75 – Auxiliary (AWS)

Discussion

NMS are increasingly using shipboard AWS to provide ship's weather reports for reasons that are well known within the VOS community. The level of sophistication of these AWS varies greatly. Many AWS contain the full suite of sensors and provide a manual input facility, whilst others are simple stand-alone systems offering a reduced sensor suite. Some ships might even be fitted with an AWS during construction.

The Task Team considers it desirable to: (1) be able to differentiate between the levels of sophistication of different AWS, and (2) differentiate between AWS owned, installed and maintained by an NMS as opposed to an AWS owned by a ship with a less rigorous maintenance schedule.

The criteria for each of the AWS sub-classes will be discussed under agenda item III-4.5, Review of VOS Categories.

Impact on Pub. 47

The resultant changes to Pub. 47 Code Table 2202 are given in *Annex 2*.

5. **Code Table 2202 – Type of Meteorological Reporting Ship (third proposal)**

Proposal

To permit multiple entries from one ship in Pub. 47 where: (1) the ship is fitted with multiple observing systems, and (2) each observing system operates completely independently of the other.

Discussion

Some ships now being equipped with an AWS are retaining the original manual system, both the equipment and the reporting method, resulting in dual data streams from the ship.

The Task Team considers that because the observing systems are independent of each other, that each system represents a separate observing platform possessing its own unique metadata, and should be regarded as separate entries in Pub. 47.

Whilst not a formal recommendation, the Task Team would encourage members using multiple and independent systems as described above, to: (1) consider using an alternative and unique callsign (approved by the Task Team on Callsign Masking and Encoding) for the secondary observing system, and (2) to aid clarity in Pub. 47 to append "(AWS)" to the ship name if the class = 15, 35, 45 or 75.

Impact on Pub. 47

Multiple entries from the same ship appearing in WMO No. 47, comprising some identical metadata and some unique metadata.

6. **Vessel Digital images, Annex 6 to Code Table 2203**

Proposal

To make mandatory for all ships classified as VOSClim: (1) the full suite of recommended digital images and, (2) all suggested sketches and drawing.

Discussion

Ship classified as VOSClim under the new VOS Classes, in addition to providing observations for routine forecasts and warnings will be used in climate studies. For climate monitoring purposes, it is critical that the properties of the observing platform are fully and accurately recorded and updated whenever there is a change.

Photographs and drawings provide much greater detail about instrument location and exposure than could be inferred from the coded Pub. 47 metadata. The Task Team recognises that this additional detail is vital in detecting real climate trends from locally induced effects.

Impact on Pub. 47

The resultant changes to Pub. 47 Annex 6, Vessel Digital Images (Code Table 2203) are given in *Annex 2*.

6. Review the Terms of Reference

As reported under **3. Ongoing Activities / Standard Tasks**, Task 1 and Task 2 were completed and reported at SOT-IV and should have been removed from the ToR Task List at SOT-IV. Apart from deleting these tasks, the Task Team does not propose any further changes to the Terms of Reference Task List.

Accordingly, the Task Team submits the following revised Task List for consideration by the Panel.

Tasks

1. Regularly review the Pub. 47 metadata requirements and make recommendations as appropriate.

2. Monitor the receipt of regular Pub. 47 updates at WMO from participating VOS members.

3. Review all relevant JCOMM Publications to ensure they are up to date and comply with Quality Management terminology.

7. Summary of action proposed

The Team is invited to:

1. Note the information contained in this report and comment as appropriate;
2. Review and discuss the recommendations relating to WMO No. 47 general issues;
3. Review and discuss the recommendations relating to WMO No. 47 metadata requirements;
4. Review the Tasks of the Task Team;
5. Review the existing membership of the Task Team and encourage new members.

_____

ANNEX 1

WMO No. 47 Updates from Members

Member	Q2 2007		Q3 2007		Q4 2007	
	CSV	XML	CSV	XML	CSV	XML
Australia		x		x		x
Canada	x		x		x	
Denmark		x		x		
France	x		x		x	
Germany	x		x		x	
Greece	x		x		x	
Hong Kong	x		x		x	
India	x (02)				x	
Ireland			x		x	
Israel			x			
Japan		x		x		x
Malaysia	x					
Netherlands	x (02)		x		x	
Norway	x		x		x	
New Zealand		x		x		x
Poland			x			
Russian Fed.			x (02)			
Spain	x (02)				x	
Sweden			x (02)		x	
UK	x		x		x	
USA	x (02)				x	
	12	4	13	4	13	3

Table 1. 2007 Pub. 47 submission post SOT-IV.
(02) indicates metadata in version 02

Member	Q1 2008		Q2 2008		Q3 2008		Q4 2008	
	CSV	XML	CSV	XML	CSV	XML	CSV	XML
Australia		x		x		x		x
Canada	x		x		x		x	
Europe (EU)				x		x		x
France	x			x		x		x
Germany	x			x		x		x
Greece		x		x		x		x
Hong Kong	x		x		x		x	
India				x (?)		x (?)		
Ireland						x		x
Japan		x		x		x		
Netherlands	x			x		x		x
Norway						x		x
New Zealand		x		x		x		x
Spain				x		x		x
Sweden	x			x		x		x
UK	x			x		x		x
USA	x				x	x		
	8	4	2	12	3	15	2	12

Table 2. 2008 Pub. 47 submissions from members.
(?) indicates XML formatting errors

_____

ANNEX 2

Proposed Changes to WMO No. 47 Code Tables

0204

brmL **Location of the barometer.**

Code	Description
PW	Pressurised wheelhouse (closed and not vented to the outside).
WH	Wheelhouse not pressurised (vented to the outside).
OT	Other (specify in footnote).

notes

CR Is deleted

0801

hgrE **Exposure of the hygrometer.**
thmE **Exposure of the dry bulb thermometer.**

Code	Description
A	Aspirated (Assmann type).
S	Screen (non-ventilated, i.e. natural ventilation).
VS	Screen (ventilated, i.e. assisted ventilation).
SN	Ship's screen (property of the ship).
SG	Ship's sling.
US	Unscreened.
W	Whirling or Sling psychrometer.

notes

SL Is deleted and replaced by code **W** – Whirling or Sling psychrometer

2202

vsslM **Type of meteorological reporting ship.**

Code	Description
10	Selected
15	Selected (AWS)
30	VOSClim
35	VOSClim (AWS)
40	Supplementary
45	Supplementary (AWS)
70	Auxiliary
75	Auxiliary (AWS)
OT	Other (specify in footnote).

additions

15	Selected (AWS)
30	VOSClim : for VOS Climate Reference Ship
35	VOSClim (AWS)
45	Supplementary (AWS)
75	Auxiliary (AWS)

notes

10	Replaces former codes 20, 21 and 22, which were vessel type specific.
40	Replaces former codes 60 and 61, which were vessel type specific.
70	Replaces former codes 80 and 81, which were vessel type specific.
OT	Replaces former code 99

Codes **88-90**, formerly used by the USA, are deleted in favour of the generic codes **10**, **40** and **70**.

Vessel Digital Images (Code Table 2203) - Annex 6

1. Recommended minimum suite of digital images/photographs

Description	VOSClim	Sel / Supp / Aux
Exposure of screen(s) showing the location of any adjacent obstructions, over-hangings, etc	Yes	Yes
Exposure of anemometer (if applicable)	Yes	Yes
Exposure of other meteorological instruments	Yes	Optional
Ship's profile – quayside or at sea if possible	Yes	Yes
Deck cargo stowage (if applicable)	Yes	Optional

2. Suggested drawings/sketches

Description	VOSClim	Sel / Supp / Aux
Ship's general profile – basic sketch showing instrument location and dimensions	Yes	Optional
Navigational Bridge Deck/wheelhouse plan – basic sketch showing instrument location	Yes	Optional
General Arrangement Plan or drawing	Yes	Optional

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APPENDIX G

REPORT BY THE TASK TEAM ON CODING

(report submitted by Hester Viola on behalf of the Task Team)

1. The team's current membership of the Task Team includes the following:

Dr Craig DONLON (Chairperson)
Dr Elizabeth C. KENT
Dr Joaquin TRINANES
Dr. Charles SUN
Mr Colin PARRETT
Mr Etienne CHARPENTIER
Mr Frits KOEK
Mr Robert LUKE
Mr Scott WOODRUFF
Ms Hester VIOLA
Nicola SCOTT
Dr Gustavo J. GONI
Mr Graeme BALL
Ms Julie FLETCHER

2. Progress updates, relating to each of the team's Terms of Reference, are presented:

2.1 TOR 1. Compile table driven coding requirements for ship based observations, for all relevant applications, and submit them in a consolidated way to the DMPA Task Team on Table Driven Codes;

2.1.1 March 2008. Requirements for XBT data were documented
http://www.jcomm.info/index.php?option=com_oe&task=viewDocumentRecord&docID=3246

2.1.2 May 2008. Changes required for the Master Table 10 were assessed and compiled.

2.1.3 September 2008 WMO, Geneva, Switzerland:

3. 2.1.3.1 Hester Viola attended the meeting of the WMO Expert Team on Data Representation and Codes (ET/DR&C) and presented a progress report and several proposals for BUFR templates on behalf of IOC and JCOMM. Contributed to discussions concerning JCOMM data.
4.
5. 2.1.3.2 She presented an update to definitions of the BUFR Master Table 10 – Oceanographic Data, on behalf of the JCOMM Data Management Programme Area.
6.
7. 2.1.3.3 She also presented the new XBT (only) template to the WMO ET/DR&C as well as some changes/additions to BUFR Tables and Code tables.
8.
9. 2.1.3.4 Some changes for VOS template were submitted to the ET/DR&C by the Czech Republic representative Eva Cervena, though these did not go via the SOT TT on Coding or the DMPA TT on TDCF.
10.

2.1.3.5 Meeting documents are available from

http://www.wmo.int/pages/prog/www/ISS/Meetings/CT-MTDCF-ET-DRC_Geneva2008/DocPlan.html

2.1.3.6 The feedback from the ET/DR&C was documented and reviewed by the DMPA TT on

TDCF Chair

2.1.3.7 The draft XBT template proposed needed to be resubmitted to the group, as it had some errors. Minor changes included updating all code tables, where, Missing was not the last element and clarify data widths (need to be converted to Bits for all character lengths given). Ordering needs to change for certain qualifying elements (heights of sensors). The ET/DR&C suggested that the manufacture date should be at the end and could just be a string/numeric.

2.1.4 December 2008- February 2009

2.1.4.1 Reviewed and revised the XBT BUFR template proposal amongst the DMPA Task Team on Table Driven Code Forms and members of the SOT TT Coding. Documentation of reports relating to BUFR Template updates will appear on the JCOMM website, http://www.jcomm.info/index.php?option=com_oe&task=viewDoclistRecord&doclistID=76, in future. It has been noted during the inter-sessional period that the management of BUFR templates and Table Driven Code Forms within JCOMM could be better coordinated across JCOMM and that if the various groups working on this area were merged (into a JCOMM Cross-cutting Task Team) there some efficiencies may be gained.

2.2 TOR 2. In collaboration with ocean forecasting system operators (GODAE) including ecosystem modellers, and other appropriate user communities, establish a core set of ship based bio-geo-chemical variable definitions for the BUFR Master Table No. 10 (MT10);

No Action noted.

2.3 TOR 3. Review and revise the draft MT10 BUFR code table

2.3.1 At the September meeting of the ET/DR&C, the team was happy that some progress had been made on Master Table 10. **Doc. 3.4(1)** Once the Master Table 10 definitions are finalised (minor changes needed to the document submitted, to be completed by the DMPA Task Team members), ECMWF volunteered to validate the table definitions, if data is provided and one JCOMM member data center can help. The ET/DR&C noted that there is a need for a clear process in managing alternative Master Tables (not just Master Table 10). There is a need for some official documentation on the mechanism for updates and storage – hosting and serving of the Master Table between responsible party/ies and the Organisation/s proposing updates and the ET/DR&C. JCOMM (on behalf of IOC) needs to decide where the official source of the Master Table 10 definitions should reside.

2.3.2 The final review of the Master Table 10 is nearly complete, but the DMPA Task Team members, in consultation with the SOT Task Team on Coding in February/March 2009, will compile a further revision. Documentation of the Master Table 10 will be the JCOMM website, here, in future.

2.4 TOR 4. Review all relevant JCOMM Publications to make sure they are kept up to date and comply with Quality Management terminology;

No action noted

2.5 TOR 5. Report to SOT-V.

_____

ANNEX 1

TERMS OF REFERENCE FOR THE

JCOMM TASK TEAM ON TABLE DRIVEN CODES

Terms of Reference for the cross cutting Task Team on Table Driven Codes

The purpose of the TT is to coordinate the development and evolution of the use of table driven code forms (TDCs) within JCOMM, and to coordinate their implementation with WMO/CBS and its applicable Expert Teams, including on Data Representation and Codes (ET-DRC) and on the Assessment of Data Representation Systems (ET-ADRS). To do this, it requires membership representing each of the programme areas who have a requirement for exchanging data in such code forms and managing such data.

Specifically the TT will carry out the following tasks:

1) Liaise with appropriate representatives of groups using the TDCs to ensure their present and future needs are met.
2) Liaise with projects such as Meta-T and metadata repositories such as WMO Pub. 47 and ODAS to ensure international management of needed metadata.
3) Review and evolve existing templates or new forms, whether actively used or being proposed, to meet the objectives of:
   a) Using the same form, as appropriate considering intrinsic characteristics of original data forms and reporting procedures, for data and metadata when reporting the same variable in different templates;
   b) Ensuring metadata necessary to real-time interpretation of the observations are carried with the data;
   c) Inserting the facility to handle new variables as they become necessary in a manner consistent with objectives a and b.
4) Maintain and evolve Master Table 10 as appropriate
5) Assess any proposed or enacted changes in TDCs for their impact on the climate record in consultation with the ETMC.
6) Coordinate with CBS and its ETs on TDC issues (including preparing documentation for presentation to the ET-DRC so as to get approval of the new or modified TDCs).
7) Report progress to chairs of the JCOMM PAs.

Membership:

Bob Keeley – DMPA (lead)
Fritz Koek -- SOT
Derrick Snowden -- Meta-T
Anh Tran -- Argo
Bruce Bradshaw - DBCP
Hester Viola - JCOMMOPS
Scott Woodruff – ETMC
Thomas Loubrieu – ADRS
Candyce Clark – OPA chair

Related Documents can be found here.

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APPENDIX H

REPORT BY THE TASK TEAM ON INSTRUMENTS STANDARDS (TT-IS)

(Submitted by Robert Luke, Chairperson, TT-IS)

Introduction

This report addresses the key issues assigned to the Team in its Terms of Reference and identifies the key areas where progress has been made since SOT IV. Taking into account work also undertaken by the ETMC and the new cross-cutting (ETMC-SOT) Task Team on Delayed Mode VOS Data (TT-DMVOS), the report invites the SOT to consider carefully how the project should develop in the future, so that it can help to raise the climate quality of data within VOS, and thereby contribute to the Global Climate Observing System (GCOS).

The following supporting documents are annexed to this report

Annex A: Task Team current Terms of Reference
Annex B: Instrument Standards Guidelines
Annex C: Instrument Standards Equipment Status Report
Annex D: Electronic Logbook Inter-Comparison Test and Results
Annex E: Electronic Logbook Manufacturers Responses
Annex F: Electronic Logbook Inter-Comparison Report
Annex G: Task Team Proposed Changes of ISO 10596
Annex H: Task Team ISO 10596 Recommendations
Annex I: Status of actions agreed at SOT IV

Reference: Proposed ISO 10596 (Ships and marine technology — Marine wind vane and anemometers)

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ANNEX A

Terms Of Reference

Task Team on Instrument Standards

Tasks:

1. Compile information on existing activities, procedures and practices within JCOMM relating to instrument testing, standardization and inter-calibration, as well as the standardization of observation practices and procedures.

2. Using guidance contained in existing guides including the WMO Guides on Instruments and Methods of Observation (WMO-No.8) communicate with manufactures regarding new technologies and recognized equipment problems.

3. Prepare a JCOMM Technical Report containing this information, to be made widely available through relevant web sites (JCOMM, JCOMMOPS, VOS, DBCP, SOOP, and SOT).

4. Provide guidance on testing and the inter-calibration of marine meteorological and oceanographic observing systems.

5. Liaise closely with WMO/CIMO, both in the compilation of the information and in assessing what additional work in this area might be required under JCOMM.

6. Liaise closely with IOC in the preparation of the wider compilation of existing instrumentation and observing practices standards in oceanographic observations in general, with a view to inputting an appropriate contribution from JCOMM.

7. Conduct an inter-comparison study of electronic logbooks.

8. Review all relevant JCOMM Publications to make sure they are kept up to date and comply with Quality Management terminology;

9. Work with the WMO Commission on Instruments and Methods of Observations for updating the WMO Guide No. 8 section dealing with ship-based observations.

Members:

Robert Luke (TT Chairman, United States)
Graeme Ball (SOT Chairman, Australia)
Julie Fletcher (VOSP Chairperson, New Zealand)
Gustavo Goni (SOOP Chairman, United States)
Rudolf Krockauer (ASAP Chairman, Germany)
Pierre Blouch (E-SURFMAR Program Manager, France)
Yvonne Cook (member in absentia due to transfer of assignments, Canada)
Henry Kleta (Germany)
Elizabeth Kent (United Kingdom)
Sarah North (United Kingdom)
Shawn Smith (United States)
Scott Woodruff (United States)
Derrick Snowden (United States)
Bruce Sumner (Associate Member, HMEI, Switzerland)

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ANNEX B

Instrument Standards Guidelines

1. VOS

a. WMO

1. Guide To Meteorological Instruments And Methods of Observation (WMO-No. 8)

   a. 7th Edition (Aug 08)
   http://www.wmo.int/pages/prog/www/IMOP/publications/CIMO-Guide/CIMO_Guide-7th_Edition-2008.html

   b. Approved changes from SOT-IV have been submitted to the JCOMM focal point on CIMO matters for endorsement and inclusion in next edition

b. NMS

1. Australia
   a. Port Meteorological Agents Guide
   b. TurboWin User Guide
   c. TurboWin Setup Manual

2. United Kingdom
   a. Marine Observers Handbook
   b. Port Met Officers Work Instruction
   c. UK Met O.740

3. United States of America
   a. Military Specification MIL-B-17089
   b. National Weather Service NWS G101 – SP004
   c. National Weather Service NWS G222 – SP002
   d. NWS Instruction 10-201 (Apr 05, 2004)
   http://www.nws.noaa.gov/directives/sym/pd01002001curr.pdf
   e. AmverSeas Users Manual (Sep 19, 2008)
   http://seas.amverseas.noaa.gov/seas/
   f. Observing Handbook No. 1 (Apr2004 - due for update 2009)
   http://www.vos.noaa.gov/ObsHB-508/ObservingHandbook1_2004_508_compliant.pdf

2. SOOP

a) IOC

1. Guide to IGOSS (now JCOMM) Data Archives and Exchange (BATHY and TESAC) - IOC Manual and Guides No.1
2. Guide to Operational Procedures for the Collection and Exchange of IGOSS (now JCOMM) Data - IOC Manual and Guides No.3
3. IGOSS (now JCOMM) Plan and Implementation Programme - IOC Technical Series No. 43
4. Best Guide And Principles Manual For The Ships Of Opportunity Program (SOOP) and Expendable Bathythermograph (XBT) Operations

b) NMS

1. Australia
   a. Devil XBT User Manual

3. ASAP

a. WMO
   1. No guidance available at this time.

b. EUCOS
   1. No guidance available at this time.

c. NMS
   1. No guidance available at this time.

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ANNEX C

Instrument Standards Equipment Status Report

A. VOS

a. Barometers

BAROMETERS				
National VOS	**Barometer**	**Barometer Type**	**Barometer Setting**	**Type of Correction Tables Used**
Australia	Vaisala PTB220	Digital	Station Level	Height
Australia		Precision Aneroid	Station Level	Pressure/Temperature, Drift & Height
Croatia	Barigo Fisher SUNDO	Ship's Aneroid Ship's Aneroid Ship's Aneroid	MSL MSL MSL	NIL NIL NIL
Ecuador		Aneroid	MSL	NIL
France	Vaisala PTB220	Digital	Station Level	NIL
Germany	Fuess	15PM	MSL	NIL
Greece	Belfort SUNDO Th. FRIEDRICH	Aneroid Ship's Aneroid Ship's Aneroid	Station Level Station Level Station Level	NIL NIL NIL
Hong Kong		Precision Aneroid Ship's Aneroid	MSL MSL	U.K. Met. O. 740 U.K. Met. O. 740
Iceland	Fuess Vaisala PA11	Ship's Aneroid Digital	MSL MSL	Air Pressure Dependent
Ireland		Ship's Aneroid Aneroid	MSL MSL	NIL NIL
Japan		Aneroid Digital	Station Level Station Level	Height Height
Netherlands	Fuess Vaisala PTB220	Aneroid Aneroid	MSL MSL	NIL NIL
New Zealand	Fuess	Aneroid Precision Aneroid	MSL Station Level	NIL Instrument & Height
Singapore	PAB MK2 M2236		MSL	U.K. Met. O. 740
South Africa	Fuess	Aneroid	MSL	NIL
United Kingdom	Negretti & Zambra PAB MK2 Vaisala PTB220	Precision Aneroid Barometer Digital	Station Level	NIL (for ships using TurboWin) U.K. Met. O. 740 (for ships not using TurboWin)
United States	Belfort Meteograf	Aneroid Digital	MSL MSL	NIL NIL
NOTES: 1) For Ships using TurboWin, the Height correction is applied by the software. 2) Information can also be found on VOS web site at: http://www.bom.gov.au/jcomm/vos/national_practices_pressure.html				

b. Barographs

BAROGRAPHS			
National VOS	**Barograph**	**Barograph Type**	**Barograph Setting**
Australia		Open Scale	Station Level
Croatia	KOMPAS	Open Scale	MSL
Ecuador		Micro-barograph	MSL
France	None		
Germany	Mueller 78A Lambrecht 290		MSL MSL
Greece	Belfort	Open Scale (4 Day)	Station Level
Hong Kong		Small Scale	MSL
Iceland	None		
Ireland		Open Scale (7 Day)	MSL
Japan		Open Scale (1 Day) Open Scale (7 Day)	Station Level Station Level
Netherlands	Fuess	Aneroid	MSL
New Zealand		Open Scale	MSL
Singapore		Open Scale MK3	MSL
South Africa	Mason		MSL
United Kingdom	Negretti & Zambra Fischer	Open Scale (7 Day) Open Scale (7 Day)	MSL MSL
United States	Belfort Meteograf	Open Scale (4 Day) Digital (1 year)	MSL MSL

c. Thermometers

VOS THERMOMETER TYPES and SETTINGS			
National VOS	**Thermometer**	**Thermometer Type**	**Thermometer Fluid**
Australia	AMA	Liquid-in-glass	Hg
Netherlands	Ship provided		
United Kingdom	Zeal 2C AMA	Liquid-in-glass Liquid-in-glass	Hg Hg
United States	Zeal P2505	Mason Hygrometer	Glycol

d. Sea Surface Temperature

VOS SEA SURFACE TEMPERATURE TYPES and SETTINGS			
National VOS	**Sensor**	**Sensor Type**	**Sensor Scale C/F**
Australia	Sea thermometer	Ship's intake Bucket (UK)	C C
Netherlands		Bucket	Alcohol or Mercury Deg C
United Kingdom	Sea thermometer	Bucket Ship's intake Hull contact sensor	C C C
United States		Ship's Intake	Either (ship Dependent)

e. Automated Systems

VOS AUTOMATED SYSTEMS			
National VOS	**Type of AWS (as of 31/12/2008)**	**Communication Method**	**Manual Entry Facility**
Australia	Vaisala Milos 500 AWS	Inmarsat C (Data Mode)	Yes
Canada	AVOS – AXYS Technologies	Inmarsat C Iridium	Yes
Denmark	BATOS	Inmarsat C (Data Mode)	Yes
EUMETNET	BATOS BAROS	Inmarsat C (Data Mode) Iridium SBD	Yes No
France	BATOS Mini BATOS MINOS BAROS	Inmarsat C (Data Mode) Inmarsat C (Data Mode) Argos Iridium	Yes No No No
Germany	Vaisala Milos 500 AWS	Meteosat	Some
Ireland	Vaisala Milos AWS	Meteosat	No
Japan	Koshin Denki Kogyo Co., Ltd (Japan) Ogasawara Keiki Seisakusho Co (Japan) Nippon Electric Instrument Inc. (Japan) Brookhaven National Laboratory (USA) JRCS MFG. Co. Ltd (Japan)	Inmarsat Inmarsat Inmarsat C Inmarsat C Inmarsat F	Some No Some Yes No
New Zealand	Sutron 9000RTU mSTAR-SHIP	MTSAT GPRS Cell	Yes No
Norway	AWS	-	some
Russia	GM6	Inmarsat C	Yes
South Africa	Vaisala Milos 520	Inmarsat C	Yes
Spain	Vaisala Milos	Inmarsat C	Yes
United Kingdom	Automet MINOS –GP MINOS-GPW BATOS AVOS Vaisala MAWS MetPod Metocean Deck Buoy	Inmarsat Argos Argos Inmarsat C (Data Reporting Mode) Inmarsat C Iridium Iridium Iridium	No No No Yes Yes Yes No No
United States	SEAS-AutoImet	SEAS	Some

B. SOOP

i. Expendable BathyThermograph (XBT)

XBT Probe	
National SOOP	**Equipment Type**
Australia	Sippican
United States	Sippican

ii. XBT Recorder System

XBT Recorder	
National SOOP	**Equipment Type**
Australia- BOM	Devil XBT
Australia- CSIRO	Devil XBT

iii. ThermoSalinoGraph (TSG)

Thermosalinograph (TSG)	
National SOOP	**Equipment Type**
United States	Seabird 21 TSG Seabird 38 Remote Temperature Sensor Seabird 45 MicroTSG

iv. Conductivity, Temperature, and Depth (CTD)

Conductivity, Temperature, and Depth (CTD)	
National SOOP	**Equipment Type**
United States	Seabird 19 Seabird 25 Seabird 911+

v. Expandable Conductivity, Temperature, and Depth (XCTD)

Expandable Conductivity, Temperature, and Depth (XCTD)	
National SOOP	**Equipment Type**
United States	Sippican TSK

vi. Acoustic Doppler Current Profile (ADCP)

Acoustic Doppler Current Profile (ADCP)	
National SOOP	**Equipment Type**
United States	RD Instruments

vii. Partial Pressure of CO_2 (pCO_2)

Partial Pressure of CO2 (pCO2)	
National SOOP	**Equipment Type**
Australia	CSIRO
United States	General Oceanics

viii. Moving Vessel Profiler

Moving Vessel Profiler	
National SOOP	**Equipment Type**
United States	Brooke
United States	Scripps

b. ASAP

ASAP TYPES and COMMUNICATIONS			
National ASAP	**CONTAINER**	**SOUNDING EQUIPMENT**	**SATELLITE TRANSCEIVER**
Denmark	10ft Container	MW12	
E-ASAP	10ft container 10ft container	MW21, version 2.17, Win2k MW21, version 2.17, WinNT	T&T 3026L/M T&T 3020-C
France	Deck launcher	MODEM SR2K	
Germany	20ft container 20ft container 20ft container 20ft container	MW21, version 1.26, WinNT MW21, version 2.17, Win2k MW21, version 2.17, WinNT MW21, version 2.17, WinNT	T&T 3020-C T&T 3020-C T&T 3020-C T&T 3020-C
Spain	10ft container	MW21, version 2.17, WinNT	T&T 3022?
Sweden	10ft container	MW21, version 2.17, Win2k	TT 3022D
United Kingdom	10ft Container & Deck launcher	MW21, version 2.17, Win2k	

ANNEX D

Electronic Logbook Inter-Comparison Test and Results

1. Objective

The objective of the inter-comparison was to compare the BBXX output from different types and versions of Electronic logbook software in common use, using identical test datasets.

The inter-comparison, as well as comparing the BBXX output, also checked the coding, computational algorithms, and the effectiveness of the in-built quality control mechanisms to reject 'bad' data.

2. Test Datasets

Three sets of metadata and associated test data were created, where each set formed a discrete observation (see *Annex 1*):

- Observation 1 is a straightforward, basic observation using ‘estimated wind speed and direction’ and MSL pressure.
- Observation 2 uses ‘measured apparent wind speed and direction’ and station level pressure.
- Observation 3 uses ‘measured true wind speed and direction’ and a MSL pressure below 1000.0hPa. It also contains some deliberate errors to test the inter-dependency of elements.

3. Instructions to Participants

The following instructions were provided to participants:

- Each Sample Observation has some associated metadata, which may or may not be required to be entered into the electronic logbook software before the entry of each observation.
- After configuring the electronic logbook software with the required metadata, enter each observation using the sample data.
- Sample Observation 3 contains some deliberate errors in the ‘data’ column. Compile the observation using the ‘data’ as supplied where possible. If or when the electronic logbook software rejects the data and requires valid data in order to proceed, enter the ‘valid data’ from column three. Please document each occasion when the software rejects the data and requires a different input to proceed.
- Produce a full coded observation output for each sample observation and copy this to a Word document, labelling the observation with the name of the electronic software used to produce it. Include comments relating to the entry of observation number 3.

4. E-Logbook types for Comparison

Sample Observations using the three main E-Logbook types were prepared as follows:

- TurboWin Version 2.12 by Julie Fletcher, MetService, New Zealand, *Annex 5*

- TurboWin Version 3.6 by Brian Sharp, Australian Bureau of Meteorology, *Annex 5*
- TurboWin Version 4.0 by Graeme Ball, Australian Bureau of Meteorology, *Annex 5*
- OBSJMA by Toshifumi Fujimoto, Japanese Meteorological Agency, *Annex 6*
- SEAS Version 6.57 by Robert Luke, NOAA, USA, *Annex 7*

For each test dataset, a manually coded observation was used as the control file.

5. Comparison of the Completed Observations

The three sample observations from the 5 E-Logbook types were compared and the discrepancies and variations noted.

A detailed comparison of observation one is in *Annex 2***,** observation two in *Annex 3***,** and observation three in *Annex 4***.**

6. Overall Summary of E-Logbook Inter-comparison Results

In general, there was close agreement between the observations output by the 3 E-Logbook types (TurboWin, SEAS and OBSJMA). All E-Logbook software types have built in checks and balances, and sample observation number 3 tested the inter-dependency between various elements. All E-Logbook types required the wet bulb to be lower than or equal to dry bulb. All E-Logbook types recognized the relationship between present weather and cloud, between cloud amount, type and height, and between tendency code 4 and nil pressure change. In these cases, the E-Logbooks prompted the observer to amend the entry before the programme would move forward.

The significant variations between the 3 E-Logbook types are listed below:

- **Dewpoint** – Each of the 3 E-Logbook types produced a slightly different dewpoint result indicating the use of different background tables. TurboWin and OBSJMA produced dewpoint to one decimal place, while SEAS only produced dewpoint in whole numbers e.g. 2011/
- **Calculation of Apparent Wind Speed and Direction to True** – All 3 E-Logbook types produced the same True Wind Direction. The computed True Wind Speed varied by a couple of knots between the logbook types and between versions of TurboWin.
- **Wind Speed Unit** – OBSJMA and SEAS can only output wind speed in knots. TurboWin provides the option of knots or m/s.
- **Calculation of MSL Pressure** - Neither OBSJMA nor SEAS has the ability to calculate MSL pressure, so MSL pressure must be entered.
- **Inter-dependability** - Only OBSJMA recognized the relationship between Wind Speed and Wind Waves, requiring the observer to enter a higher wind wave to match the high wind speed. Only OBSJMA required ship speed to be entered, while SEAS and TurboWin allowed the non-entry of ship speed.

7. Recommendations

a. That all E-Logbook software report Dewpoint to one decimal place.

b. That the algorithm for calculating dewpoint be standardised between E-Logbooks.

c. That the coding of swell in TurboWin be revised to remove ambiguity and misunderstanding about the coding of the second swell. Presently, the drop-down list for the direction of second swell includes “no swell”, which can be interpreted to infer no second swell, but then codes dw2dw2 as 00 (calm) instead of // (no 2nd swell).

d. That TurboWin and SEAS software implement a QC check to correlate the reported wind speed with wind wave height.

e. That all E-Logbook software provides more information on screen to aid in the selection of correct code figures for Visibility (VV) and Height of base of lowest cloud (h) when the ranges and heights are at the boundaries of the levels. Refer to WMO manual on Codes (WMO No 306) FM13-XII Ext. SHIP. For VV refer to WMO code table 4377 and note that if the distance of visibility is between two of the distances given, the code figure for the smaller distance shall be reported. For h refer to WMO code table 1600 and note that a height exactly equal to one of the values at the ends of the ranges shall be coded in the higher range.

f. That SEAS and TurboWin prompt for the entry of ship speed if it is not entered.

_____

Annex 1 **E-Logbook Comparison Raw Data Sets**

Observation 1	
Metadata	
Callsign	TEST1
Units of wind speed in final report i_w	Speed in knots
Precipitation Indicator i_R	No precipitation
Weather Group Indicator i_x	included
Wind Observation method	Estimated True Wind Speed & Direction
Barometer setting	MSL
Height of barometer above sea level	Not required
Method of taking Sea temperature	Bucket
Observed parameters	**Data**
UTC date YY	12th
UTC time GG	0000UTC
Latitude $L_aL_aL_a$	10.5 South
Longitude $L_oL_oL_oL_o$	24.7 West
Height of lowest cloud h	3000ft
Visibility VV	60km
Total Cloud N	3
Amount of low cloud N_h	1
Type of low cloud C_L	2
Type of medium cloud C_M	No cloud
Type of high cloud C_H	1
Wind Direction ***** dd	070 deg
Wind Speed ***** ff	08 knots
Dry Bulb Temp TTT	25.7 deg
Wet Bulb Temp $T_bT_bT_b$	21.9 deg
Sea temperature $T_wT_wT_w$*****	27.2 deg
MSL Pressure PPPP	1012.5 hPa
Pressure change characteristic a	Rising steadily /
Pressure change amount ppp	0.4 hPa
Present weather ww	State of the sky on the whole unchanged
Past weather W_1	No cloud
Past weather W_2	Cloud covering less than half the sky
Course of ship D_s	270 deg
Speed of ship v_s	15kts
Wind Wave period P_wP_w	6 seconds
Wind Wave Height H_wH_w	0.5 metre
Direction of Primary swell $d_{w1}d_{w1}$	230 deg
Direction of Secondary swell $d_{w2}d_{w2}$	No secondary swell
Primary swell period $P_{w1}P_{w1}$	6 seconds
Primary swell height $H_{w1}H_{w1}$	2.0 metres
Secondary swell period $P_{w2}P_{w2}$	No secondary swell
Secondary swell height $H_{w2}H_{w2}$	No secondary swell
*refer to metadata	

Observation 2	
Metadata	
Callsign	TEST2
Units of wind speed in final report i_w	Speed in knots
Precipitation Indicator i_R	No precipitation
Weather Group Indicator i_x	included
Wind Observation method	Measured Apparent Speed and Direction (off the bow clockwise)
Barometer setting	Station Level
Height of barometer above sea level	25 Metres
Method of taking Sea temperature	Engine room intake
Observed parameters	**Data**
UTC date YY	20th
UTC time GG	1200UTC
Latitude $L_aL_aL_a$	42.4 South
Longitude $L_oL_oL_oL_o$	168.5 East
Height of lowest cloud h	1000ft
Visibility VV	10km
Total Cloud N	8
Amount of low cloud N_h	7
Type of low cloud C_L	7
Type of medium cloud C_M	Not known
Type of high cloud C_H	Not known
Wind Direction ***** dd (apparent)	080 deg
Wind Speed ***** ff (apparent)	15 knots
Ship's ground course	340 deg
Ship's ground speed	20kts
Ship's heading	340 deg
Dry Bulb Temp TTT	12.5 deg
Wet Bulb Temp $T_bT_bT_b$	11.6 deg
Sea temperature $T_wT_wT_w$ *****	14.9 deg
Station Level Pressure PPPP *****	1000.6 hPa
Pressure change characteristic a	Falling steadily \
Pressure change amount ppp	1.5 hPa
Present weather ww	continuous light drizzle
Past weather W_1	Cloud covering more than half the sky
Past weather W_2	drizzle
Course of ship D_s	340 deg
Speed of ship v_s	20kts
Wind Wave period P_wP_w	4 seconds
Wind Wave Height H_wH_w	2.5 metre
Direction of Primary swell $d_{w1}d_{w1}$	250 deg
Direction of Secondary swell $d_{w2}d_{w2}$	150 deg
Primary swell period $P_{w1}P_{w1}$	5 seconds
Primary swell height $H_{w1}H_{w1}$	3.0 metres
Secondary swell period $P_{w2}P_{w2}$	8 seconds
Secondary swell height $H_{w2}H_{w2}$	2.0 metres
*refer to metadata	

Observation 3		
Metadata		
Callsign	TEST3	
Units of wind speed in final report i_w	Speed in m/s	
Precipitation Indicator i_R	No precipitation	
Weather Group Indicator i_x	included	
Wind Observation method	Measured True Wind Speed and Direction	
Barometer setting	MSL	
Height of barometer above sea level	Not required	
Method of taking Sea temperature	Not taken	
Observed parameters	**Data**	**Valid data to allow e-logbook entry to proceed**
UTC date YY	25th	
UTC time GG	1800UTC	
Latitude $L_aL_aL_a$	54.3 North	
Longitude $L_oL_oL_oL_o$	151.6 West	
Height of lowest cloud h	1500ft	Cloudless
Visibility VV	4km	
Total Cloud N	0	
Amount of low cloud N_h	2	0
Type of low cloud C_L	1	No cloud
Type of medium cloud C_M	No cloud	
Type of high cloud C_H	No cloud	
Wind Direction ***** dd	330 deg	
Wind Speed ***** ff	15 m/s	
Dry Bulb Temp TTT	-0.6 deg	2.5deg
Wet Bulb Temp $T_bT_bT_b$	2.5 deg	-0.6 deg
Sea temperature $T_wT_wT_w$	No data	
MSL Pressure PPPP	982.5 hPa	
Pressure change characteristic a	No change	
Pressure change amount ppp	0.5 hPa	0.0
Present weather ww	Intermittent light rain	Rain in the past hour, but not at the time of observation
Past weather W_1	Cloud covering less than half the sky	
Past weather W_2	rain	
Course of ship D_s	070 deg	
Speed of ship v_s	Not given	22kts
Wind Wave period P_wP_w	6 seconds	3 seconds
Wind Wave Height H_wH_w	0.5 metre	4.0 metres
Direction of Primary swell $d_{w1}d_{w1}$	130 deg	
Direction of Secondary swell $_{w2}d_{w2}$	No secondary swell	
Primary swell period $P_{w1}P_{w1}$	7 seconds	
Primary swell height H_{w1} H $_{w1}$	2.5 metres	
Secondary swell period $P_{w2}P_{w2}$	No second swell	
Secondary swell height H_{w2} H $_{w2}$	No second swell	
*refer to metadata		

_____

Annex 2 TEST 1 – Resultant BBXX and detailed Comparison

Note: The name of the E-logbook type has been entered in the 'callsign' position for comparison purposes. MAN is the manually coded observation.

BBXX TW212 12003 99105 50247 41699 30708 10257 20199 40125 52004 70200 81201 22263 02272 20601 323// 40604 5//// 80219

BBXX TW36 12003 99105 50247 41699 30708 10257 20199 40125 52004 70200 81201 22263 02272 20601 323// 40604 5//// 80219

BBXX TW40 12003 99105 50247 41599 30708 10257 20199 40125 52004 70200 81201 22263 02272 20601 32300 40604 5//// 80219

BBXX SEAS 12003 99105 50247 41599 30708 10257 2020/ 40125 52004 70200 81201 22263 02272 20601 323// 40604 5//// 6//// 80219 ICE /////=

BBXX OBSJMA 12003 99105 50247 41599 30708 10257 20202 40125 52004 70200 81201 22263 02272 20601 323// 40604 80219

BBXX MAN 12003 99105 50247 41699 30708 10257 20199 40125 52004 70200 81201 22263 02272 20601 323// 40604 5//// 80219

Comparison of Observation TEST1

1. All versions of TurboWin produced essentially the same output, the only exception being the choice of the height range for the 'height of the lowest cloud'. TW 2.12., 3.6 and MAN = 6, TW 4.0, OBSJMA, SEAS = 5. This is due to observer interpretation and is not significant, but could be alleviated by improved on-screen instructions.
2. All Versions coded 'no secondary swell' as 323//, exception of TW 4.0 coded 32300. In the case of TW 4.0, the 'no swell' option was selected from the drop-down list under Swell 2 direction.
3. Manually coded Ob same as TurboWin outputs.
4. Dewpoint – JMA = 20.2, ALL TW & MAN 19.9, SEAS 20/
5. JMA required height of cloud to be entered in metres not feet, result as above.
6. SEAS same as JMA & TW except for dewpoint. Groups 6//// ICE ///// added automatically

TEST1 Summary

This was a basic Ob using estimated WSD and MSL pressure

- All E-logbooks (& manual Ob) produced almost identical Obs.
- All correct selection of iw figure, Quadrant, WSD, MSL pressure, SST method
- Dewpoint is main area of difference – TurboWin the same, OBSJMA similar, SEAS to whole numbers
- Insignificant difference in selection of height of lowest cloud
- Perhaps TurboWin requires an additional option of 'swell not determined', code // rather than just 'no swell', code 00, to prevent ambiguity.

_____

Annex 3 TEST 2 – Resultant BBXX and detailed Comparison

Note: The name of the E-logbook type has been entered in the 'callsign' position for comparison purposes. MAN is the manually coded observation.

BBXX TW212 20124 99424 31685 41497 81221 10125 20108 40036 57015 75152 877// 22284 00149 20405 32515 40506 50804 80116

BBXX TW36 20124 99424 31685 41497 81223 10125 20108 40036 57015 75152 877// 22284 00149 20405 32515 40506 50804 80116

BBXX TW40 20124 99424 31685 41396 81223 10125 20108 40036 57015 75152 877// 22284 00149 20405 32515 40506 50804 80116

BBXX SEAS 20124 99424 31685 41496 81222 10125 2011/ 40006 57015 75152 877// 22274 00149 20405 32515 40506 50804 6//// 80116 ICE /////=

BBXX OBSJMA 20124 99424 31685 41497 81223 10125 20109 40036 57015 75152 877// 22284 00149 20405 32515 40506 50804 80116

BBXX MAN 20124 99424 31685 41497 81223 10125 20108 40036 57015 75125 877// 22284 00149 20405 32515 40506 50804 80116

Comparison of Observation TEST2

1. Correction of apparent WSD to True WSD. Wind Speed in knots – TW2.12= 21, TW3.6 = 23, TW4.0 = 23, MAN = 23, OBSJMA = 23, SEAS = 22. Wind Direction in all versions = 120 deg.
2. TW requires Visibility in nautical miles, the example was in km. SEAS & TW4.0 Vis = 96, TW 2.12, TW 3.6, OBSJMA and MAN Vis= 97. Although the difference is not significant, it could be alleviated by improved on-screen instructions.
3. All versions (including manual) coded 4 for 'height of the lowest cloud', TW4.0 coded 3. Insignificant
4. Past weather all E-versions selected with highest number coded first (52), MAN (25) done chronologically (a NZ National variation)
5. Dew point - OBSJMA = 10.9, ALL TW & MAN 10.8, SEAS 11/
6. Calculation of MSL, all TW and MAN = 1003.6hPa, OBSJMA no correction function, so pressure calculated manually from tables and corrected reading (1003.6) entered in OBSJMA. SEAS have no correction function, so station level pressure (1000.6) entered in SEAS ob.
7. OBSJMA links present weather with visibility, warning that with 51, present weather, Visibility cannot exceed 10km.
8. Ship Course Ds was 8 for all TW, JMA and manual. SEAS coded 7 – not significant.

TEST2 Summary

This Ob required the calculation of True WSD and MSL Pressure

- All produced True wind direction of 120 deg
- True wind speed varied from 21 -23 Kts
- All TW and the manual Ob produced MSL pressure. Neither OBSJMA nor SEAS has the ability to calculate MSL pressure, but OBSJMA made the calculation manually and entered MSL pressure in the OB. SEAS coded the station level pressure.
- Dewpoint differences as in TEST1
- All used correct iw figure
- All coded correct SST method

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Annex 4 TEST 3 – Resultant BBXX and detailed Comparison

Note: The name of the E-logbook type has been entered in the 'callsign' position for comparison purposes. MAN is the manually coded observation.

BBXX TW212 25181 99543 71516 41996 03315 10025 21072 49825 54000 72160 80000 2222/ 20601 313// 40705 5//// 81006

BBXX TW36 25181 99543 71516 41995 03315 10025 21072 49825 54000 72160 80000 2222/ 20601 313// 40705 5//// 81006

BBXX TW40 25181 99543 71516 41995 03315 10025 21072 49825 54000 72160 80000 22225 20601 313// 40705 5//// 81006

BBXX SEAS 25184 99543 71516 41996 03329 10025 2107/ 49825 54000 72160 80000 2221/ 0//// 20601 313// 40705 5//// 6//// 81006 ICE /////=

BBXX OBSJMA 25184 99543 71516 41996 03329 10025 21063 49825 54000 72160 80000 22225 20608 313// 40705 81006

BBXX MAN 25181 99543 71516 41996 03315 10025 21071 49825 54000 72106 80000 22225 20308 313// 40705 5//// 81006

Comparison of Observation TEST3

E-logbook type	iw	Qc Quadrant	H Height base lowest cld	Vis	N Total cloud	WS	Dry bulb	Dew point	appp	wwW1W2
Manual	1	7	9	96	0	15 m/s	10025	21071	4000	2106
TW 2.12	1	7	9	96	0	15m/s	10025	21072	4000	2160
TW 3.6	1	7	9	95	0	15m/s	10025	21072	4000	2160
TW 4.0	1	7	9	95	0	15m/s	10025	21072	4000	2160
OBSJMA	4	7	9	96	0	29 kts	10025	21063	4000	2160
SEAS	4	7	9	96	0	29 kts	10025	2107/	4000	2160

E-logbook type	Nh Total Low cloud	Vs vessel speed	Wet bulb	Wind waves						
Manual	0	5	81006	20308						
TW 2.12	0	/	81006	20601						
TW 3.6	0	/	81006	20601						
TW 4.0	0	5	81006	20601						
OBSJMA	0	5	81006	20608						
SEAS	0	/	81006	20601						

1. All the TW & SEAS entries accepted low wind wave with high WS. Manual Ob recognized the relationship between high WS and wind waves.
   OBSJMA recognized a relationship between high WS and wind wave height, but not period

2. All E-logbooks rejected Present weather of intermittent light rain with no Cloud, entering instead 'rain in the past hour' code 21.

3. Past weather all E-versions selected with highest number coded first (60), MAN (06) done chronologically (a NZ National variation)

4. All E-logbooks required wet bulb to be lower than/equal to dry bulb, and would not allow reversed entries to be entered.

5. Dewpoint - OBSJMA = -6.3, ALL TW = -7.2, MAN -7.1, SEAS -7/

6. OBSJMA and SEAS do not have the option of outputting wind speed in m/s. Entry was made in kts using the correct iw code figure.

7. TW and SEAS allowed non-entry of ship speed, although TW4.0 chose to enter the speed. OBSJMA required ship speed entry.

8. All TW, SEAS & OBSJMA required tendency 4 with 000 change.

9. All TW, SEAS & OBSJMA recognized total 0 cloud affects low cloud amount, cloud type, cloud height and present weather.

10. Only SEAS coded 0//// for no SST data, rest E-Logbooks omitted group.

11. All TW and SEAS code 5//// when there is no secondary swell group, OBSJMA omits the group.

12. All SEAS obs include groups 6//// ICE /////

TEST3 Summary

This Ob was designed to test the checks and balances within the E-logbook software concerning inter-dependability of parameters.

- OBSJMA and SEAS can only output wind speed in knots. TurboWin provides the option of knots or m/s
- Only OBSJMA recognized the relationship between high WS and wind waves
- All E-logbooks required wet bulb to be lower than/equal to dry bulb, and would not allow reversed entries to be entered
- Dewpoint differences as in TEST1 and TEST2
- All E-logbooks recognized the relationship between present weather and cloud and would not allow present weather 'intermittent light rain' to be coded with 'no cloud'
- All E-logbooks recognized the relationship between cloud amount, low cloud amount, cloud type and cloud height
- All E-logbooks linked tendency code 4 with nil pressure change
- Only OBSJMA required ship speed to be entered, SEAS and TurboWin allowed non-entry of ship speed.

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Annex 5 TurboWin TEST Observations

TurboWin TEST observations were submitted in March 2008.

TurboWin 2.12 – Julie Fletcher, MetService NZ

BBXX TEST1 12003 99105 50247 41699 30708 10257 20199 40125 52004 70200 81201 22263 02272 20601 323// 40604 5//// 80219

BBXX TEST2 20124 99424 31685 41497 81221 10125 20108 40036 57015 75152 877// 22284 00149 20405 32515 40506 50804 80116

BBXX TEST3 25181 99543 71516 41996 03315 10025 21072 49825 54000 72160 80000 2222/ 20601 313// 40705 5//// 81006

Notes on Inter-dependability in Ob 3

1. It does allow non-entry of ship speed vs
2. It does allow entry of long period (6 sec) and low wave height (0.5m) for wind waves even when 15m/s of actual wind is coded.
3. Does not allow 0.5hPa AP change with 'no change' characteristic (4) – had to code 0.0hPa to move forward
4. Does not allow warmer WB than DB – entries reversed
5. Does not allow 2/8 low cloud when total = 0, changed to 0/8 low cloud
6. Does not allow a cloud height if total = 0, 'cloudless' entered
7. Does not allow a low cloud type to be entered if no low cloud – 'no cloud' entered
8. Does not allow present weather Rain with 0 cloud – had to change ww to rain in past hour

Note - entry of Visibility in TW2.12 is in nautical miles not km.

TurboWin 3.6 – Brian Sharp, Australian Bureau of Meteorology

BBXX TEST1 12003 99105 50247 41699 30708 10257 20199 40125 52004 70200 81201 22263 02272 20601 323// 40604 5//// 80219

BBXX TEST2 20124 99424 31685 41497 81223 10125 20108 40036 57015 75152 877// 22284 00149 20405 32515 40506 50804 80116

BBXX TEST3 25181 99543 71516 41995 03315 10025 21072 49825 54000 72160 80000 2222/ 20601 313// 40705 5//// 81006

Prompts from TurboWin 3.6 re last observation

Air temperature must be greater than or equal to wet bulb

If cloud cover = cloudless Cl must be 0/8

If total cloud cover = cloudless then Ch Cm and Ch must be 0/8

If air pressure characteristics = steady amount of pressure tendency is zero.

TurboWin 4.0 – Graeme Ball, Australian Bureau of Meteorology

BBXX TEST1 12003 99105 50247 41599 30708 10257 20199 40125 52004 70200 81201 22263 02272 20601 32300 40604 5//// 80219

BBXX TEST2 20124 99424 31685 41396 81223 10125 20108 40036 57015 75152 877// 22284 00149 20405 32515 40506 50804 80116

BBXX TEST3 25181 99543 71516 41995 03315 10025 21072 49825 54000 72160 80000 22225 20601 313// 40705 5//// 81006

Notes on TEST3 during data entry
---
(1) Air temp must be >= wet bulb
(2) Speed of ship if left as unknown (default option) then accepted, but if set to 0 then ship must be stationary
(3) If total cloud cover = cloudless then Cl must be 0/8
(4) If total cloud cover = cloudless then height of base of lowest cloud must be cloudless

Notes on TEST3 prior final message generation
---
(1) If pressure tendency = steady then amount must be 0
(2) If total cloud cover = cloudless then Cl must be no clouds
(3) If total cloud cover = 0 then present weather cannot indicate drizzle at the time of observation

Additional notes
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(1) Original wind wave data did not give rise to any error messages

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Annex 6 OBSJMA TEST Observations

Submitted by Toshifumi Fujimoto, Japanese Meteorological Agency, March 2008

Observation 1 (OBSJMA)

BBXX TEST1 12003 99105 50247 41599 30708 10257 20202 40125 52004 70200 81201 22263 02272 20601 323// 40604 80219

(Note)
As the height of lowest cloud should be input in the unit of metre for OBSJMA, we input 914.4 m instead of 3000 ft.

Observation 2 (OBSJMA)

BBXX TEST2 20124 99424 31685 41497 81223 10125 20109 40036 57015 75152 877// 22284 00149 20405 32515 40506 50804 80116

(Note)
As the height of lowest cloud should be input in the unit of metre for OBSJMA, we input 304.8 m instead of 1000 ft.
As OBSJMA does not have a function of correcting station level pressure into MSL pressure automatically, we corrected the station level pressure, 1000.6 hPa, into the MSL pressure, 1003.6 hPa, manually using our height correction table.
OBSJMA warned, “Under the present weather, visibility can't be over 10km. (RxhVV, 7wwWW)”.

Observation 3 (OBSJMA)

BBXX TEST3 25184 99543 71516 41996 03329 10025 21063 49825 54000 72160 80000 22225 20608 313// 40705 81006

(Note)
As height of lowest cloud should be input in the unit of metre for OBSJMA, we input 457.2 m instead of 1500 ft (*).
As wind speed should be input in the unit of knots for OBSJMA, we input 29 knots instead of 15 m/s.
The warning messages of OBSJMA were as in the below table for entering the given values of Observation 3.
As OBSJMA made no warning for wind wave period, we did not change the value 6 seconds into 3 seconds.

Observed parameters	Data	Warning in inputting data	Warning in saving data
Height of lowest cloud h	457.2 m (*)		When total cloud cover is 0, enter '9' as the cloud height.(Nddff,RxhVV)
Amount of low cloud N_h	2		Total cloud cover can't be smaller than the amount of the lowest cloud.(Nddff,8nLMH)
Type of low cloud C_L	1		When total cloud cover is 0, 8nLMH should be '80000'.(Nddff,8nLMH)
Dry Bulb Temp TTT	-0.6 deg	Element (Wet bulb temperature) must be smaller than or equal to Element (Air temperature)	
Wet Bulb Temp $T_bT_bT_b$	2.5 deg	Element (Wet bulb temperature) must be smaller than or equal to Element (Air temperature)	
Pressure change amount ppp	0.5 hPa	If Element (Type of tendency) equal 4, Element (Amount of change) equal 0	
Present weather ww	Intermittent light rain		Present weather and type of CL clouds are inconsistent.(7wwWW,8nLMH) Present weather and type of CM clouds are inconsistent.(7wwWW,8nLMH) Total cloud cover can't be 0 under the present weather.(Nddff,7wwWW)
Speed of ship v_s	Not given		Ship's average speed must be entered.(222Dv)
Wind Wave period P_wP_w	6 seconds		No warning
Wind Wave Height H_wH_w	0.5 metre		Wind speed is too fast considering the wave height.(Nddff,2PwHw)

Annex 7 **SEAS TEST Observations**

Submitted by SEAS by Robert Luke, NOAA, USA, March 2008.

VOS Panel International E-Logbook Inter-comparison

Electronic Logbook Types to be included in the Inter-comparison
SEAS Version 6.57

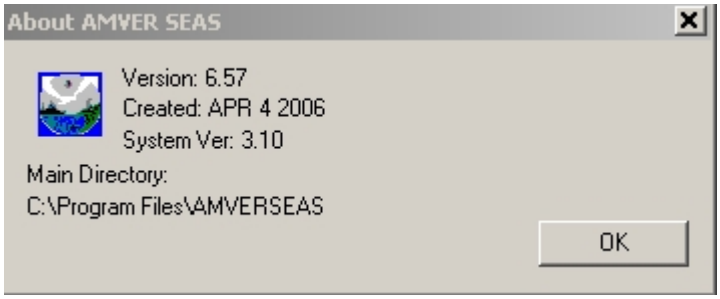

Figure 1 - SEAS VERSION DETAILS

The Sample Observations

Notes:

1. For all three observations, assumed Dry Bulb temperature was measured and not a computed value.

Observation 1
BBXX TEST1 12003 99105 50247 41599 30708 10257 2020/ 40125 52004 70200 81201 22263 02272 20601 323// 40604 5//// 6//// 80219 ICE /////=

Notes:
1. Past Weather 1(W_1) could not be encoded with a lower code value than Past Weather 2 (W_2). Data parameters switched and observation encoding accepted.

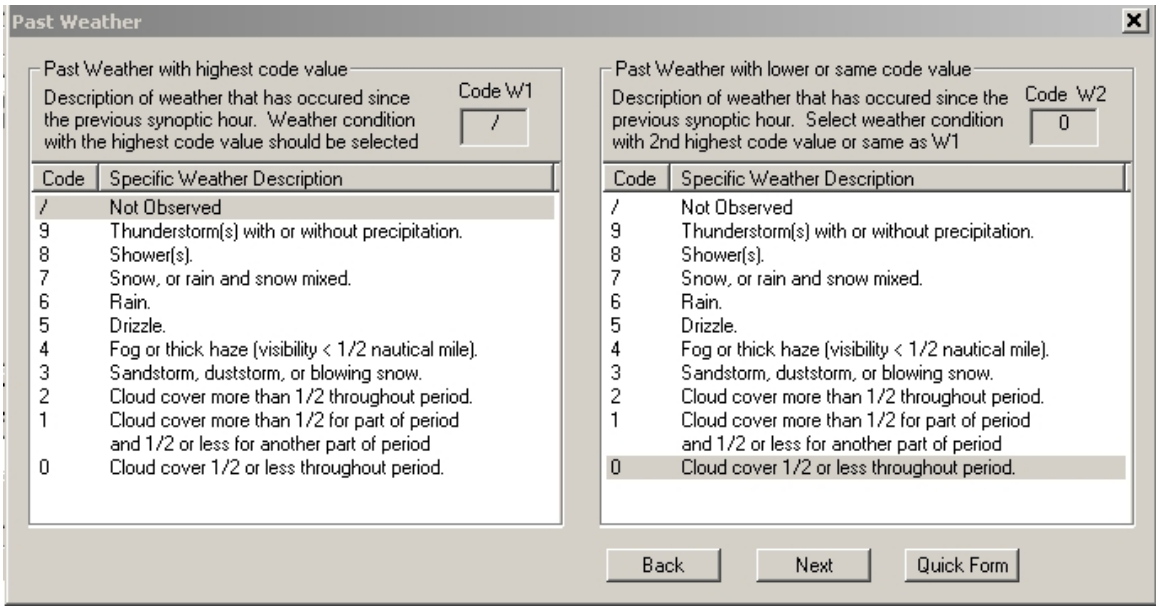

Figure 2 - Initial Past Weather Encoding

Figure 3 - past Weather Error Notice

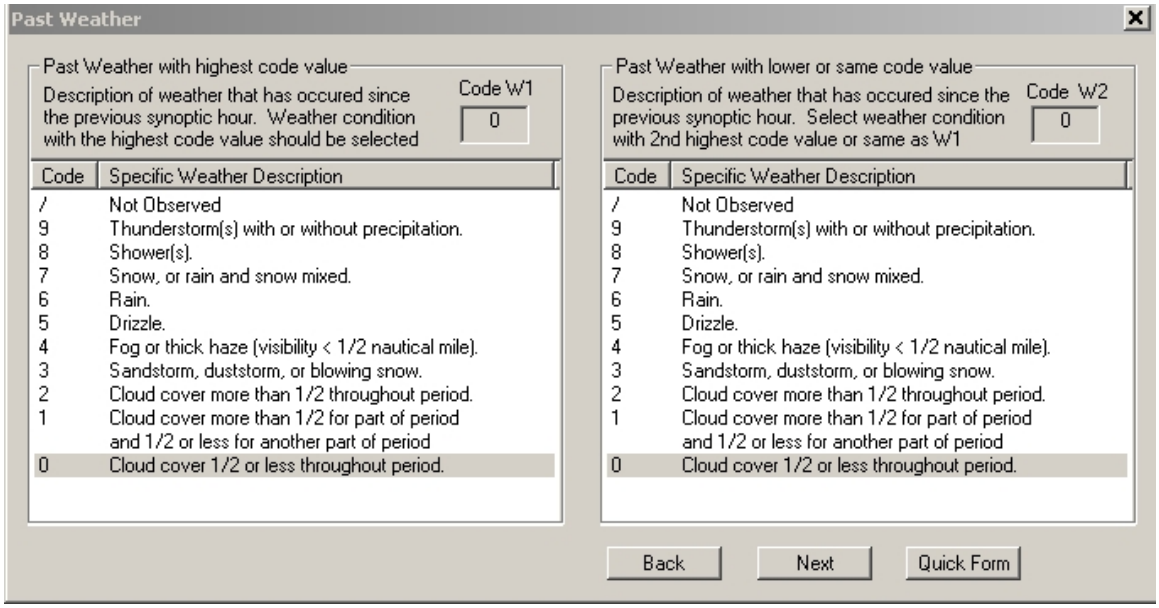

Figure 4- Correction to Past Weather parameters

Observation 2
BBXX TEST2 20124 99424 31685 41496 81222 10125 2011/ 40006 57015 75152 877// 22274 00149 20405 32515 40506 50804 6//// 80116 ICE /////=

Notes:

1. Height of lowest cloud could either be a code figure 3 or 4. Selected 4 due to prevailing visibility value.
2. Past Weather 1(W_1) could not be encoded with a lower code value than Past Weather 2 (W_2). Data parameters switched and observation encoding accepted.

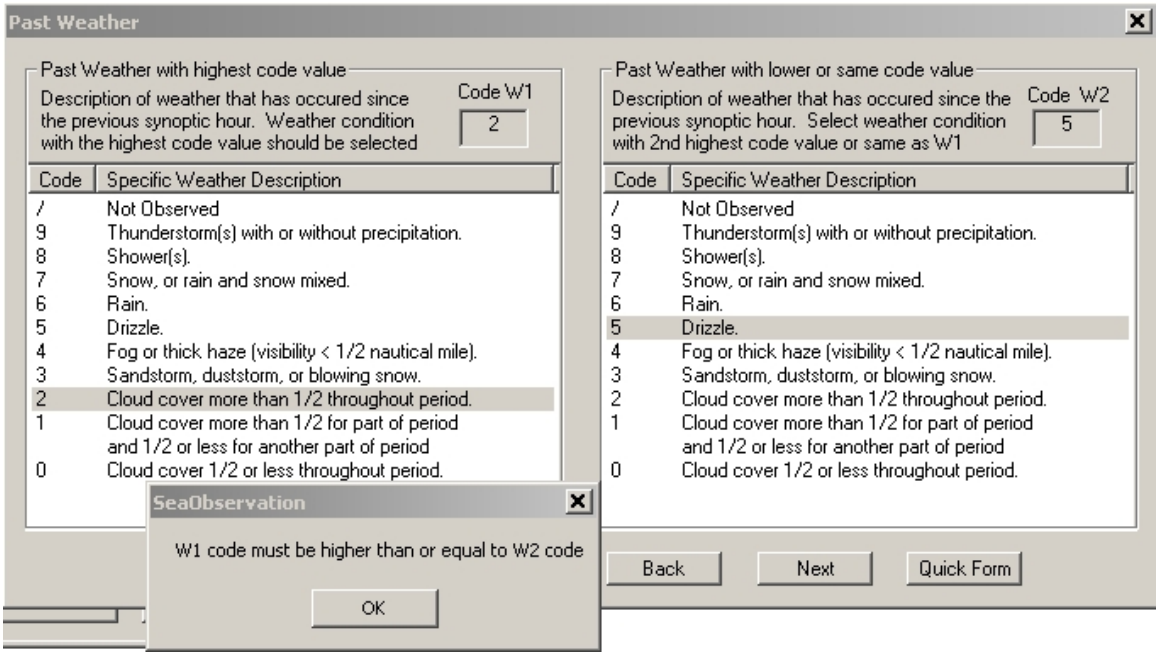

Figure 5 - TEST 2 past weather selection priority issue

Observation 3

BBXX TEST3 25184 99543 71516 41996 03329 10025 2107/ 49825 54000 72160 80000 2221/ 0//// 20601 313// 40705 5//// 6//// 81006 ICE /////=

Notes:

1. This is a corrected observation. Seas would not accept the values that were in error.
2. SEAS allow Observer to override QC if they feel data is truly correct. However, this is not set as default choice.

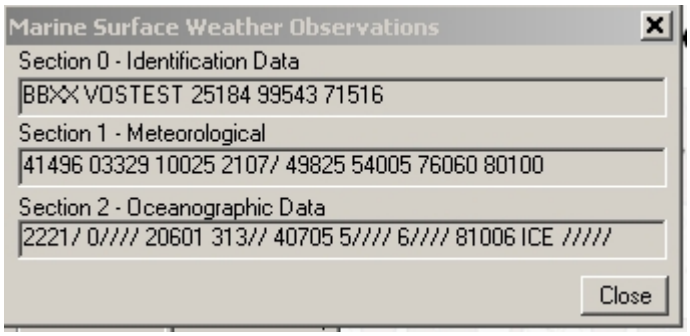

Figure 6 - Encoded observation with errors before QC Review

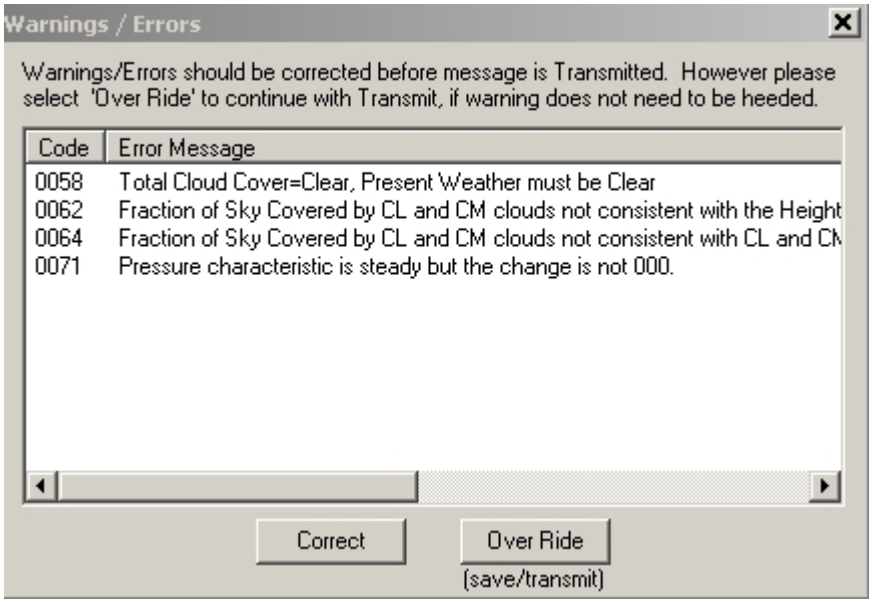

Figure 7 - TEST3 List of encoded errors

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ANNEX E

E-Logbook Manufacturers Responses

10/09/08 KNMI - comments about correlation of Wind Speed, wave height and ship position – a warning may not always valid if ship in e.g. lee conditions

11/09/08 JMA – OBSJMA can calculate MSL manually. Position – can't check for position sequence, but checks for and rejects positions over land

12/09/08 NOAA – SEAS checks for position errors – compares successive positions and flags a huge distance to alert to position errors

12/09/08 Graeme Ball – no swell coding reply to KNMI. Requests information on how calm sea is coded in all E-logbooks.

12/09/08 KNMI – Likes Graeme Ball's suggested redesign of swell pages for TurboWin. Comments about 'no swell' 3 group = 30000. Climate community had in the past-advised KNMI that they wanted to see 40000 and 50000 to show zero period and zero height.

17/09/08 Sarah North - comments on KNMI's wind speed and wind wave correlation-warning message – re lee conditions etc.

17/09/08 Gustavo Goni – Says should be easy to get SEAS to report Dew point to 10ths. SEAS Wind Speed entry is in knots – he questions whether there should be a check box warning to show entry is in knots.

19/09/08 Sarah North - Do other countries use E-logbooks on rigs? Wants groups with no data (e.g. 5////) omitted to save communications costs

23/09/08 KNMI – Is adding a warning message re wind/wave correlation. Will be in TurboWin ver4.5

24/09/08 NOAA – Using SEAS and reporting zero swell or calm, SEAS outputs 3//// 4//// 5////.
SEAs can be used for fixed stations, but position needs to be entered at every Ob, and course and speed entered as stationary. Air Pressure can only be entered as MSL. WSD is at station height (like a ship); the actual observing height is contained in the SEAs setup data, which forms part of the SEAS archive. There is no specific 'land' setup, just a ship set up.

3, 10 and 29 Oct 2008 – JMA – OBSJMA used for ship data only (no land applications).
JMA omits groups 3, 4 and 5 in the case of no swell, or no observation of swell. A screen dump example of 'no swell' selected showed an output, which omitted groups 3, 4 and 5.

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ANNEX F

Electronic Logbook Inter-Comparison Report

1. Background

At SOT-IV, Geneva, April 2007, the ETMC recommended that the Task Team on Instrument Standards should compare the output from the different types of electronic logbook software and report on the findings. Refer SOT-IV Final Report Items I-2.1.13 and IV-3.5.7.

2. Objective

The objective of the inter-comparison was to compare the BBXX output from different types and versions of Electronic logbook software in common use, using identical test datasets.
The inter-comparison, as well as comparing the BBXX output, also checked the coding, computational algorithms, and the effectiveness of the in-built quality control mechanisms to reject 'bad' data.

3. The Inter-Comparison

In February 2008, three sets of metadata and associated raw observation data were created and sent to volunteers to use to compile observations using the various types of E-Logbook. The resultant coded BBXX observations were then compared and a report on the findings including summary and recommendations was produced on 14 August 2008. (*Annex D*).

4. Feedback from E-Logbook Manufacturers

The 'E-Logbook Inter-Comparison Results' report was sent to the three E-logbook manufacturers (KNMI for TurboWin, JMA for OBSJMA and NOAA for SEAS) and the members of TT on Instrument Standards, on 2 September 2008, seeking feedback on how the Recommendations might be implemented. The manufacturers' responses are summarized in *Annex E*. Discussion centred on the recommendations made in the report, but widened to examine practices regarding the coding of swell and look at whether groups with no data could be omitted from transmission to save communications costs. A check was also made to find out whether the three E-logbook types checked for position errors, and it was found that both TurboWin and SEAs checks successive positions and queries the entry if the ship has moved an abnormal distance, while both TurboWin and OBSJMA query positions reported 'over land'.

5. Swell Coding

In the feedback that followed the circulation of the Inter-Comparison Report, there was considerable discussion about the coding of swell, in particular the need to differentiate between swell not observed (i.e. no data) and no swell (calm sea). The Inter-Comparison revealed that the 3 E-logbook types coded these differently. For example, 'no swell' entered in SEAS, produces an output of 3//// 4//// 5////, while OBSJMA omits groups 3, 4 and 5 in the case of 'no swell' or 'no observation of swell'. TurboWin codes 3000 4//// 5////. There was also discussion about the need to transmit groups containing no data, with a strong plea to reduce the number of groups transmitted to save on communications costs.

In an effort to force consistency across all E-logbook types, and (1) considering the interpretation by some participants in the comparison regarding the coding for FM13 in the WMO Manual on Codes No.306, and (2) a desire to reduce transmission costs by omitting groups with no useful data, the Task Team proposes five recommendations regarding the coding of swell. These are described in full under **6.Recommendations No. 3** below.

6. Recommendations

The Task Team proposes that Recommendations numbers 1, 2, 4, 5 and 6 from the original report be accepted, and that Recommendation No.3 regarding swell be extended to cover all swell coding options as described below.

1. That all E-Logbook software report Dewpoint to one decimal place.

2. That the algorithm for calculating dewpoint be standardised between E-Logbooks.

3. Swell coding:

   (1) When swell 'not determined' = 3//// 4//// 5////. Recommendation is to omit the 3, 4 and 5 groups in the coded observation.

   (2) When 'no swell' i.e. calm sea = 30000 40000 50000. Recommendation is to code 30000 and omit the 4 and 5 groups in the coded observation. By inference, if the 3 group is reported as 30000 then the 4 and 5 groups **must** be 40000 and 50000 respectively, in which case they provide no useful additional information.

   (3a) When confused swell (plus confused height and period) = 399/// 4//// 5////. Recommendation is to omit the 5 group in the coded observation.

   (3b) When confused swell (height and period estimated) = 399// 4xxxx 5////. Recommendation is to omit the 5 group in the coded observation. Note: x = valid data

   (4) Coding of 1 swell = 3xx// 4xxxx 5////. Recommendation is to omit the 5 group in the coded observation. Note: x = valid data

   (5) Coding 2 swells = 3xxxx 4xxxx 5xxxx. Recommendation is to code all groups. Note: x = valid data

4. That TurboWin and SEAS software implement a QC check to correlate the reported wind speed with wind wave height.

5. That all E-Logbook software provide more on-screen information to aid in the selection of the correct code figures for Visibility (VV) and Height of base of lowest cloud (h) when the ranges and heights are at the boundaries of the levels. Refer to WMO manual on Codes (WMO No 306) FM13-XII Ext. SHIP. For VV refer to WMO code table 4377 and note that if the distance of visibility is between two of the distances given, the code figure for the smaller distance shall be reported. For h refer to WMO code table 1600 and note that a height exactly equal to one of the values at the ends of the ranges shall be coded in the higher range.

6. That SEAS and TurboWin prompt for the entry of ship speed if it is not entered.

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ANNEX G

Changes for ISO 10596 recommended by the SOT Task Team on Instrument Standards, and the JCOMM focal point on CIMO matters

1. Background

Discussions were established between the SOT Task Team on Instrument Standards and Dr. Chung-Chu Teng (NOAA, National Data Buoy Center, USA), the JCOMM Focal Point on WMO Commission for Instruments and Methods of Observation (CIMO) matters (FP/CIMO) in order to coordinate efforts between SOT and ISO and contribute to the development of ISO standard 10596 for marine wind vanes and anemometers.

2. Objective

The objective of the SOT-TT and the efforts of the FP/CIMO were to ensure that the marine observing community and equipment quality standards were maintained as per the WMO No. 8 Publication.

3. The Inter-Comparison

In November 2008, the FP/CIMO and the SOT Task Team on Instrument Standards Chairperson (Robert Luke, NOAA, National Data Buoy Center) held discussions regarding the proposed ISO 10596 changes. Numerous items did not match with the WMO No. 8 even though the ISO 10596 used the WMO No. 8 as one of its main references.

The list of changes suggested by the FP/CIMO and the SOT Task Team on Instrument Standards were:

Initial Comment from FP/CIMO –

- 'While this standard directly relates to marine applications it should not define different ISO test standard for anemometer and wind vane accuracy or performance. Any difference in testing should be directly related to the marine environment. If multiple ISO standards exist, some not as stringent as other, the consumer will not have a clear understanding of what quality sensor they are dealing with if it is stated that it was tested to ISO standards."

Section 1- Scope

- Replace "velocity" with "speed"
- FP/CIMO Comment – "Wind velocity is a vector measurement indicating wind speed and direction. Care should be taken not to use speed, a scalar value, and velocity as interchangeable."

Section 3 – Terms and definitions

- 3.1 should read "magnitude of straight-line moving distance of airflow per unit time on a horizontal plane passing through the anemometer."
- 3.2 should read, "wind direction is the direction from where the wind is blowing from on a horizontal plane passing through the wind vane."
- 3.3 If wind speed measurement range is defined, the wind direction measurement range should also be defined:

  "wind direction measurement range - range of measurable wind direction within the accuracy specified in this standard."

- 3.4 should read "range of airflow temperature in which wind speed and wind direction can be measured within the accuracy specified in this standard."
- 3.5 should read, “the distance the air flows past a rotating type anemometer during the time it takes the rotor to reach (1-1/e) or 63% of the equilibrium speed after a step increase change in air speed.”
- .3.6 should read “the amount by which a measurement made by a wind vane/anemometer exceeds or falls short of the true values of wind speed and direction.”
- Add Time Constants definition of “the time required for a wind sensor to detect and report a ~63% of a step-function change of the input speed.”
- Add Relative Wind Speed and direction “Wind Speed and direction as described above but without compensating for the actual course and speed of the ship.”
- Add True Wind Speed and direction “Wind Speed and direction as described above but corrected for ships’ own course and speed. “

Section 4 – Type

- FP/CIMO comment “The use of the term anemometer to strictly represent a device to measure wind speed becomes problematic with the introduction of ultrasonic anemometer since they measure both speed and direction without the use of a wind vane.”
- 4.1.1 should read “A rotation anemometer whose axis of rotation is horizontal. The instrument has, either flat or helicoidally shaped blades. The axis of rotation has to be oriented parallel to the direction of the wind by an auxiliary wind vane.”
- 4.1.2. should read “A rotation anemometer whose axis of rotation is vertical. Cup anemometers with wind vane usually consist of three or four hemispherical or conical cups mounted with their diametrical planes vertical and distributed symmetrically about the axis of rotation. A cup anemometer does not require the use of a wind vane for its correct orientation.
  A wind vane consists basically of an asymmetrically-shaped object mounted at its centre of gravity about a vertical axis of rotation.”

- 4.2 should read “An anemometer which measures the effect of the local wind speed and wind direction on the propagation of ultra sonic waves in the air.”

Section 5 – Composition

- FP/CIMO Comment “Two other issues should be addressed in composition. First, most meteorological applications measure the averages of wind speed and direction and provide data on wind gusts. Hence, a complete system should include a processing device that can produce averaged data between 2, 10 and 60 minutes and peak gust information. The second issue for measuring wind speed and direction on ships is distinguishing between relative and true wind. For meteorological purposes, true wind data is required. Hence, ship speed and direction must be corrected in the relative wind measurement.”
- 5 should read “A wind vane/anemometer is composed of the wind vane/anemometer sensor (hereafter simply referred to as “sensor”), display, etc. The sensor shall have measurement functions for wind direction and wind speed, and the display shall be capable of indicating the measured wind direction and wind speed.”

Section 6 – Functionality

- FP/CIMO Comment “This functionality description is centred on ships. What about other marine platforms for wind measurement.”
- 6.2 should read, “The sensor shall have measurement functions for wind direction and wind speed, whose range and accuracy are specified 7.1 and 7.2 respectively, and the display shall be capable of indicating the measured wind direction and wind speed.

- 6.2 should read, **"**The wind vane/anemometer shall be capable of outputting analogue or digital signals, which can be distributed to the bridge and other necessary locations. Where digital signals are used, at least one of them shall satisfy IEC 61162-1.
- FP/CIMO Comment "There should be some discussion on sensor positioning for optimal wind speed and direction measurement. It is difficult to provide good wind sensor exposure on a ship to prevent local effects produced by the mast, superstructure, etc. Section 4.2.5.2 of Chapter 4 of Part II of the CIMO Guide provides some guidelines for shipboard wind sensor positioning."

Section 7 – Performance and accuracy

- 7.1 Table 1 – Wind Speed Measurement range should be increased to 75 m/s to match WMO No. 8 requirements.
- 7.1 Table 1 – Wind direction Minimum measurement unit should be decreased to 01° to match WMO No. 8 requirements.
- 7.2 Table 2 – Wind Speed accuracy should use "speed" not "velocity."
- 7.3 a) should read, "At the minimum level of the wind speed measurement range, the propeller, or cup of an anemometer shall start and maintain rotation from any position."
- 7.3 b) should read "At the minimum level of the wind speed measurement range, the blades in windmill type, and tails in cup types of a wind vane shall remain parallel to the airflow.
- 7.4 FP/CIMO Comment "WMO standard is a 2 to 5 m distance constant - see CIMO Guide 8 Chapter 1 Part I."

Section 8 – Test

- ***8.1.1 a) - FP/CIMO Comment – "Should be replaced with ASTM International standard for determining the dynamic performance of a wind vane ASTM D5366-96."***
- 8.1.1 b) – FP/CIMO Comment – "Ultrasonic anemometers should be tested at indices less than 90 degrees apart. Sonic anemometers have the added complication of possible turbulence created around the transmitter/receiver posts at higher wind speeds. Typically, the accuracy generated at a wind speed of 2 m/s or less will not hold for higher wind speeds. Hence, should be performed at varying speeds at indices of 15 degrees or less. ISO procedure 16622 section 8.3.1 provides testing procedures for ultrasonic anemometers. Testing of ultrasonic anemometers should just be listed as complies with ISO 16622."
- 8.1.1 b) 2) should read "Align the direction of the wind tunnel air flow axis and the mark on the sensor indicating the direction of the bow.
- 8.1.2 FP/CIMO Comment – "Wind Speed testing should be performed according to ISO 16622 for ultrasonic anemometers and ISO 17713-1 for rotary /vane anemometers."
- 8.1.2 a) should read "Wind speeds to be measured shall be the lower limit of the measurement range, 5, 10, and 30 m/s, and the upper limit of the measurement range. However, the wind speed of the wind tunnel does not need to reflect these figures exactly; inspections can be conducted using approximate values."
- 8.1.2 b) should read "Indications of the wind speed of the wind tunnel and the anemometer shall be measured under stable wind speed in increments of 0,1 m/s. Tolerance below 10 m/s is ± 0,5 m/s and above 10 m/s is wind tunnel speed x 5%.
- 8.2.1 FP/CIMO Comment – "Should use ASTM International Standard D5366-96 for wind vane starting speed."
- 8.2.2 FP/CIMO Comment – "Should use section 8.1 of ISO 17713-1 for inspection of wind speed starting threshold."
- 8.2.2 a) should read "Use a wind tunnel meeting the requirements in 8.5.1 and set the wind speed at the lower limit of the measurement range of the anemometer."
- 8.2.2 b) should read "Hold the wind-receiving part of the anemometer at a given position, and then release. Confirm that it resumes rotation starting from several initial positions."
- 8.2.2. c) should read "The wind-receiving part of the anemometer (propeller, impeller, or cups) shall remain rotating from whichever position it starts rotation."

- 8.3 FP/CIMO Comment – “Should use section 8.3 of ISO 17713-1”
- 8.3 a) should read” The wind speed (m/s) of the wind tunnel specified in 8.5.1 shall be set at [approximately 10 m/s].
- 8.3 b) should read, “Hold the rotor of the anemometer in a stationary position and then release it. Record the elapsed time in seconds to reach 0.63% V (m/s). This is the time constant “S” of the anemometer. “
- 8.5.1 FP/CIMO Comment “Nearly impossible to generate test conditions that would determine measurement accuracy to Table 2 with this method.”
- 8.5.2 should read “The equipment shall be capable of providing stable rotation to the rotating axis of an anemometer and shall allow reading of rotational speed.”
- 8.5.3 b) should read “The wind direction inspection board shall bear a mark indicating the direction of the ship’s bow, and shall be scaled from 0° to 359° from 0° clockwise.”
- 8.5.3.c) should read “For a wind direction inspection board for anemometers that use ultrasonic waves, when setting the wind direction inspection board on the wind tunnel inspection table, the rotation angles of the wind direction inspection board shall be readable in increments of 1°.”
- 8.5.3.d) Delete second paragraph.
- 8.6.1 a) FP/CIMO Comment – “When would anemometers be installed indoors? Is this for the display? Delete indoor parameters.”
- 8.6.1.c) should read “Operating electrical range”
- 8.6.1 c) FP/CIMO Comment, “The lower value should be reduced to allow for low power applications (i.e. 3.3 V dc).”

Section 10 - Marking

- 10.2 should read, “A marker to align the base position of the wind direction (0°) with the direction of the bow of the ship shall be placed at an appropriate place on the sensor of the wind vane/anemometer.”
- 11 FP/CIMO Comment “Site the wind sensor as far forward as high as practical. The top of the foremast is typically considered a good mounting site. The sensor should be mounted in a position at a distance of at least 10 mast diameters away from the mast. Rule of thumb is the sensor should be placed 10 times the diameter of an obstruction away from that obstruction. A 2004 study by the Royal Meteorological Society provides some additional guidelines for VOS ships. See the following link http://www.wmo.int/pages/prog/amp/mmop/
- documents/Jcomm-TR/J-TR-13-Marine-Climatology/REV1/joc1177.pdf.”

Bibliography

- FP/CIMO Comment “The following standards should be used in the development of this standard and should be referenced in the bibliography:
  - ISO 16622:2002 - Meteorology - Sonic anemometer/thermometers - Acceptance test methods for mean wind measurements
  - ASTM D5366-96 (2002) e0, "Standard Test Method for Determining the Dynamic Performance of a Wind Vane.”

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ANNEX H
ISO 10596 Recommended Changes

In an effort to ensure continuity and quality of worldwide-fielded wind equipment, the SOT Task Team on Instrument Standards proposes the following recommendations.

4. Recommendations

The Task Team proposes that Recommendations listed below be accepted and implemented by the SOT:

1. That the WMO Secretariat contact the ISO TC 8/SC 6 group and request the following:

    d) These proposed changes be reviewed by TC 8/SC 6 for possible inclusion into the ISO 10596.
    e) Ensure that the changes to Section 7 are incorporated into ISO 10596 or proper response provided to the WMO Secretariat and SOT as to why the variance of WMO No. 8 Requirements cannot be implemented.
    f) A proper revision of ISO10596 is promulgated for review and publication within normal WMO/ISO channels.

2. That the SOT national focal points coordinate nationally with their ISO/TC or SC representative to ensure FP/CIMO Proposed changes are incorporated.

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ANNEX I

Status of Actions Agreed At SOT IV

Status of action items from SOT IV relating to TT on Instrument Standards

I-2.1.13 and IV-3.5.7	To conduct a comparison study of electronic logbooks (including algorithms, and documenting the calculation methods of dew point for historical purposes), with participation from both SOT and ETMC	TT/Instr	Done. Electronic Logbook comparison is complete. The dew point calculation information has been forwarded to ETMC for their review
I-6.3.2 and I-6.3.6	To continue the efforts of developing high quality best practices for the VOF with the goal of publishing them as a JCOMM Technical Report during the next intersessional period	TT/Instr; Secretariat (WMO)	Still under review.
I-6.3.7	To investigate how the different publications or technical documents dealing with best practices could be better integrated into fewer number of documents or into existing ones	TT/Instr	Inadvertently overlooked. Will begin collating information asap.

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APPENDIX I

REPORT BY THE TASK TEAM ON CALL SIGN MASKING AND ENCODING

(submitted by Graeme Ball on behalf of the Task Team)

1. Current Terms of Reference

Tasks

(i) Oversee the implementation of MASK and ENCODE and develop guidelines as necessary;

(ii) Review and approve national MASK schemes to ensure they remain unique and do not impinge on (1) the ITU callsign series allocated to a country, or 2) any other marine or oceanographic identification scheme used by WMO, e.g. buoy identification numbers;

(iii) Ensure the MASK v REAL database is kept up-to-date by NMSs implementing MASK;

(iv) Develop the ENCODE encryption strategy, as well as develop the encoding and decoding keys.

Members

- Graeme Ball (SOT Chairperson, Australia)
- Julie Fletcher (VOSP Chairperson, New Zealand)
- Scott Woodruff (ETMC Chairperson, USA)
- Hester Viola (DBCP/SOT Technical Coordinator, France)
- Colin Parret (United Kingdom)
- Robert Luke (USA)
- WMO Secretariat representative

2. Status of Action Items from SOT-IV

Nil action items.

3. Ongoing Activity / Standard Tasks

Task 1

(i) The Task Team prepared instructions for members considering implementing a MASK Callsign Masking Scheme, see Appendix 1. The instructions, covering initial and ongoing requirements, were distributed via the SOT and VOS mailing list and are available on the VOS website at the following link:
(ii) < http://www.bom.gov.au/jcomm/vos/documents/mask_implementation_instructions.pdf >.

(iii) The Task Team established the rules for accessing the MASK v REAL database at JCOMMOPS. These rules were incorporated in a letter from WMO to PRs, ref: OBS/WIGOS/OSD/MAR/SOT, dated 26 January 2009.

Task 2

(i) The Task Team approved a submission from Australia to implement a MASK callsign-masking scheme.

(ii) The Task Team recorded the details of existing MASK-like schemes operated by E-Surfmar, E-ASAP and SeaKeepers.

(iii) The Task Team was involved in the discussion pursuant to the establishment of a WMO numbering system for underway sampling reports (TESAC) from seals.

Task 3

(i) JCOMMOPS has not yet developed the MASK v REAL database, but, as an interim measure, has developed a flat file available by secure FTP. The unique username/password to this FTP was provided to the SOT chairperson.

(ii) JCOMMOPS confirms that the MASK v REAL list is up-to-date. Routine updates were received from:

(a) AU VOS. Quarterly, latest update on 11 February 2009 (4 Ships)
(b) EU VOS. Quarterly, latest update on 15 January 2009 (135 Ships)
(c) E-ASAP. Once only on 22 April 2008 (13 ships)

3.

(iii) JCOMMOPS Tasks:

(a) Upgrade the JCOMMOPS Information System to manage this new information: database structure modification, loading/export scripts development. (done)
(b) Develop web based products to distribute such information, with appropriate security level (individual passwords for MASK Focal Points, web pages to browse archives) (March-April 2009)
(c) Review security aspects of all existing web services (April 2009)
(d) Adapt existing services to this new scheme (in particular the QC Relay tool) (April-May 2009)

Task 4

(i) No action during the inter-sessional period. This will be a focus of attention post SOT-V.

4. Recommendations

Nil.

5. Review the Terms of Reference

The Task Team does not propose any changes to the current Task List.

The Task Team recommends that Mathieu Belbeoch, new SOT/TC, replace Hester Viola, former SOT/TC, as a member of the Task Team.

6. Summary of action proposed

The panel is invited to:

(i) Note the information contained in this report and comment as appropriate;
(ii) Review the Tasks of the Task Team;
(iii) Review existing Task Team memberships and encourage new members.

Annexes to Appendix I:

Annex 1 Task Team recommendations for members considering implementing a MASK Callsign Masking Scheme
Annex 2 Copy of the letter to the Permanent Representative of USA regarding archiving of unmasked VOS data for climate use

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ANNEX 1

TASK TEAM RECOMMENDATIONS FOR MEMBERS CONSIDERING IMPLEMENTING A MASK CALLSIGN MASKING SCHEME

SOT and VOS Focal Points
via JCOMMOPS mailing lists

IMPLEMENTING A MASK CALLSIGN MASKING SCHEME

Purpose

To advise SOT and VOS Focal Points of the initial and recurring obligations for a country implementing a **MASK** callsign-masking scheme.

Background

2. At SOT-IV, Geneva 2007, there was considerable debate regarding callsign masking for the VOS and the methods by which this could be achieved. A long-term solution dependent on BUFR for message dissemination on the GTS, and utilising an encrypted callsign formed from random data elements in the message, gained widespread support. This solution however cannot be implemented until 2013 when BUFR is mandatory. In the short- to medium-term two schemes were ultimately endorsed as follows:

    a. **SHIP:** where the true ITU callsign (**REAL**) is replaced by the generic callsign **SHIP**. This can be done either on the ship or by the NMS prior to distributing the BBXX on the GTS. NMS replacing **REAL** with **SHIP** prior to distributing the BBXX on the GTS are required to have systems in place that will make the original (**REAL**) data available for monitoring purposes in near real-time to the monitoring centres, or

    b. **MASK:** where the true ITU callsign (**REAL**) is replaced in the BBXX sent from the ship by an alternative and unique callsign (**MASK**) provided by the NMS. NMS implementing this method are required to provide JCOMMOPS with a regularly updated list of their ships using **MASK**.

3. Japan and the USA have adopted the **SHIP** scheme and are working towards fulfilling their obligations to make the original (**REAL**) data available in near real-time.

4. Some other countries have introduced, or are considering introducing a **MASK** scheme. The remainder of this document is for countries implementing a **MASK** scheme.

Initial Obligations

5. Countries considering introducing a **MASK** scheme must first provide the details of their proposed scheme to the *SOT Task Team on Callsign Masking* < sot-tt-masking@jcommops.org >. The Task Team will review the scheme to ensure that it does not conflict with:

    a. The official callsign series allocated by the ITU to another country;

    b. The **MASK** scheme of another country; or

    c. Any other known WMO numbering scheme.

6. If the Task Team discovers any concerns with the proposal, the submitting country will be invited to review its proposal and re-submit it to the Task Team.

Recurring Obligations

7. Countries implementing a **MASK** scheme shall provide JCOMMOPS < mask2real@jcommops.org > with a regularly updated list of ships involved in their national **MASK** scheme. This includes updating the list of ships if there are changes to the assigned **MASK** of a ship, or ships. The list shall be submitted as follows:

    a. **Ship starts using MASK or is assigned a new MASK**:

    The list shall be submitted immediately. The list shall contain all active **MASK** ships including the new ship or new **MASK** that prompted the submission;

    b. **Ship stops using MASK or changes its MASK**:

    The list shall be submitted immediately. The list shall contain all active **MASK** ships and also the de-listed ship or former **MASK** that prompted the submission with its corresponding **MASK** end-date (refer to requirements in para. 9); and

    c. **Quarterly**:

    All active **MASK** ships if there are nil additions or deletions from the last submitted list.

8. It is recommended that the quarterly submission to JCOMMOPS is made at the same time as the quarterly WMO No. 47 (Pub47) update to WMO, i.e. by the 15th day of January, April, July and October.

9. The following details shall be provided in accordance with the scheduling outlined in para. 7:

Country-of-Recruitment	(1)	The country that recruited the vessel for the VOS.
Report-Date	(1)	The date when the current report was prepared.
nmsID	(2)	Unique identification number assigned by the NMS (if applicable).
MASK	(1)	The unique masked callsign provided to the ship by the NMS.
REAL	(1)	The official ITU callsign of the ship.

IMOn	(2)	The number assigned by the IMO to the hull of the ship (if applicable).
Start-Date	(1)	The commencement date of using **MASK** on the ship in question, and reported in **YYYYMMDD** format.
End-Date	(3)	The final date of using **MASK** on the ship in question (if applicable), and reported in **YYYYMMDD** format.

(1) Mandatory in every report | **(2)** Either or both | **(3)** Required only when **MASK** on the ship ends

10. The callsign list submitted to JCOMMOPS shall be a semi-colon delimited text file (**.CSV**) consisting of one ship per line comprising the details described above and formatted as follows:

    Country-of-Recruitment;Report-Date;nmsID;MASK;REAL;IMOn;Start-Date;End-Date;

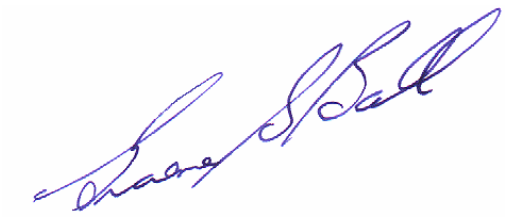
11. If a non-mandatory element is not available it shall be omitted, but the trailing semi-colon must be retained.

    e.g. **AU;20080326;;ABC1234;DEFG;9123456;20080325;;**

12. Submissions to WMO No. 47 shall continue to list ships with **REAL**.

Action

13. That (1) you note the above, and (2) VOS Focal Points in countries implementing a **MASK** callsign masking scheme observe the initial and recurring obligations contained herein.



Graeme S. Ball

Chair, JCOMM Ship Observations Team (SOT)
Chair, SOT Task Team on Callsign Masking

11 April 2008

ANNEX 2

COPY OF THE LETTER TO THE PERMANENT REPRESENTATIVE OF USA REGARDING ARCHIVING OF UNMASKED VOS DATA FOR CLIMATE USE

World Meteorological Organization
Organisation météorologique mondiale

Secrétariat
7 *bis*, avenue de la Paix – Case postale 2300 – CH 1211 Genève 2 – Suisse
Tél.: +41 (0) 22 730 81 11 – Fax: +41 (0) 22 730 81 81
wmo@wmo.int – www.wmo.int

Our ref.: 11105-08/OBS/WIGOS/OSD/MAR/MC

Dr John L. Hayes
Permanent Representative of the United States of America with WMO
National Weather Service International Activities
1325 East-West Highway
SILVER SPRING, MD 20910
United States of America

GENEVA, 11 December 2008

Subject: Archiving of unmasked Voluntary Observing Ship (VOS) data for climate use

Dear Dr Hayes,

As you will recall, Members in line with Resolution 27 (EC-LIX), have implemented specific ship's call sign masking schemes on a trial basis in order to address the issue of ship owners and masters' concerns with regard to Voluntary Observing Ship (VOS) data exchange. Resolution 27 was kept in force by EC-LX.

You will also recall that the Marine Climatological Summaries Scheme (MCSS), established in 1963 (Resolution 35, Cg-IV), has as its primary objective the international exchange, quality control and archival of delayed-mode marine climatological data in support of global climate studies and the provision of a range of marine climatological services. JCOMM has established a cross-cutting Task Team on Delayed Mode VOS Data (TT-DMVOS) and an ETMC Task Team on Marine-meteorological and Oceanographic Climatological Summaries (TT-MOCS) to assist in the modernization of the MCSS. In particular, the TT-DMVOS will focus mainly on modernizing the management and quality control of the delayed-mode VOS data, while at the same time exploring possible connections with the management of real-time VOS and other ship-based data. The TT-MOCS will develop a plan to modernize the production and dissemination of user relevant marine climatological summary products.

The VOS instrument / platform metadata, as provided in the WMO Publication No. 47, *International List of Selected, Supplementary and Auxiliary Ships*, permit to obtain important information about the observing instruments used onboard the ships, including their siting, and are therefore essential for climate studies and for bias correction. As climate studies are based on historical records, it is important to be able to establish the link between the VOS observations and the metadata in the long term archives. Preserving original ship's call sign information from real-time and delayed-mode VOS reports collected and archived by the MCSS Global Collecting Centres (GCCs) - operated by the Met Office, United Kingdom, and Deutscher Wetterdienst (DWD), Germany - is therefore required in order to permit this linkage with the ship's metadata.

cc: Executive Secretary, IOC
TT-DMVOS Members
ETMC Members
Chairperson, SOT
Chairperson, VOSP
Coordinator, JCOMM DMPA
Coordinator, JCOMM OPA
JCOMM Co-presidents

I am writing to you as a WMO Member implementing ship's call sign masking scheme and wishing to protect the identity of VOS as part of a collaboration with the ship owners and masters. I wish to recall that Resolution 27 (EC-LIX) asked all Members implementing a scheme, whereby the official ITU callsign is replaced with the generic SHIP callsign, to: (i) provide for the secure exchange of ITU call signs and reports affected by the masking process, (ii) assist in the timely resolving of real-time monitoring and climate analysis problems, and (iii) minimize the technical implications on the Quality Monitoring of Marine Data set by the Commission for Basic Systems (CBS) Lead Centre.

These issues were recently discussed at the first meeting of the TT-DMVOS and TT-MOCS (Gdynia, Poland, 10 May 2008), and it was suggested that the Global Collecting Centers (GCCs) should eventually be responsible for real-time data collection / storage and provide a secure environment for data processing. When authorized to do so, the GCCs which are collecting both real-time and delayed-mode data streams would be in a position to identify "masked" data and insert the real call sign information as appropriate. However, it is realized that many aspects of the issue still require substantial discussion with the Technical Commissions (i.e., JCOMM, CCI, CBS), and Members implementing such schemes.

As an important and time-critical intermediate step, and until a widely accepted solution is found, the Meeting therefore recommended that for subsequent use for climate studies, Members implementing the generic SHIP callsign masking scheme should ensure the long-term archival at the national level of all VOS data (i.e., FM-13 SHIP and IMMT), including confidential unmasked data and associated metadata, since the initiation of callsign masking. This would permit that all likely unforeseen problems arising from implementation of masking by different countries could eventually be rectified in the climate archives in due course.

I would therefore like to invite you to urgently consider (which hopefully might already be the case) the feasibility of managing and preserving nationally all of VOS data (including real callsigns) since the implementation of callsign masking as detailed above, and contribute, in collaboration with the Ship Observations Team (SOT) and the Expert Team on Marine Climatology (ETMC), to the definition of the conditions by which those unmasked data could be made available to the international archives including the GCCs, and the International Comprehensive Ocean-Atmosphere Data Set (ICOADS). In this regard, I would also be grateful if you could inform me of your perspective on this issue.

I look forward to your continuous and active participation in ocean observations and services activities.

Yours sincerely,

(Hong Yan)
for the Secretary-General

ANNEX 3

COPY OF THE LETTER TO THE PERMANENT REPRESENTATIVE OF JAPAN REGARDING ARCHIVING OF UNMASKED VOS DATA FOR CLIMATE USE

World Meteorological Organization
Organisation météorologique mondiale

Secrétariat
7 *bis*, avenue de la Paix – Case postale 2300 – CH 1211 Genève 2 – Suisse
Tél.: +41 (0) 22 730 81 11 – Fax: +41 (0) 22 730 81 81
wmo@wmo.int – www.wmo.int

Our ref.: 11105-08/OBS/WIGOS/OSD/MAR/MC

Dr Tetsu Hiraki
Permanent Representative of Japan
with WMO
Japan Meteorological Agency (JMA)
1-3-4, Otemachi
Chiyoda-ku
TOKYO 100-8122
Japan

GENEVA, 11 December 2008

Subject: Archiving of unmasked Voluntary Observing Ship (VOS) data for climate use

Dear Dr Hiraki,

As you will recall, Members in line with Resolution 27 (EC-LIX), have implemented specific ship's call sign masking schemes on a trial basis in order to address the issue of ship owners and masters' concerns with regard to Voluntary Observing Ship (VOS) data exchange. Resolution 27 was kept in force by EC-LX.

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cc: Executive Secretary, IOC
TT-DMVOS Members
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These issues were recently discussed at the first meeting of the TT-DMVOS and TT-MOCS (Gdynia, Poland, 10 May 2008), and it was suggested that the Global Collecting Centers (GCCs) should eventually be responsible for real-time data collection / storage and provide a secure environment for data processing. When authorized to do so, the GCCs which are collecting both real-time and delayed-mode data streams would be in a position to identify "masked" data and insert the real call sign information as appropriate. However, it is realized that many aspects of the issue still require substantial discussion with the Technical Commissions (i.e., JCOMM, CCl, CBS), and Members implementing such schemes.

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I look forward to your continuous and active participation in ocean observations and services activities.

Yours sincerely,

(Hong Yan)
for the Secretary-General

ANNEX 4

COPY OF THE REPLY FROM USA REGARDING THE LETTER IN *ANNEX 2*

3015874524

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE
1325 East-West Highway
Silver Spring, Maryland 20910-3283

JAN 8 2009

Rcvd WMO REGISTRY (4) - 9 JAN. 2009

30319-09 OBS/WIGOS/OSD

OSD W.J 15/1/09

The Secretary-General
World Meteorological Organization (WMO)
7 bis, Avenue de la Paix
Case postale No. 2300
1211 Geneva 2
SWITZERLAND

Dear Mr. Secretary-General:

In response to your letter, reference 11105-08/OBS/WIGOS/OSD/MAR/MC, and dated December 11, 2008, please be advised that the United States Voluntary Observing Ship (VOS) program, in conjunction with the Japan Meteorological Agency (JMA) VOS program, has been masking selected callsigns for over one year. Selected ships' call signs are replaced with the generic "SHIP" call sign at the National Weather Service Telecommunications Gateway (NWSTG) for release into the public domain. The periodicity, or control time, for this data is either (1) releasable after 90 days or (2) never released to the public as specifically requested by management of the shipping company. This effort has been a fully coordinated effort with the WMO Ship Observation Team (SOT) and its Task Team on Call Sign Masking and Encoding.

All controlled data, in real time, is sent from the NWSTG to the NWS National Centers for Environmental Prediction for inclusion into the models and to JMA and the U.S. VOS Program Manager, Mr. Robert Luke, at the NWS National Data Buoy Center. As agreed upon at the WMO SOT-V meeting in Geneva in 2007, JMA is the central clearing house for the periodicity-cleared data by NOAA's National Climatic Data Center (NCDC) as part of the International Comprehensive Ocean-Atmosphere Data Set (ICOADS). National hydrometeorological services (NHMSs) can obtain either real-time-controlled or periodicity-cleared data through JMA. Mr. Luke also submits the periodicity-cleared data from U.S.-controlled ships to NCDC and ICOADS for archival on a monthly basis. ICOADS access to the JMA data, the monthly releases from the U.S. VOS Program office, and the WMO No. 47 (International List of Voluntary Observing Ships) metadata allow ICOADS to remain an integral partner in the long-term archival of these critical marine observations.

Thank you for the opportunity to comment on U.S. procedures.

Sincerely,

for John L. Hayes
Permanent Representative
of the U.S. with the WMO

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ANNEX 5

COPY OF THE REPLY FROM JAPAN REGARDING THE LETTER IN *ANNEX 3*

JAPAN METEOROLOGICAL AGENCY
1-3-4 Otemachi, Chiyoda-ku, Tokyo 100-8122
TELEPHONE : +81-3-3211-4966
TELEFAX : +81-3-3211-2032
E-mail : iao-jma@met.kishou.go.jp

Our reference: JMA09/A3/038 4 March 2009

Mr Michel Jarraud
Secretary-General
World Meteorological Organization
7 bis, avenue de la Paix
Case postale No. 2300
CH-1211 Geneva 2
Switzerland

Dear Mr Jarraud,

I refer to your letter 11105-08/OBS/WIGOS/OSD/MAR/MC dated 11 December 2008 regarding the archiving of unmasked Voluntary Observing Ship (VOS) data for climate use.

The Japan Meteorological Agency (JMA) shares the understanding that developing international archives of unmasked VOS data are essential for climate research, while it is also important to ensure the security of ships that provide VOS data to maintain and further promote the VOS programme.

JMA has been and will be preserving all ship data with original call signs. JMA also releases, after ninety days from the date of reporting in principle, VOS unmasked data that are permitted to be provided in delayed mode, based on the agreement of shipping agents and relevant organizations.

In addition, to facilitate their real time quality management, JMA can provide original ship data on real time to National Meteorological Services including the MCSS GCCs, the European Centre for Medium-Range Weather Forecasts and International Comprehensive Ocean-Atmosphere Data Set (ICOADS), on condition that they are not provided to any third party.

I hope JMA's data processing scheme will contribute to the development of ocean observation systems and international archives of marine meteorological data.

Yours sincerely,

Tetsu Hiraki

(Tetsu Hiraki)
Permanent Representative of Japan with WMO

→ Etienne 14/3/09
E. Ch. 16/3/09

ANNEX 6

LETTER TO THE PERMANENT REPRESENTATIVES OF MEMBERS REGARDING SHIP'S MASKING SCHEMES IMPLEMENTED AS PER RESOLUTION 27 (EC-LIX)

World Meteorological Organization
Organisation météorologique mondiale

Secrétariat
7 *bis*, avenue de la Paix – Case postale 2300 – CH 1211 Genève 2 – Suisse
Tél.: +41 (0) 22 730 81 11 – Fax: +41 (0) 22 730 81 81
wmo@wmo.int – www.wmo.int

TEMPS • CLIMAT • EAU
WEATHER • CLIMATE • WATER

Our ref.: OBS/WIGOS/OSD/MAR/SOT GENEVA, 26 January 2009

Annexes: 6 (Annexes II to VI available in English only)

Subject: Ship's callsign masking schemes implemented as per Resolution 27 (EC-LIX)

Dear Sir/Madam,

You may recall the concerns of the ship owners and masters' with regard to the issue of Voluntary Observing Ship (VOS) data exchange, as ultimately information on ship callsigns and position data appear on some public websites. During the fourth session of the JCOMM Ship Observations Team (SOT-IV), which was held Geneva, Switzerland, 16-21 April 2007, the meeting discussed and reviewed proposed ship's callsign masking schemes, and established a Task Team on Callsign Masking and Encoding for progressing on this matter and to seek the adoption of a universally accepted solution. Details concerning the SOT recommendations on this matter can be found in the Final Report from the session which can be downloaded from the WMO Website (JCOMM Meeting Report No. 52, under Programmes/APP/MMOP/Publications).

As per the SOT recommendations, the fifty-ninth WMO Executive Council (EC-LIX, Geneva, Switzerland, 28-30 May 2007) discussed the issue and passed Resolution 27 recommending in particular that Members, in consultation with ship owners, who wish to protect the identity of VOS, may extend the trial period for the implementation of their current callsign masking schemes as per Resolution 7 (EC-LVIII). All Members implementing such a process were asked to: (i) provide for the secure exchange of ITU callsigns and reports affected by the masking process, (ii) assist in the timely resolving of real-time monitoring and climate analysis problems, and (iii) minimize the technical implications on the Quality Monitoring of Marine Data

To: Permanent Representatives (or Directors of Meteorological or Hydrometeorological Services) of Members of WMO (PR-6403)

cc: Hydrological Advisers to Permanent Representatives)
Dr Patricio Bernal, Executive Secretary, IOC)
Drs Jean-Louis Fellous and Peter Dexter, co-presidents, JCOMM)
Dr Alexander I. Gusev, president, CBS)
Professor Geerd-Ruediger Hoffmann, vice-president, CBS)
Dr James F. W. Purdom, Chairperson, CBS OPAG-IOS)
Ms Candyce Clark, Coordinator, JCOMM Observations Programme Area)
Mr Robert Keeley, Coordinator, JCOMM Data Management Programme Area)(for information)
Mr Graeme Ball, Chairperson, SOT)
Ms Julie Fletcher, Chairperson, VOSP)
Mr Gustavo Goni, Chairperson, SOOPIP)
Ms Sarah North, Chairperson, SOT Task Team on VOSClim)
Mr Rudolf Krockauer, Chairperson, SOT Task Team on ASAP)

set by the Commission for Basic System (CBS) Lead Centre. The resolution also asked the Secretary-General to continue the High-Level Dialogue, involving affected Members, the International Maritime Organization (IMO), the International Chamber of Shipping, shipping companies, and other relevant Organizations and technical commissions (e.g., JCOMM, CBS and CCl), in order to review the implementation and impact of masking. The sixtieth session of the WMO Executive Council (EC-LX, Geneva, Switzerland, 18-27 June 2008) decided to keep Resolution 27 (EC-LIX) in force. The text of the resolution is reproduced in Annex I.

Japan and the United States have informed the WMO Secretariat of the technical details regarding the specific masking schemes they are currently implementing in accordance with Resolution 27 (EC-LIX). The details of these schemes are attached in Annexes II and III, respectively. Other Members, such as Australia, and European countries participating in E-SURFMAR, have also implemented masking schemes where the ship's callsign is replaced by a unique identification number allocated nationally and consistent with the recommendations from the Ship Observations Team. These schemes are also detailed in Annexes IV and V, respectively. Following the recommendations from SOT-IV, the JCOMM in situ Observing Platform Support Centre (JCOMMOPS) was asked to develop and implement a secured database to cross reference masked call signs (MASK) with unmasked call signs (REAL). The conditions for accessing JCOMMOPS database of MASK / REAL call signs are detailed in Annex VI.

In this context, I am writing to you to: (i) inform you about the schemes; (ii) suggest upgrading your data processing and quality monitoring systems accordingly; (iii) invite you to provide the WMO Secretariat (echarpentier@wmo.int) with information regarding your national activities and needs in terms of quality monitoring for VOS data and climate studies based on VOS data; and (iv) nominate a focal point for each of those activities requiring access to the JCOMMOPS database of MASK / REAL call signs. Upon your nomination, your focal point(s) will be provided with the necessary codes to access the database.

I look forward to your continued and active participation in met-ocean observations and services activities.

Yours faithfully,

(Hong Yan)
for the Secretary-General

ANNEX I

Res. 27 (EC-LIX) – SHIP OWNERS AND MASTERS' CONCERNS WITH REGARD TO VOS DATA EXCHANGE

THE EXECUTIVE COUNCIL,

Recalling:

(1) The request by EC-LVII to the JCOMM Ship Observations Team (SOT) to assess the risks associated with allowing Voluntary Observing Ships (VOS) callsigns and position data being made freely available on external Websites not maintained by the National Meteorological or Hydrometeorological Services (NMHSs), and to provide options to address the issue, as appropriate,

(2) The request by EC-LVIII to the Secretary-General to establish, as a high priority issue, a high level dialogue, involving affected Members, the International Maritime Organization, the International Chamber of Shipping, shipping companies, and relevant Organizations and Technical Commissions, in order to determine if there is a link between VOS data availability on external Websites and piracy and other ship security issues; to review the implementation and impact of masking; and to propose a general and universally acceptable solution to the issue that would address ship owners and masters' concerns as well as the data monitoring and quality information feedback requirements, for consideration by the fifty-ninth session of the Executive Council in 2007,

(3) The recommendation by EC-LVIII to Members who, in consultation with ship owners, wish to protect the identity of VOS may implement ship callsign masking, for a trial period of one year, a process which would facilitate open distribution of masked data on the GTS,

(4) The recommendation by EC-LVIII to all Members implementing such a process to provide for the secure exchange of ship callsigns and report affected by the masking process, so as to assist in resolving real time monitoring and climate analysis problems,

Noting:

(1) The outcome, recommendations, and agreed principles by the High Level WMO/IMO Consultative Meeting (Geneva, Switzerland, February 2007), and its recommendation to seek a universally accepted global and standardized solution using an agreed international system of masked callsigns, yet to be developed,

(2) The outcome and recommendations by the Second Session of the JCOMM Expert Team on Marine Climatology (Geneva, Switzerland, March 2007) and the Fourth Session of the JCOMM Ship Observations Team (Geneva, Switzerland, April 2007),

(3) The trial ship masking schemes implemented by a few Members and their technical implications for quality monitoring, and climate related applications,

Recognizing:

(1) That it is difficult to establish a relationship between VOS data availability on external Websites and piracy and other ship security issues, but that there is a perception that a connection exists in the shipping industry, and that such security concerns have to be addressed,

(2) That there are also concerns on commercial considerations amongst the shipping companies,

Acknowledging:

(1) The seriousness of the situation, which if not adequately addressed could lead to a decline of ships participating in the Voluntary Observing Ship (VOS) Scheme, and therefore a significant decrease of VOS reports available on the GTS,

(2) The concerns expressed by ship owners and masters with regard to VOS data exchange,

Recommends:

(1) Members who, in consultation with ship owners, wish to protect the identity of VOS may extend the trial period for the implementation of their current callsign masking schemes as per Resolution 7 (EC-LVIII);

(2) Members who, in consultation with ship owners, wish to protect the identity of VOS and have not implemented such schemes yet, may implement a callsign masking scheme, as a process which would facilitate open distribution of masked data on the GTS;

(3) All Members implementing such a process to:

   (a) Provide for the secure exchange of ITU callsigns and reports affected by the masking process;

   (b) Assist in the timely resolving of real time monitoring and climate analysis problems;

   (c) Minimize the technical implications on the Quality Monitoring of Marine Data set by the Commission for Basic System (CBS) Lead Centre;

(4) All Members implementing such a process, to seek long term solutions in a way consistent with recommendations raised by the High Level WMO/IMO Consultative Meeting (Geneva, Switzerland, February 2007), the Second Session of the JCOMM Expert Team on Marine Climatology (Geneva, Switzerland, March 2007), and the Fourth Session of the JCOMM Ship Observations Team (Geneva, Switzerland, April 2007);

(5) To continue the trial masking schemes in successive years, unless decided otherwise by the Executive Council, while pending the universal acceptance and implementation of a more suitable solution and the CBS migration to table driven codes;

Requests the Secretary-General, as a high priority issue:

(1) To continue the High Level Dialogue, involving affected Members, the International Maritime Organization, the International Chamber of Shipping, shipping companies, and other relevant Organizations and technical commissions (e.g., JCOMM, CBS and CCl), in order to review the implementation and impact of masking;

(2) To propose a general and universally acceptable solution to the issue that would address ship owners and masters' concerns as well as the operational, data monitoring and quality information feedback, and climate requirements;

(3) To bring this resolution to the attention of all persons concerned.

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ANNEX II

Ship's callsign masking scheme as implemented by Japan per Res. 27 (EC-LIX)

The trial callsign masking of FM-13 SHIP reports
operated by the Japan Meteorological Agency (JMA)

In accordance with World Meteorological Organization (WMO) Resolution 7 (EC-LVIII) and 7.7/1 (EC-LIX), the Japan Meteorological Agency (JMA) started implementing trial callsign masking of FM-13 SHIP reports at 00:00 UTC on 12 December 2007 in order to protect the identity of Voluntary Observing Ship (VOS) fleets and assist in resolving real-time monitoring and climate analysis problems.

1. Callsign masking

Upon request from the administrators of reporting ships such as ship owners and masters, JMA replaces callsigns included in incoming SHIP reports via the Inmarsat Yamaguchi Land Earth Station with a generic *SHIP* callsign before distribution on the Global Telecommunication System in order to ensure the security of such ships. This trial callsign masking started from 12 December 2007 along with the service of providing the original SHIP reports (referred to below as *Non-masked Data*) explained in the next section.

Regarding the registration of VOS fleets, VOS focal points are kindly requested to contact the relevant administrators to confirm whether trial callsign masking is required for their respective fleets. Those asking for the service are requested to fill out the registration form attached to the letter from JMA dated 27 November 2007 reference: JMA07/A3/222 and send it to JMA.

2. Provision of Non-masked Data

For the purpose of real-time monitoring and climate analysis by National Meteorological and Hydrological Services (NMHSs) and monitoring centers, JMA provides Non-masked Data with real callsigns to registered users (referred below as *Users*) only. This information has been available through JMA's Ship Data Website (referred to below as *the Website*), secured with ID and password authentication, since 12 December 2007.

Use of the Website is limited to NMHSs (including the CBS Lead Centre for the Quality Monitoring of Marine Data), the European Centre for Medium-Range Weather Forecasts (ECMWF) and the International Comprehensive Ocean-Atmosphere Data Set (ICOADS) project. Users must comply with the following terms and conditions for accessing the Website:

a. Users shall not provide or expose Non-masked Data obtained via the Website or the IDs / passwords used to access the Website to any third party.

b. If JMA or Users detect or are informed of the leakage of Non-masked Data or IDs / passwords, Users shall cooperate with JMA to investigate the causes of the leakage.

c. JMA reserves the right to revoke IDs / passwords if either of the above items (a or b) is not observed.

Organizations interested in obtaining Non-masked Data are kindly requested to read the terms and conditions above and to complete the form attached to the letter JMA07/A3/222 and send it to JMA.

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ANNEX III

Ship's callsign masking scheme as implemented by USA per Res. 27 (EC-LIX)

The trial callsign masking of FM-13 SHIP reports operated by the United States' National Weather Service (NWS)

In accordance with World Meteorological Organization (WMO) Resolution 7 (EC-LVIII) and 27 (EC-LIX), the National Weather Service (NWS) started implementing trial callsign masking of FM-13 SHIP reports at 00:00 UTC on 12 December 2007 in order to protect the identity of Voluntary Observing Ship (VOS) fleets and assist in resolving real-time monitoring and climate analysis problems.

1. Callsign masking

Upon request from the administrators of reporting ships such as ship owners and masters, NWS replaces callsigns included in incoming SHIP reports via the Inmarsat Southbury or Santa Paula Land Earth Station with a generic SHIP callsign before distribution on the Global Telecommunication System in order to ensure the security of such ships. This trial callsign masking started from 12 December 2007 along with the service of providing the original SHIP reports (referred to below as Non-masked Data) explained in the next section. This masking is completed in conjunction with the Japan Meteorological Agency (JMA) to better expand there communication coverage area.

Ships and Shipping companies who request masking support shall provide the NWS with a completed Callsign Masking Registration/Change Form. This form also designates the public release periodicity level. With coordination from JMA, the standardized releasing periodicity is either fully public releasable after 90 days or never to be released publicly. This controlled data is shared only with NWS's Ocean Prediction Center (OPC) for inclusion into the real-time models, the U.S. VOS program for management, and JMA for release control of Non-masked data.

Callsigns have also been completely removed from all OPC analysis charts released to the public regardless of their enrolment in the masking scheme. The OPC is now able to allow select call sign re-appear back on the analyses if requested by the ship and or shipping company. The U.S. VOS program is maintaining this "display" list.

2. Provision of Non-masked Data

For the purpose of real-time monitoring and climate analysis by National Meteorological and Hydrological Services (NMHSs) and monitoring centers, the U.S. and Japan VOS programs have agreed that JMA will be the focal point location to provide Non-masked Data with real callsigns to registered users as described in Annex II.

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ANNEX IV

Ship's callsign masking scheme as implemented by Australia per Res. 27 (EC-LIX)

The Australian Bureau of Meteorology (BOM) has introduced on a trial basis, and on a limited number of ships, a masking scheme whereby the official ITU callsign is replaced by an alternative and unique callsign. The name given by SOT to this form of masking scheme is MASK.

The Australian MASK broadly follows ITU callsign practices, but explicitly uses unallocated and reserved 'not for future use' callsigns from the ITU Table of Callsigns (http://life.itu.int/radioclub/rr/ap42.htm).

The format of the Australian MASK is CNCNNNN, where C = character (A - Z) and N = number (0 - 9, or 2 - 9 for N in the second position in the MASK in accordance with ITU directives).

The two numeric components of the MASK (N and NNNN) are automatically generated for every ship recruited by Bureau (regardless of whether the ship participates in the MASK trial or not), and is derived from the unique database ID number assigned to the ship.

The callsign series approved for use by the Bureau by the SOT Task Team on Callsign Masking and Encoding comprises B2M0000 - B2M9999 through to B9M0000 - B9M9999.

In accordance with the procedures developed by the Task Team, specifically to assist with real-time quality monitoring and long-term data archival, Australia provides JCOMMOPS with a quarterly list linking the official ITU callsign (REAL) with MASK, or immediately whenever a change is made to the list of MASK ships.

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ANNEX V

Ship's callsign masking scheme as implemented by European Countries participating in E-SURFMAR per Res. 27 (EC-LIX)

As of 1 September 2006, in accordance with Resolution 7 (EC-LVIII) and Resolution 27 (EC-LIX), and in order to protect the identity of Voluntary Observing Ships (VOS) fleets and to assist in resolving real-time monitoring and climate analysis issues, some countries participating in the Surface Marine programme of the Network of European Meteorological Services, EUMETNET (E-SURFMAR) started implementing on a trial basis a common ship's callsign masking scheme for ship reports distributed on GTS in FM-13 SHIP format.

1. Callsign masking

E-SURFMAR *MASK* callsigns (*tttccnn*) are based on the following format: a 3-character prefix (*ttt*) indicating the type of observing station installed onboard the ship; a 2-character string (*cc*) corresponding to the country recruiting the ship; and a 2-character string (*nn,* from 00 to ZZ) allowing to identify up to 1296 VOS for any given type and country. A few prefixes were allocated for the following types of observing stations: TBW for Turbowin conventional VOS stations; AVO, BAR, BAT, MIN, MPD for Avos, Baros, Batos, Minos and Met Pod Automated Weather Stations, respectively; IDD for Iridium Deck Drifters. The country code may be the 2-character ISO country code (ISO 3166-1:2006) but this is not mandatory. The probability to have an E-SURFMAR *MASK* identical to a *REAL* ITU callsign is extremely small. In such a case, the corresponding *MASK* would be frozen. Since September 2006, about 125 such *MASK* callsigns have been allocated to VOS ships participating in the E-SURFMAR programme.

2. Provision of masks

In accordance with the rules proposed by the JCOMM Ship Observations Team (SOT) Task Team on Callsign masking and encoding, the E-SURFMAR Management team regularly provides JCOMMOPS with a cross-reference list of *MASK vs. REAL* callsigns. The data centres that are using real-time VOS reports, and need access to the related metadata records from the WMO Publication No. 47 require this list. It must be noted here that, due to the knowledge of the country code - included in the *MASK* -, the national focal point for VOS Programmes can be easily identified (i.e. access to WMO Publication No. 47 metadata is not required) and contacted if necessary. For example, this would facilitate feedback from data users to VOS operators in order to undertake corrective actions for ships reporting systematic errors (i.e. through the Quality Information Relay of JCOMMOPS).

3. Provision of WMO Publication No. 47 metadata

WMO Publication No. 47 metadata from VOS participating in the E-SURFMAR programme (half of the world's fleet) are made available on a password-protected web site. Metadata from non E-SURFMAR VOS may also be hosted on this website, as is already the case.

In addition, the E-SURFMAR Management team, on a quarterly basis, is providing the WMO Secretariat with the WMO Publication No. 47 metadata from E-SURFMAR VOS. Ships are identified through their *REAL* callsigns and their IMO numbers. *MASK* callsigns are not submitted with the WMO Publication No. 47 metadata.

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ANNEX VI

Conditions for accessing JCOMMOPS database of masked call signs

1. Access to the MASK vs. REAL list shall be restricted to WMO approved subscribers contributing to WMO Programmes or co-sponsored Programmes and with legitimate requirements for:

   1.1 Real-time quality monitoring of VOS data;

   1.2 Climate database applications (e.g., linking archived MASK observations with REAL WMO Publication No. 47 metadata); and

   1.3 National VOS and PMO activities (e.g. provision of monitoring feedback and encouragement to ships; ensuring a ship under consideration for recruitment is not already a member of another national VOF).

2. Requests for access shall be made by means of a letter from the PR of a country to the WMO Secretary-General, who, is consultation with WMO experts and concurrence from the SOT Chair, will grant access.

3. Approved subscribers may include:

   3.1 Recognised monitoring centres, including RSMC Exeter, and VOSClim RTMC;

   3.2 NMHSs;

   3.3 Recognised JCOMM DACs or GCCs;

   3.4 National VOS Programme Managers; and

   3.5 Port Meteorological Officers.

4. An approved subscriber shall not: (1) disclose, (2) confirm, or (3) otherwise make publicly available; the masking details of any ship or group of ships, without written permission from the Programme Manager implementing the masking scheme.

5. Failure to observe these rules shall result in a loss of access privileges.

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APPENDIX J

REPORT BY THE TASK TEAM ON THE VOS CLIMATE PROJECT (VOSCLIM)

(report submitted by Sarah North, Chairperson of the VOSClim Task Team)

Introduction

1. The VOSClim project is now operationally mature with many of the obstacles identified at previous sessions of the SOT having been overcome. Levels of ship participation set by the SOT have been met and the data flow processes are now operating as required with the relevant datasets readily available to users via the project website

2. However, whilst the implementation phase of the project has now been completed, there has been limited progress with the evaluation stage, which is intended to demonstrate the added value of the VOSClim datasets.

3. This report addresses the key issues assigned to the Team in its Terms of Reference and identifies the key areas where progress has been made since SOT IV. Taking into account work undertaken by the ETMC and the new cross-cutting (ETMC-SOT) Task Team on Delayed Mode VOS Data (TT-DMVOS), the report invites the SOT to consider carefully how the project should develop in the future, so that it can help to raise the climate quality of data from the wider VOS, and thereby contribute to the Global Climate Observing System (GCOS). In this respect, the Task Team believes that the time is now right to extend the good practice established for VOSClim ships to the wider VOS community and invites the SOT to consider the most appropriate means of achieving this objective.

4. The following supporting documents are appended to this report

Annex 1 Task Team current Terms of Reference
Annex 2 VOSClim Project Status Report
Annex 3 Report by Scientific Advisers to the Project
Annex 4 Overview of Current Project Status
Annex 5 Status of actions agreed at SOT III & SOT IV
Annex 6 The future of the VOSClim project

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ANNEX 1

Terms of Reference of the SOT Task Team on VOS Climate Project

Task Team on the VOS Climate Project

Tasks (in close cooperation with the ETMC):

1. Coordinate, maintain, promote and enhance the VOS Climate project, monitor its performance, and encourage increased participation.

2. Revise the VOS Climate project document to reflect the current procedures and to clarify and revise where necessary the responsibilities of the VOSClim data centres;

3. Review all relevant JCOMM Publications to make sure they are kept up to date and comply with Quality Management terminology;

4. Prepare a report to SOT-IV on, inter-alia, the following over-arching VOSClim issues

    a. Should VOSClim be continued as a project, or developed into a separate long-term operational programme? If so, what form should this programme take?

    b. Is the high-quality dataset a valuable resource? If so, how should it be updated? operationally?

    c. How can the lessons learnt from the VOSClim be used to improve data quality in the wider VOS?

Members:

Sarah North (TT chairperson, United Kingdom)
Julie Fletcher (VOSP chairperson, New Zealand)
Representatives of participating countries (VOSClim focal points)
Representative of the Real Time Monitoring Centre (RTMC) —hosted by the UK Met Office
Representative of the Data Assembly Center (DAC) —hosted at the NOAA National Climatic Data Center (NCDC)
Representatives of the Global Collecting Centres (GCCs)
Scientific advisers

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ANNEX 2

VOSCLIM PROJECT STATUS REPORT

1. VOSClim Ship Participation & Recruitment

1.1 At SOT-IV (April 2007) it was noted that the initial target of 200 ships participating, which was set at the outset of the project, had been achieved and a new target of 250 ships set.

1.2 The Task Team is pleased to report that this revised target has now also been met and at the end of 2008, the number of ships reported as actively participating in the project stood at 255, representing ships recruited by ten participating countries. Table 1 below shows the growth in participation since SOT III (March 2005). An update on the current status will be given at the SOT-V meeting

Country	Number of VOSClim ships at SOT III	Number of VOSClim ships at SOT IV	Number of VOSClim ships at SOT V *(at February 2009- to be updated at meeting)*
Australia	10	12	10
Canada	14	40	47
France	6	23	25
Germany	11	22	32
India	21	22	22
Japan	5	5	5
Netherlands	1	19	37
New Zealand	0	1	1
UK	33	62	59
USA	12	12	17
TOTALS	113	218	255

Table 1: Contribution of ships to VOSClim by country

1.3 To ensure that the project data can be monitored by the RTMC, it is essential that recruitments, withdrawals and call sign/name changes be notified promptly to the DAC (and to the RTMC) so that the participating ship list can be kept up to date. The team is therefore pleased to report that previous problems with updating the ship list on the website, reported at SOT IV, have now been resolved. Furthermore, the format of the ship list has been revised since SOT IV to show additional information such as former ship names and call signs. Full details of participating ships are maintained on the project website at http://www1.ncdc.noaa.gov/pub/data/vosclim/vosclimshiplist.xls.

1.4 There has been a marked increase in the number of ships equipped with shipborne AWS systems participating in the project (notably those ships recruited by France and Canada) and approximately one third of the project ships now carry AWS. Although this has resulted in an increase in data volume it, perhaps means that the scope of participation is not as representative of the wider VOS as originally intended – although there is a wide variety of different ship types involved in the project, including research ships, container ships, bulk carriers, cruise ships and ferries.

1.5 The number of manually reporting VOSClim ships has also grown gradually since SOT IV and notably Germany, the US and the Netherlands have increased the size of their VOSClim fleets.

1.6 The need for Port Met Officers to routinely, inspect VOSClim ships has resulted in ships mostly being drawn from the regular liner trades, such as container ships, and relatively fewer ships operating on variable charter trades, such as oil tankers. However as the nature of shipping is highly dynamic there have been cases where ships routes have changed with little notice, making routine inspections impossible. Inspection details for VOSClim ships are only maintained on a national basis and are not available at a central location.

1.7 Resource pressures felt by national met services, and reported previously at SOT IV, appear to have had only a small impact on the availability of Port Met Officers to inspect VOSClim ships. However, the growing migration to using Automatic Weather Stations is inevitably having an impact on the range of observed parameters available in the VOSClim datasets. Such problems are also a pressing issue for the wider VOS community and will need to be addressed by SOT in the coming years

2. Electronic Logbooks and AWS software

2.1 As identified in the 2008 GCC report there continues to be a significant number of ships that are effectively 'self recruiting' and submitting observations with the additional delayed mode VOSClim IMMT elements. This is typically due to the use of electronic logbooks such as TurboWin, which is used on the majority of manually reporting project ships, and which easily permits officers to upgrade their reports to VOSClim standards (i.e. by ticking the VOSClim check box). Whilst a warning message was added to TurboWin Version 4 to try to prevent this practice the Task Team maintains the view that such self recruited ships do not impact on the value of the VOSClim datasets - provided that it is recognised that the only ships officially recruited to the project are those which have been formally notified to the DAC and are listed on the project website. Indeed the additional data provided by self-recruited ships should not be discouraged given the proposed extension of VOSClim standards to all VOS [see separate discussion at *Annex 6*].

2.2 The need to compare the algorithms associated with these different electronic logbook software systems (OBSJMA, TurboWin, SEAS) was identified at the outset of the project and the Team is pleased to note that the intercomparison of electronic logbook software will have resolved many of these potential inconsistencies. However, given the increased use of proprietary AWS software (AVOS, BATOS, and MILOS etc) it is considered that a similar intercomparison study should be undertaken for these systems to ensure consistency of data

2.3 The latest version of the TurboWin software, due to be released in early 2009, will include password protection for its metadata module - as changes to metadata should preferably be made by the Port Meteorological Officer rather than by the observers themselves. Some flexibility may however need to be exercised for ships that do not routinely return to a homeport and where inspections can be years apart. In all cases, however, it is the responsibility of the recruiting country to vet all metadata before making submissions to WMO Pub. 47.

3. Real Time Data

3.1 The transmission of VOSClim ship observations from the RTMC to the project DAC continues to operate in accordance with the project requirements. Reports from manually reporting VOSClim ships are typically transmitted in WMO Ship GTS Code (FM 13) via Inmarsat C, whilst an increasing number of automatically reporting ships send their reports via national centres using data compression to reduce transmission costs.

3.2 The RTMC appends the six prime model parameters from the forecast model – pressure,

relative humidity, air temperature, sea temperature, wind speed and wind direction – to the ship report and, since July 2002, has been routinely transferring this data in BUFR code to the project DAC, forming what is referred to as the "BUFR" dataset. Furthermore, the RTMC has also been making back-up copies of the data available to the DAC via the Met Office's external FTP server. A more detailed RTMC report will be included in the Met Office's RSMC report submitted under agenda item SOT-V/III-3.

3.3 The DAC also makes available a second "GTS" dataset based on NCDC GTS data, which has not been transformed into the BUFR format and retains the original FM 13 message data.

4. Delayed Mode Data

4.1 The delayed mode observations from VOSClim ships (including the additional IMMT project code groups) recorded in electronic logbooks (from manually reporting ships) are typically downloaded by visiting Port Meteorological Officers on a recommended three monthly basis. Minimum quality control procedures are then applied to the collected delayed mode datasets before being sent to the two Global Collecting Centres (located in Hamburg and Edinburgh). Having checked the data quality flags, and clarified any problems bilaterally, the GCCs have been sending the delayed mode data to the DAC on a quarterly basis since March 2003. Problems reported at the previous sessions have now been overcome and this "GCC" dataset is now available to users via the DAC website.

4.2 Further details of the delayed mode VOSClim data contributions will be included in the 2008 GCC report submitted under agenda item SOT-V/III-3.4. The number of VOSClim observations being submitted to the GCCs remains generally good although submissions were only received from nine of the ten participating countries. In total 48583 observations were received from VOSClim ships in 2008 amounting to 6% of the total submissions received by the GCCs (the same proportion as in 2007)

4.3 Although the IMMT-3 format (which permits QC flags to be applied to the additional project elements) formally came into use in 2006 it is understood that some VOSClim contributing members are still having problems with sending their data in the newer format and one member has been unable to submit any data. In addition the IMMT element for SLL (maximum deck cargo height) reported by new generation container ships has created problems for application of MQCS. Consequently, the current limiting height of 32 m has had to be increased to 40m, following agreement by the ETMC.

4.4 In accordance with discussion in the TT-DMVOS, the way in which the VOSClim data is distributed was changed in July 2008 so that the complete quarterly dataset containing VOSClim data is now despatched by the GCCs to the Responsible Members and to the Project DAC. Accordingly the DAC now takes ownership for calculating the quarterly statistics for the number of VOSClim observations with and without the additional elements, and the number of observations from unlisted ships (refer to SOT-V/III-3.4 for further details).

5. Metadata Collection & Recruitment/Update forms

5.1 Although, the majority of project participants are now collecting metadata in accordance with the latest format prescribed for WMO Publication No. 47 (i.e. Version 03 introduced in July 2007), it is regretted that the availability of updated metadata to users on the WMO website continues to be extremely poor, with the WMO website not having been updated since the 2nd Quarter of 2008 (at time of writing this report). However, in the case of E-SURFMAR recruited project ships this metadata is now also maintained on the new E-SURFMAR metadata database, with monthly updates provided by contributing project members. (Metadata from other project countries is also made available on this database.)

5.2 VOSClim metadata is now collected in exactly the same Pub. 47 format as used for normal VOS, although PMO's are requested to take additional digital images showing the location and

exposure of instruments and to make schematic drawings of the ships arrangements. At SOT III it was agreed that these could be submitted to the DAC for archive only, (as it was considered that inclusion of such digital imagery on the website could require considerable manual intervention) while at SOT IV the WMO Secretariat was requested to investigate whether such photographs could be stored together with Pub. 47 Metadata on the WMO website. The outcome of this action is awaited.

5.3 As a consequence of the introduction of Metadata Format Version 03 in July 2007, it was decided to recommend that a new Form VOSP002 should in future be used for the recruitment and collection of metadata for VOSClim ships. To ensure accurate completion of this form it was further recommended that Port Met Officers take a copy of the latest Metadata Format Version 03 with them when inspecting VOSClim ships. Copies of Form VOSP002 and Metadata Format Version 03 are available for download from the project website (via a link to the form on the VOS website).

5.4 However, the availability of a separate metadata module within TurboWin has greatly simplified the collection of metadata for several VOSClim ship operators, as it automatically encodes the metadata into Pub. 47 format (XML or delimited). Because it is maintained in electronic format at source it can be easily verified and maintained by, visiting Port Met Officers while on board and then downloaded for subsequent ingestion into national databases and submission to WMO. This therefore brings into question the need to additionally fill in hard copy VOSClim recruitment/update forms, as it represents a duplication of effort for some project members (especially as VOS operators may require national inspection forms to be completed as well). This could explain why some Port Met Officers appear reluctant to recruit new project ships. It is suggested, therefore, that the requirement to additionally fill in a hardcopy of form VOSP002 should rest with the individual VOSClim ship operators concerned - however, the Task Team would not wish to appear to be preventing use of this excellent hardcopy form by both VOS and VOSClim members who find it advantageous. The important points to remember are that it is essential that the required metadata is collected and updated at regular intervals and that records of the inspections and visits made by Port Meteorological Officers are maintained and archived.

5.5 The use of the TurboWin module also affords the opportunity for downloaded metadata to be routinely transmitted back to VOS and PMO focal points, which could be particularly useful for ships that are trading on a worldwide basis and are out of the reach of the Port Met Officers. In this respect, consideration is currently being given to, whether TurboWin should include a timed facility, linked to the computer time, to remind observing officers to download all their TurboWin log files at routine intervals (e.g. quarterly or six monthly) and return them to their recruiting VOS focal points. (This would be particularly helpful to keep abreast of changes to ship's call signs.)

6. Monitoring Statistics

6.1 Monitoring statistics for the real time observed data continue to be produced by the RTMC on a monthly basis together with monthly listings of ships whose observations have been flagged as 'suspect'. These statistics are made available to the DAC via the Met Office external FTP server.

6.2 Problems reported at SOT IV concerning the availability of the monitoring statistics on the project website have now been overcome, and they are now readily available to VOSClim focal points and PMO's, who are encouraged to take early remedial action to resolve any monitoring problems.

7. Project Website

7.1 The project website [http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html] is maintained by the DAC, and acts as the main focal point for the project, providing users with easy access to the necessary data.

7.2 The website design and layout was improved in 2006 and further minor improvements have

been made since SOT IV. Previous metadata information on the website has now been removed and a direct link to the Pub. 47 website has been added. A link has also been made to the new inspection Form VOSP002 which is now recommended for use by VOSClim ship operators, and which replaces the previous project recruitment/update form. The ship list on the website has been amended to include former ship names and call signs, and details of when masked call signs were adopted. A large number of digital images for ships recruited by the UK, US and Australia are included on the website and a link is made to the images of project ships recruited by the Netherlands available on the KNMI website at http://www.knmi.nl/vos/vosclim/.

7.3 The Team is pleased to report that previous problems with maintaining the information on the project website up to date have now been overcome due to the addition of additional staff resource at NCDC (i.e. with particular thanks to the efforts of Eric Freeman who has been promptly updating the website when requested).

7.4 A separate report by the DAC will be made under agenda item SOT-V/III-3.6.

8. Project promotion – Project Brochure & Project Newsletter

8.1 It was recognised at the last session that the revision of the project brochure was not an urgent task, but agreed that it would eventually need to be revised to reflect changes such as the increased target for participating ships

8.2 In view of the need for SOT to agree the future form and direction of the project at the current session, and the possibility of extending the project to wider VOS programme, the Task Team has taken no action on this item since the last session

8.3 Copies of the project brochure are now in short supply, although pdf copies are downloadable for printing from the project website and from the TurboWin electronic logbook

8.4 The first issue of the VOSClim project newsletter was issued in October 2003 and was made available for download via the project website. The newsletter was originally intended as a means for exchanging information and for keeping all those involved in the project – both ashore and at sea – aware of the latest developments. Unfortunately, resource limitations have prevented further copies of the newsletter from being issued, although articles on the progress of the project have been included in publications such as NOAA's Mariners Weather Log, the Ocean Views newsletter issued by the Australian Bureau of Meteorology, and the KMNI Marine Information Bulletin.

9. Project Certification

9.1 Following discussion at the last session it was decided to discontinue the VOSClim Certificate of Appreciation (intended for presentation, unsigned, to ships observers) and concentrate solely on the VOSClim Certificate of Participation (for presentation, signed, to participating ships). This would help reduce the proliferation of certificates being issued to observing ships. Copies of the VOSClim Certificate of Participation are available for pdf download from the project website.

10. Masked Call signs

10.1 The masking of ship call signs in response to security concerns, and its implications for data monitoring, is being addressed separately by the Task Team on Call Sign Masking and Encoding. However, this issue continues to have implications for the success of the VOSClim Project, especially if national met services adopt non-unique masked 'SHIP' solutions with data release time restrictions.

10.2 Notwithstanding, the masking issue does not appear, so far, to have had a major impact on the availability of project data or on its ability to be monitored in real time. Although the E-SURFMAR AWS

systems that are contributing to the project are uniquely masked this has not been done for security purposes, but to assist efficient operation of the E-SURFMAR programme. However, it should be noted that these AWS ships are listed on the VOSClim website under their real call signs, and not under the masked call signs that are used for their real time transmissions. In the case of the Japanese ships that contribute to the project it is understood that because they are government research ships they are not subject to the non-unique SHIP masking system being used for merchant Japanese (and a few US) ships that send their observations via Yamaguchi LES.

10.3 The planned introduction of a lookup database of Mask Vs Real call signs on the JCOMMOPS website (WMO Letter to Permanent Representatives dated 26 January 2009 refers) will greatly assist the real time monitoring centre to ensure ongoing monitoring of project observations. However, the non-unique SHIP call sign system in use for Japanese ships and a lesser number of US ships continue to present problems for the RTMC as highlighted in the Met Office RSMC/RTMC report submitted under agenda item SOT-V/Doc. III-3

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ANNEX 3
Report by Scientific Advisers to the Project

1. The three overlapping VOSClim datasets (BUFR, GTS, and GCC, as discussed in *Annex 2*) are now readily available from the project website, all conveniently unified into the International Maritime Meteorological Archive (IMMA) format (Woodruff 2007), but unfortunately, no analysis has been possible using them in the period since SOT-IV. This highlights the need to make the VOSClim datasets an integral part of the scientific DataStream to improve accessibility to scientists, and initial efforts along these lines linked to ICOADS (Worley et al. 2005, http://icoads.noaa.gov) are discussed below.

2. An important study using the observation/model comparison methodology of VOSClim has been carried out recently at the Met Office, but using the full marine dataset for 2007-8 which is available internally at the Met Office (Ingleby 2009). This study showed, for example, that differences between the Met Office NWP model winds and ship visual winds showed a strong country-to-country variation and clearly shows the effect of bias in air temperatures caused by solar heating of the ship (e.g. Berry and Kent 2005). Ingleby (2009) demonstrated that ships in VOSClim without AWS reported air temperatures with smaller RMS differences than those of the remainder of VOS reports. VOSClim humidity observations were also better than average, but little difference was seen for pressure observations. The Ingleby study was carried out on over 2500 ships and clearly shows the advantage of making the associated model parameters routinely available with all ship reports, and of extending this to other observation types such as moored buoys, rigs and drifters. The delayed mode information available as part of the VOSClim dataset, which includes relative wind speed and direction, would have helped in diagnosing whether or not the true wind speed had been calculated correctly. It seemed likely that in some cases, this was not done properly, but no definite conclusions could be drawn.

3. The full availability of the VOSClim datasets now needs to be advertised to the scientific community, and mechanisms for doing this will be investigated and implemented. It is clear from the Ingleby study that the extension of the VOSClim model data and additional parameters to all VOS would be advantageous. Meanwhile, to ensure the widest take-up by the scientific community, the existing VOSClim datasets should be made readily available together with ICOADS, which is widely used for climate research. Data from the three VOSClim datastreams are now starting to flow regularly to ICOADS (which also uses the IMMA format), and the possibility of merging these with ICOADS in the most effective manner will be investigated. With the support of UK NOCS, selected Pub. 47 metadata are already periodically merged with ICOADS for the entire VOS (currently back to 1973) utilizing an extensible “attachment” feature of the IMMA format. Additional IMMA attachments could potentially be defined, for example, to store unique data from the three VOSClim datastreams and, as appropriate, combine them via report compositing. In the longer-term, it is also hoped that additional and timelier integration can be achieved within the modernisation of the delayed mode and real time dataflow, including linkages with ICOADS, as proposed by TT-DMVOS (see *Annex 6* and SOT-V/III-3.5).

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ANNEX 4

OVERVIEW OF CURRENT VOSCLIM PROJECT STATUS

Element of VOSClim Project	Implemented?	Status
Recruitment	Yes	Initial target of 250 ships met. (expansion of project to be considered at SOT V)
Real time data exchange	Yes	Data transfer to DAC working with backup FTP transfer now implemented (BUFR template not ideal for data exchange).
Metadata availability	Partly	Metadata often only available with significant delay. Availability of digital imagery not fully resolved
Delayed mode data exchange	Mostly	IMMT data available on DAC website- but some countries not making quarterly submissions MQCS-V being implemented by [most] contributing members.
Monitoring	Yes	Monthly statistics for full range of variables being produced by RTMC and sent to DAC. (Mechanisms for logging monitoring follow up actions not fully resolved though)
Project Promotion	Partly	Brochure available but may need updating. Project document needs updating Newsletter and articles issued Certification being issued
VOSClim website	Yes	Website updated in 2006 and now being routinely kept up to date
VOSClim Datasets	Mostly	Real time and delayed mode data streams now working and data added to website Metadata still not promptly available
Scientific Analysis	Partly	Data sets not being fully exploited despite data now being available on the website (despite interest expressed by scientific community). Scientific journal papers have been published using VOSClim dataset. Some comparison of VOS and VOSClim reports made at SOT-IV Scientific and Technical Workshop.

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ANNEX 5

STATUS OF VOSCLIM ACTIONS AGREED AT SOT III & SOT IV

1. Status of action items from SOT IV relating to VOSClim

II-4.5	To provide VOSClim uncertainty maps and time series of uncertainty	TT/VOSClim	For presentation at Technical Workshop
I-4.4.2	To check the VOSClim project website (recently updated) to verify ships and call sign changes to make sure that none are missing	VOSClim operators	Done/Ongoing
IV-3.2.5	To use a slightly higher limit of 12% for the bias limit criteria for the real time monitoring for relative humidity VOSClim	RTMC	***Done***
IV-3.2.6	To provide details of remedial actions taken to the DAC by email	PMOs	Ongoing?
IV-3.4.4	To consider the following recommendations by the meeting regarding the display and availability of VOSClim project data on the website: (i) there is a need for maintaining the list of VOSClim ships up to date, (ii) the notification of the recruitment to the DAC must be the date of notification, (iii) a link to VOS web site should be added on the VOSClim web site, (iv) the DAC should keep track of call sign changes (e.g. beginning/ending dates for call signs)	VOSClim DAC	***Done/Ongoing*** (i) Done (ii) Done? (iii) Done (iv) Done
IV-3.7.1	To consider how many observations are needed from the VOSClim yearly	TT/VOSClim	For presentation at Technical Workshop
IV-3.7.1	To investigate whether the VOSClim photographs could be stored with Pub47 Metadata	Secretariat (WMO)	Not done - To be confirmed
IV-3.7.1	To revise the VOSClim brochure	TT/VOSClim	***Not Done***
IV-3.7.1	To consider a way to discriminate between VOSClim and non-VOSClim ships for ships not listed in the VOSClim in case of extending the Principle of all VOSClim data going to one central repository (DAC) to be used for all VOS data.	VOSClim DAC	Done (Project ships are those notified to the DAC and included in the ship list)
IV-4.1.2.7	To negotiate with some of the web sites making ship positions and identification available on their web sites to delay the availability of the data in certain regions to be defined	VOSClim USA	Part Done (time delay now on sailwx.info)
I-6.3.7	To consider adopting VOSClim best practices more generally under the VOS scheme	TT/VOSClim	For further consideration at SOT V

2. Status of action items from SOT III relating to VOSClim

III-B/1.3.2	DAC to link to the latest version of Pub. 47 on the WMO web site and the JCOMM VOS web site, and the tools for metadata display and interrogation on the JCOMMOPS website.	DAC	Done
III-B/1.3.2	Scientific Advisers to be responsible for the association of metadata with individual VOSClim reports. A mechanism for the provision and storage of VOSClim digital images to be investigated.	Scientific Advisers and DAC	Part done Storage of images not resolved yet
III-B/1.3.3	Increased recruitment of VOSClim ships.	VOSClim operators, VOS operators who have yet to contribute	Ongoing/Done (targets achieved)
III-B/2.1.2	RTMC to take appropriate actions so that only reports received in ocean areas (model surface type 'ocean') would be included in the monitoring statistics.	RTMC	Done
III-B/2.1.2	Operators who had responded to the monitoring statistics to provide feedback on remedial actions.	VOSClim operators	Ongoing/Partly done
III-B/2.1.2	Once the VOS monitoring feedback system is established, using JCOMMOPS facility, mechanism to be extended to VOSClim project.	RTMC, JCOMMOPS Coordinator, VOSClim operators	Not done?
III-B/2.1.2	An up-to-date list of the project focal points to be maintained on the web site.	VOSClim operators	Done (needs updating again)
III-B/2.1.2	Modifications to the list of participating ships to be sent to the RTMC and VOSClim Data Assembly Centre	VOSClim operators	Ongoing
III-B/2.2.1	DAC and RTMC to take actions to recover data from the Met Office to fill the gap in the BUFR data stream between the end of April and the end of August 2003 due to the transition from e-mail to GTS transmission of the BUFR data stream.	DAC and RTMC	Done
III-B/2.2.2	DAC and the RTMC to agree on improved mechanisms, which will be put in place to avoid RTMC BUFR data loss.	DAC and RTMC	Done
III-B/2.2.2	Mechanisms for simplifying data delivery between RTMC and the DAC, such as ftp, to be considered	DAC and RTMC	Done
III-B/2.2.2	DAC to simplify data delivery to users using ftp site.	DAC	Done
III-B/2.2.2	RTMC to investigate whether the monthly statistics and suspect lists can be transferred to the DAC by ftp rather than e-mail.	RTMC	Done
III-B/2.3	VOSClim operators to ensure implementation of the latest version of IMMT.	VOSClim operators	Ongoing/ Part done
III-B/2.3.2	All contributing members of the VOSClim project to review their delayed mode data submission processes to the GCCs in IMMT-2 or IMMT-3, and ensure or work toward their processes and submissions being up-to-date	VOSClim operators	Ongoing/ Part done
III-B/2.3.3	France to attempt to revise the BATOS system.	France	Done (BATOS now reports IMMT3)
III-B/3.1.1	Since the lack of delayed mode, data for the VOSClim project is a problem, as interim measure VOSClim operators are to provide raw data from the data entry software direct to the Scientific Advisers.	VOSClim operators	Done (delayed mode data flow now working)
III-B/3.1.2	Scientific Advisers to convene an informal 'Scientific	Scientific	Part done

	Users Group' to widen expertise inform the development of the high-quality dataset and guide the assessment and exploitation of the value of VOSClim datasets.	Advisers	(i.e. at MARCDAT-II in 2005 when a number of scientists agreed to contribute to analysis of the VOSClim dataset)
III-B/3.1.2	A strategy for the future production and maintenance of a high-quality dataset to be developed and agreed based on results of assessment of value of VOSClim datasets. The strategy to include a determination of how many ships and observations will be needed to ensure the quality of the dataset.	Scientific Advisers	Part Done
III-B/3.1.3	JCOMMOPS to set up and maintain a VOSClim Task Team mailing list.	JCOMMOPS	Done
III-B/3.1.4	New Task Team on VOSClim to prepare a report to SOT-IV on, inter-alia, overarching VOSClim issues.	Task Team on VOSClim	Done
III-B/3.1.5	Scientific Advisers to produce a VOSClim dataset for presentation at SOT-IV. Mechanisms for the maintenance of the dataset to be developed.	Scientific Advisers	Mechanism for dataset maintenance considered in Appendix F
III-B/3.1.5	VOSClim operators who are currently not providing delayed mode data in IMMT-2 and IMMT-3 formats to the GCC to contact the Scientific Advisers (eck@noc.soton.ac.uk) to arrange delivery of delayed mode data as a temporary measure to allow scientific assessment to proceed.	VOSClim ship operators	Done (delayed mode data flow to DAC now working)
III-B/3.2.2	As an alternative to issuing a VOSClim Newsletter, Robert Luke (USA) to include an updated VOSClim article in a coming edition of the US Mariner Weather Log. NMS encouraged taking similar actions.	Robert Luke, NMS	Done
III-B/3.2.3	DAC to review the front page of the VOSClim web site and make revisions as appropriate. The Task Team on VOSClim to advise the DAC regarding any web site enhancement.	DAC and Task Team on VOSClim	Done

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ANNEX 6

THE FUTURE OF THE VOSCLIM PROJECT

(Note - the VOS Panel under SOT agenda item III-4.1 will also consider this aspect of the Task Team report separately)

1. The following discussion paper outlines the general views of the Task Team for the future of VOS Climate Observations taking into account the three overarching issues assigned to the Team, as follows (but with item b updated from *Annex 1* to reflect the current situation with three distinct datasets available from the DAC)

(a) ***Should VOSClim be continued as a project, or developed into a separate long-term operational programme? If so, what form should this programme take?***

(b) ***Are the high-quality datasets a valuable resource? If so, how should they be updated operationally, including possibilities for integration of overlapping data receipts?***

(c) ***How can the lessons of VOSClim be used to improve data quality in the wider VOS?***

DISCUSSION

2. In considering the future need for the VOSClim Project and its implications for the wider VOS, the Task Team has taken into account the following key factors, which will impact on its future evolution -

(a) Although the number of ships has now achieved the target levels set by SOT, the volume of project data being collected is far less than had originally been hoped for, and is insufficient to permit the required level of scientific scrutiny

(b) From 2012 all GTS international data exchange between National Met Services will be required to use either BUFR or CREX table driven formats. The latest VOS BUFR templates include all the current VOSClim elements and should permit additional elements to be included with less difficulty. Previous CBS restrictions on making amendments to the WMO Ship code will no longer apply once the alphanumeric codes have been superseded, although any code amendments will still need to be approved formally through CBS in what can be a lengthy process.

(c) Recruitment of project ships has been made a far simpler process with the increased use of electronic logbooks such as TurboWin, which include a Pub. 47 metadata module. This therefore offers the opportunity to widen the current participation to all manual VOS with minimal effort.

(d) The expected rapid growth in the use of shipborne AWS systems is likely to give rise to a variety of different transmission mediums and formats for sending coded observations e.g. hexadecimal, compressed binary, and other proprietary codes. While the volume and quality of observations is likely to increase, the range of parameters will be limited to those that can be measured without manual input. The future focus is therefore likely to be targeted at NWP forecast requirements, and often at the expense of providing the full range of observed elements traditionally provided by VOS.

(e) PMO resources to inspect and maintain the traditional manually reporting VOS are under significant pressure, and with the introduction of AWS systems it is anticipated that there is likely to be an increased requirement for technical skills

(f) The work of the TT-DMVOS is expected to have an impact on the future VOSClim data flow. In particular, their proposals for a revised GCC data flow involving both real time and delayed mode Global Collecting Centres feeding the data into a WIS data server and thence on to the ICOADS will need to be considered.

3. Having considered these factors the Task Team and its scientific advisers, have come to the conclusion that there is a need for the additional IMMT code groups reported by VOSClim ships to be requested (as soon as feasible) from all VOS ships. Moreover, as these parameters are currently only reported in delayed mode, it is considered that work should begin on ensuring that these parameters can increasingly be made available in real time.

4. Accordingly, the Task Team considers that it is now time to end the 'project' status of VOSClim and to start applying the benefits learned to the wider VOS. Upgrading, whenever possible, existing VOS to VOSClim standards will help to ensure the future availability of climate quality marine data.

5. Consequently, rather than developing the project into a separate long-term operational programme as was originally suggested at its outset, it is recommended that VOSClim should be fully integrated within the existing VOS Scheme as separate category of VOS. In liaison with the Task Team on WMO Pub, 47 metadata, the Task Team considered that that this could be achieved, as least in part, by introducing a new type of meteorological ship into WMO Pub. 47 (e.g. by adding 'Selected VOS Climate Ship' as a new type for the field vsslM and in associated table 2202). Detailed proposals in this respect, including proposals on how to distinguish VOSClim ships fitted with AWS systems will be included in the report of the Task Team on Metadata for WMO Pub No 47. In addition, it was suggested that a flag could be added to the delayed-mode IMMT format to indicate whether a given ship is officially part of the VOSClim project. Having made these changes VOS operators could then be strongly encouraged to upgrade their existing Selected VOS to the VOSClim standard.

6. One of the key achievements of the VOSClim project is the process whereby all relevant datasets (i.e. real time data and associated model output data, delayed mode data, and metadata) are made available at a single location, and unified into the IMMA format (see *Annex 3*) to be compatible with the International Comprehensive Ocean-Atmosphere Data Set (ICOADS; http://icoads.noaa.gov/). Although it took longer than originally anticipated to establish this data flow, it is now in place and climate researchers can easily gain ftp access to the data from the VOSClim website. It is proposed that the aim now should be to apply the principle of this data flow to the whole VOS, but with modifications to also eventually align it with long-term data management proposals currently under consideration by TT-DMVOS (see *Annex 3* and SOT-V/III-3.5). The resultant VOSClim datasets are already starting to flow regularly to ICOADS with an IMMA flag indicating ships identified as members of the VOSClim project. It is suggested that ICOADS, with support from UK NOCS (and contingent on agreement with the Met Office RTMC, NCDC DAC, and other involved organizations) should also investigate populating the model and VOSClim attachments historically (back to 2000). Model parameters are already associated with all GTS reports by the RTMC, but only the VOSClim subset is currently forwarded to the DAC, and extending this to all ships (including the model information historically, as feasible, and possibly extended to buoys and other non-ship data types) could be highly beneficial scientifically.

7. One of the additional tasks assigned to the Task Team at SOT IV was to review all relevant JCOMM Publications to make sure they are kept up to date. Consequently, SOT is invited to note that the proposal to start upgrading all VOS to encompass VOSClim standards is likely to require amendments to the following publications

- WMO No 471, WMO Guide on Marine Meteorological Services (Chapter 6 - The WMO Voluntary Observing Ships' Scheme)
- WMO No. 544, WMO Manual on the Global Observing System (GOS) (section 2.3.3 Sea Stations which makes references to selected, supplementary, and auxiliary)
- WMO No. 488, WMO Guide to the Global Observing System (GOS) (section 3.2.1.3.3 Mobile sea stations which defines selected, supplementary, and auxiliary, and criteria for recruiting VOS; there is also section 3.7 dealing with climatological stations although these are basically land stations but a note could be added to refer to VOSClim)
- JCOMM TD No.4, The Voluntary Observing Ships Scheme – A Framework Document

8. Upgrading existing VOS to VOSClim standards will provide an impetus for VOS operators to ensure that they collect the full suite of metadata for all VOS in accordance with WMO Pub. 47, together with the supporting digital images and ship profile plans that are currently collected for VOSClim ships. In addition, it will help to ensure that VOS are equipped with the calibrated instruments needed to collect high quality observations.

9. Subject to acceptance of the above proposals the SOT is invited to revise the Task Teams Terms of Reference, in particular by deleting para 4 and by introducing a new task to ensure that the data management aspects are addressed and aligned with the long-term proposals currently under consideration by TT-DMVOS.

10. As the project can now be considered as being operationally mature it is recommended that the leadership of the project should now be revisited, noting that the current project leader intends to step down at SOT-V.

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