WORLD METEOROLOGICAL ORGANIZATION

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (OF UNESCO)

JOINT WMO/IOC TECHNICAL COMMISSION FOR OCEANOGRAPHY AND MARINE METEOROLOGY (JCOMM)
SHIP OBSERVATIONS TEAM

FOURTH SESSION

GENEVA, SWITZERLAND, 16 TO 21 APRIL 2007

SOT-IV/Doc. I-4
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ITEM I-4

Original: ENGLISH

REPORT AND RECOMMENDATIONS BY TASK TEAMS

(Submitted by the Secretariats)

Summary and purpose of document

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

ACTION PROPOSED

The Ship Observations Team is invited to:

(a) review the information contained in this report and comment as necessary;

(b) seek a volunteer to update the PowerPoint presentation "The Partnership between the Maritime Industry, Marine Forecasting and Science" and

(c) consider the issues raised in para 36.1 to 36.7 of the TT on Satellite Communication System Costs report and make recommendations, as appropriate;

(d) approve the proposed global VOS routes;

(e) provide guidance to the VOSClim Task Team, as appropriate, on the 19 key discussion issues identified (shown in italics in the document);

(f) discuss and approve the recommendations by the Task Teams, and to provide guidance on the next steps to be taken;

(g) re-establish the Task Teams as required, review their membership and select the Chairs.

Appendices:
A. Report by the Task Team on VOS Recruitment and Programme Promotion
B. Report by the Task Team on Satellite Communication System Costs
C. Report by the Task Team on Metadata for WMO Publication No. 47
D. Report by the Task Team on VOSClim
E. Report by the Task Team on Coding
F. Report by the Task Team on Instrument Standards

DISCUSSION

1. Task Team on VOS Recruitment and Programme Promotion

Appendix A contains the report by the Task Team on VOS Recruitment and Programme Promotion. The Task Team Chairperson, Ms Julie Fletcher, prepared this report.

The SOT is invited to seek a volunteer to update the PowerPoint presentation "The Partnership between the Maritime Industry, Marine Forecasting and Science" and to re-establish the Task Team, review its membership and select a new Chair.

2. Task Team on Satellite Communication System Costs

Appendix B contains the report by the Task Team on Satellite Communication System Costs. The Task Team Chairperson, Ms Sarah North, prepared this report.

The Task Team on Satellite Communication Costs was established at SOT- I to consider the problem of unequal cost burdens on countries accepting Code 41 Inmarsat messages through their Land Earth Stations (LES). This document contains background information on the work of the Task Team and also summarizes developments since the last session, which impact on future Inmarsat Costs. It identifies technical innovations, which will help reduce Inmarsat costs, and also briefly considers the costs associated with alternative communication systems.

The meeting is invited to review the report of the Task Team, to discuss and approve the recommendations, and to provide guidance on the next steps to be taken.

3. Task Team on Metadata for WMO Publication No. 47

Appendix C contains the report by the Task Team on Metadata for WMO No. 47 (Pub 47) on its activities during the intersessional period, and includes the Task Team's recommendation for a global VOS route scheme to replace the existing separate national route lists. The Task Team Chairperson, Mr Graeme Ball, prepared this report.

4. Task Team on VOSClim

Appendix D contains the report by the Task Team on VOSClim. The Task Team Chairperson, Ms Sarah North, prepared this report.

5. Task Team on Coding

Appendix E contains the report by the Task Team on Coding. The Task Team Chairperson, Mr Craig Donlon, prepared this report.

6. Task Team on Instrument Standards

Appendix F contains the report by the Task Team on Instrument Standards. The Task Team Chairperson, Mr Robert Luke, prepared this report.

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Appendices: 6

Appendices

A) Report by the Task Team on VOS Recruitment and Programme Promotion
B) Report by the Task Team on Satellite Communication System Costs C) Report by the Task
C) Team on Metadata for WMO Publication No. 47
D) Report by the Task Team on VOSClim
E) Report by the Task Team on Coding
F) Report by the Task Team on Instrument Standards

APPENDIX A

REPORT BY THE TASK TEAM ON VOS RECRUITMENT AND PROGRAMME PROMOTION

Status of Action Items from SOT III for TT on VOS Recruitment and Programme Promotion

1/ 4.1.6 International Newsletter to be kept under review

This was also discussed at PMO-III, Hamburg, March 2006. Action Item No 20 from PMO-III invited member countries to volunteer to publish a SOT newsletter on behalf of the TT. In view of limited resources to prepare and publish a SOT newsletter, it was agreed that newsworthy material could be placed on the Wiki website hosted by E-SURFMAR for use by any NMS that publishes a marine-based newsletter. The cover page for the repository of articles is

http://esurfmar.meteo.fr/wikisurf/index.php/Marine_Observing_Articles

and authors are invited to contact Pierre Blouch at Meteo France.

III/ A4.2.4 *Tools developed by the TT (eg flyer, PowerPoint presentation) be used to promote VOS thro shipping companies*

These tools are all available on the VOS website for promotional use

http://www.bom.gov.au/jcomm/vos/resources.html#operational4

III A/4.5.3 *VOSP to provide VOSP Chair with list of improvements to the Marine Meteorological Services monitoring questionnaire to be passed to ETMSS for inclusion in the next questionnaire.*

The update of the questionnaire was completed and sent to Henri Savina, Chair of ETMSS on 30 August 2006 for consideration at ETMSS-II.

Progress by TT on Tasks defined at SOT III

Five tasks were identified for the TT to progress, these are numbered below with the actions achieved listed below each task.

1. *Further develop the generic pre-installation design standards that will eventually be available to ship builders and classification societies.*
   Work in progress - WMO sent a letter about ship design to the International Association of Classification Societies (IACS) in February 2007 and the issue was discussed at a high level WMO-IMO consultative meeting in Geneva in February. WMO will report on this.

2. *Review existing promotional aids (flyer, certificate) and recommend new promotional aids.*
   The promotional aids are on the VOS website and being used.

3. *Promote the use of, and keep under review, the promotional presentation "The Partnership between the Maritime Industry, Marine Forecasting and Science".*
   The PowerPoint presentation still conveys the right message, but some of the slides need updating to keep it current.

4. *Establish a store of newsworthy articles for use in a SOT or VOSClim Newsletter or in national newsletters.*
   Agreed to use the E-SURFAR Wiki website

5. *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.
Questionnaire review completed and revised questionnaire sent to Chair of ETMSS, in August 2006. The questionnaire was discussed and adopted at the Expert Team on Maritime Safety Services (ETMSS-II) in Brazil in January 2007, and will be disseminated for the next monitoring survey in early 2008, after final discussion during the SOT-IV in April 2007.

Summary of other work completed under the TT

Initiatives

1. The SOT Certificate and Flyer were finalized and put on the VOS web site http://www.bom.gov.au/jcomm/vos/resources.html#operational5 during the 4th quarter (Q4) 2005. These are now in routine use.

2. The PMO and VOS FP group mailing lists were established to improve global communication and these are being used. pmo@jcommops.org and vos@jcommops.org

3. The Foreign VOS Inspection form (Annex 3) was completed in Q2, 2006 and put on the VOS website http://www.bom.gov.au/jcomm/vos/documents/foreign_vos_inspection_form.doc for PMOs to download. PMOs should use this generic inspection form to record the details of a visit to a foreign VOS ship and then email the completed form to the VOS FP in the country of recruitment.

4. VOS Quick Reference Guides for PMOs (Annex 1) and National VOS Programme Managers (Annex 2) were written by the Chairs of the SOT and VOSP and put on the VOS web site in Q4 2006.
http://www.bom.gov.au/jcomm/vos/information.html#info1
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.

TT Membership Review

The TT members as agreed at SOT III are:
Steve Cook (TT chairperson, USA)
Graeme Ball (Australia)
Pierre Blouch (France)
Julie Fletcher (New Zealand)
Gordon Mackie (United Kingdom)
Sarah North (United Kingdom)

It is recommended that this Task Team be re-established for the next intersessional period, but that its membership is reviewed and a new Chairperson appointed to replace Steve Cook (retired).

ANNEX 1 TO APPENDIX A

ANNEX 2 TO APPENDIX A

ANNEX 3 TO APPENDIX A

APPENDIX B

REPORT BY THE TASK TEAM ON SATELLITE COMMUNICATION SYSTEM COSTS

A Background Information

1. At JCOMM-I (Akureyri, June 2001), it was recognized there was a marked lack of uniformity among Inmarsat Land Earth Station (LES) and their associated National Meteorological Services regarding the policy for accepting ship reports using Code 41, with restrictions being applied in some cases, which resulted in the loss of valuable data. It therefore requested the Ship Observations Team to review this question with a view to developing, if possible, a common policy and approach to the application of Code 41.

2. The Ship Observations Team, at its first session (SOT-I) (Goa, February-March 2002), further considered the Code 41 system whereby communication costs are wholly borne by those National Met Services who host LES accepting Code 41 observations (irrespective of whether the observation emanates from an observing ship recruited by the host country). With the idea of some form of global cost sharing scheme being suggested, among other possible solutions, the meeting established a Task Team on Satellite Communications System Costs.

3. At SOT-II (London, July – August 2003), it was recognized that although the Code 41 system was working efficiently, 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. If such actions were to be taken it would not only increase the burden on the remaining National Met Services, but could also have a consequential impact on the level of real time data availability.

4. The Task Team proposing possible actions to address the problem, whilst maintaining the Code 41 principle that the costs should not be borne by the ship owners or managers submitted a detailed report to SOTII. Following consideration of the Teams report it was generally considered that some form of global cost-sharing scheme, financed through a single common fund presented the best approach to solving the problem of unequal sharing of the costs. The fund could be administered by WMO or by a single national service on behalf of all. Whilst it was recognized, that obtaining agreement of all National Meteorological Services to contribute to a global scheme would be difficult, the Team was instructed to prepare a formal paper for initial consideration at the third session of the JCOMM Management Committee (MAN-III) held in Geneva, from 17 to 20 March 2004.

5. In considering this submission MAN-III strongly endorsed the actions undertaken within the Ship Observations Team with regard to the growing cost problem, and requested that the issue be brought to the attention of the WMO Executive Council (EC-LVI June 2004). A report on the issue was subsequently made to EC-LVI by the JCOMM co-president Johannes Guddal. In response, the Council recognized that the problem was not necessarily a global one, but might best be addressed on a regional basis, and that more detailed information was required before any decisions could be made.

6. As a consequence of the Council's advice, the Task Team revisited the issue. In November 2004 following an informal meeting between the Task Team Chairperson and representatives from IMSO and Inmarsat Ltd., it was recognized that an alternative approach to the problem might be to appoint an Accounting Authority to oversee the payment of Code 41 satcom costs. Although this could be an independently appointed accounting company, it was generally felt that it would be preferable if an individual Responsible National Met Service (NMS) would be willing to take on this role. Under this proposal the Accounting Authority, would act as the billing intermediary between the LES service providers and the NMS's that operate code 41 VOS.

7. The Task Team recommended this 'Accounting Authority' approach to the Third session of the Ship Observations Team, (SOT-III – Brest 7-12 March 2005) as a potential solution to the problem of fairly distributing VOS transmission costs. SOT III recognized that the Code 41 cost burden of ship observations being borne by the relatively few National Met. Services was likely to increase with the

growing use of ship borne AWS systems sending hourly observations; with the migration to BUFR coded observations; and with the growth in TEMP messages being sent by ASAP ships.

8. Although SOT III considered the Task Teams proposals in detail it recognized that there were many issues that would need to be resolved if it were to have any chance of success. In particular a method would need to be devised to allocate costs back to individual VOS operators, either based upon the Inmarsat numbers of individual ships or on the volume of ship code observations received through GTS collecting centres. This could incur significant administrative effort and agreements would need to be established between the accounting authority and the NMS operating VOS to ensure the prompt payment of invoices. Start up and ongoing costs would also be incurred by the Accounting Authority, and provision would need to be made for bad debtors. There was also the risk that some VOS operators may reduce the size of their fleets in order to cut costs. Accordingly SOT III decided against pursuing an Accounting Authority solution.

9. Recognizing that the problem remained, albeit lessened by recent E-ASAP and E-SURFMAR initiatives to address the problem on a regional European basis, the meeting nevertheless decided to retain the Task Team on Telecommunication Costs in order to further monitor the problem. The Teams Terms of Reference were therefore revised at SOT III to simply

- Continue to monitor the cost implications of Inmarsat satellite communications sent be Code 41, and
- Report to SOT-IV on relevant issues/proposals

B Developments since SOT III

10. Even before SOT III it had become apparent that the cost burden problem arising from Code 41 observations was being felt most strongly by European NMS that host Inmarsat LES. The problem had been amplified in Europe by the closure of Raisting LES in Germany resulting in a significant amount of re-routing of observations via other LES, and had also been exacerbated by the relocation of certain shipping companies with large observing fleets to other countries, and the consequential re-routing of their observations via other LES

11. Recognizing the need for a regional European approach the E-SURFMAR and E-ASAP programmes have therefore been particularly active since SOT III in developing cost reduction solutions, as outlined below;

E- SURFMAR Developments

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12. E-SURFMAR has established contractual arrangements with its member National Met Services to increasingly compensate them, subject to budget provisions, for their VOS communication costs. Member countries contribute to this programme based upon their GNI and are then compensated according to the number of SHIP code reports received via their GTS originating centres. The compensation is therefore mainly directed to those members that host LES i.e. France, Netherlands, Greece and UK. This compensation has helped to alleviate the problem to some extent but still only represents a small proportion of the overall burden, and it must be remembered that a significant percentage of the costs borne by European LES continues to be generated by non-E-SURFMAR ships. Further cost reduction strategies and incentives are therefore needed, and are being considered.

13. In this regard, and thanks largely to the efforts and leadership of the E-SURFMAR Programme Manager, Pierre Blouch, there have been notable technological innovations made recently to reduce the Inmarsat transmission costs arising from both manned VOS and Automatic Weather systems contributing to the E-SURFMAR Programme -

Manned VOS – 'Half compressed' system

49.1 Because Inmarsat C is a carriage requirement under SOLAS for the Global Maritime Distress and Safety System (GMDSS) it is likely to remain the primary transmission route for manual VOS for several years to come. Consequently unless NMS's are prepared to

fund the installation of alternative dedicated communication systems, such as those used by AWS systems, then alternative cost reduction methods are needed for manually reporting VOS.

49.2 With this in mind the E-SURFMAR Programme team have successfully developed and tested a data compression system for Inmarsat-C messages from manned VOS. The system is actually referred to as a "half compressed" system because messages remain alphanumeric and are not pure binary. Two blocks of 32 characters are needed at most for each VOS report resulting in a cost of approximately 0.32 € per message. By comparison an uncompressed report VOS report occupies five blocks of 32 characters and currently costs approx 0.8 -1.0 Euro per message (depending on LES supplier)

49.3 This 'half compressed' facility has been implemented in the latest version of TurboWin (V 4.0), which was released in January 2007 (although a separate installation routine is needed to activate this function) and is being tested on a number of ships. The first successful transmissions took place from a Dutch VOS (*Maersk Miami* - PGDM) and at the time of writing this report six ships are now using the system.

49.4 The main difference from a standard VOS report is that the half compressed message system requires the use of new Special Access Codes. The messages are presently sent via Aussaguel LES using dedicated SAC 412. The raw data are then processed at Météo-France and inserted onto the GTS in Toulouse.

49.5 Météo-France has offered to make the data processing software that is necessary to convert the raw data into GTS messages available to other NMS free of charge. At present the software is limited to FM-13 SHIP Code messages, although it is planned to extend this to FM-96 BUFR code messages in the near future. SAC 412 is presently only available via France Telecom (Aussaguel LES) with the costs paid by Météo-France. As with the current SAC 41 system there are no charges incurred by the ship.

49.6 In order to expand the use of this half compressed system it will be necessary for other VOS operators to establish similar arrangements with their Inmarsat providers/LES. Each VOS operator will need to provide the email address to which they want their data to be routed for processing and by having their own dedicated SACs assigned they could then be responsible for paying their own VOS communications costs.

49.7 The use SAC 412 therefore brings an opportunity to improve on the current SAC 41 system whilst also reducing the cost burden. Because there appears to be nothing to prohibit any NMS from establishing a similar dedicated contract with France Telecom, or any other provider that offers a dedicated SAC facility, it could help to gradually engender a fairer system whereby each NMS pays the costs for its own VOS fleet. The current SAC 41 procedure would be maintained in parallel, but with VOS operating countries gradually invited to adopt the new procedure.

Automated Weather Stations - Data Reporting Service

49.8 Météo France has also been active in the development of new compression software to enable messages from BATOS AWS systems to be sent via the Inmarsat-C Data Reporting Service. This compression software has been shown to result in a significant reduction in transmission costs (~ 0.145 Euro per report).

49.9 In 2006 Météo-France upgraded half of its BATOS fleet to the new software and expects complete deployment by mid-2007. The software is also now in use on 2 BATOS AWS systems installed on E-SURFMAR ships and one UK Research Ship.

49.10 Once the BATOS AWS software has been set up for data reporting service the 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. Configuration files and metadata files are set up at the processing centre for each ship, and transmission of any parameter onto the GTS can be switched on or off as necessary.

49.11 Météo-France plan to make the data processing software, which converts raw BATOS data into GTS messages freely available, to other NMS that wish to process their own data flow. The data format could also be made available to other AWS manufacturer who wishes to implement it in their own systems (e.g. Vaisala, Axys, etc.). As with the half compressed system, the software is presently limited to FM-13 SHIP Code messages, although it is planned to extend this to FM-96 BUFR code messages

E-ASAP Developments

14. Similarly, the E-ASAP programme, has been active in addressing the need to reimburse the cost of ASAP TEMP messages sent via Inmarsat Code 41 – which, until recently were mostly sent via Goonhilly LES. Because TEMP code messages are comprised of four parts, and are significantly larger than SHIP code messages, the transmission costs involved are significantly larger (often amounting to over 400 Euros/ship each month)

15. Accordingly, with effect from 1st January 2005 it was agreed that the Met Office should be reimbursed by participating E- ASAP operating countries for the costs it incurs in respect of their TEMP Code transmissions sent via Goonhilly Inmarsat Land Earth Station. This compensation also extends to the costs incurred by fully integrated E-ASAP ships that are managed directly by the E-ASAP Programme Team

Bilateral Agreements

16. In addition to the above mentioned technical solutions and compensation schemes bilateral arrangements have also been established between the German Weather Service, Deutscher Wetterdienst (DWD) and those NMS whose pay the additional communications costs for German VOS caused by the closure of Raisting LES. As many of these messages were re-routed via Burum and Goonhilly LES, bilateral agreements have been established with the Royal Netherlands Meteorological Institute (KNMI) and the UK Met Office respectively for DWD to reimburse these costs.

Recent Closure of Goonhilly LES

17. In November 2006 the company that operates Goonhilly LES - Stratos Global Corporation – advised that they were moving their Inmarsat A and C services to Burum LES in the Netherlands (following their take over of Xantic, the company that previously operated Burum). Remaining Inmarsat B M and F Services were to be migrated thereafter during 2007

18. Unfortunately this transition was made without prior notice being given to the VOS or ASAP operators that were going to be affected by the changes. Despite subsequent assurances that the transition was seamless, it resulted in serious data transmission losses, message header format issues and significant data delays. It also impacted on the Met Office's issuance of SafetyNet broadcasts and warnings

19. The main 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. Considerable effort, lasting several weeks, was therefore expended in trying to resolve the issue and trying to provide suitable telex nodes capable of dealing with the volume of transferred traffic. The problem lasted until late January when notification was received from Burum LES that the telex problems had been resolved. (Although at the time of writing this report this has yet to be confirmed in practice, as some ASAP ships still appear to be experiencing delays).

20. A formal meeting with Stratos representatives is due to be held in late February to discuss the implications of the closure for the future, and to investigate better ways of routing the messages back to the Met Office, such as by email. Any relevant issues arising from this meeting will be reported verbally to SOT IV.

21. When the problems first arose the data delays being experienced extended many hours beyond the model cut off times, and were especially noticeable for ships contributing to the E-ASAP programme. It therefore proved necessary for the E-ASAP Programme team to instruct its participating ships to switch their satcom configurations to use alternative Inmarsat LES. The overwhelming majority switched to using Aussaguel LES (ID 121).

22. The problems experienced by the closure of Goonhilly highlight the need to be able to ensure continuity of Inmarsat data traffic (both SHIP and TEMP). This is not only necessary for ensuring E-SURFMAR & E-ASAP NWP objectives, but also for ensuring wider global forecasting and climate objectives. To ensure that such data losses are not experienced in future it is suggested that suitable emergency back-up arrangements are needed, whereby data can be transferred to another LES/Supplier are therefore needed

Other Communication Systems

23. Whilst not within the remit of the Task Team (which is currently limited to Inmarsat communication costs) it should be noted that a variety of alternative communication systems are now used in the surface marine observing area, notably on Automatic Weather Stations. These systems offer the potential to further reduce communications costs and include the following;

49.1 **Iridium** – this system using a global array of satellites is currently gaining popularity and offers notable advantages. In particular the Short Burst Data transmission costs offer potentially great savings for AWS applications (~0.08 € per report). There are no transmission delays and it has the potential for two-way communication. The system has recently been successfully tested by Météo-France on two drifting buoy prototypes and is also being evaluated under the DBCP's Drifter Iridium Pilot Project, which began in November 2006 and will run for a period of two years. The Iridium system will also be used as the transmission system for the new BAROS AWS being developed by Météo France. As for Inmarsat-C Data Reporting service, the messages are received by email at processing centre(s) where decoding software prepares the FM-13 SHIP FM-96 BUFR reports for insertion on the GTS.

49.2 **Argos**. – This system is still the primary transmission medium for drifting buoys and is also used on the MINOS AWS system. The advantages of the system are the low cost of the transmitters and the low power consumption. However the transmission costs are comparatively high (equivalent to ~ 0.33 € per report), and because the system uses polar orbiting satellites it can introduce significant transmission delays, depending on the location of the satellites relative to the ground receiving stations. Raw data from the satellites is processed by Service Argos who prepares the FM-13 SHIP messages for insertion on the GTS (through Météo-France or NOAA).

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49.3 **Geostationary Met. Satellites – Meteosat/GEOS/GMES** - Meteosat **DCP's** are used on a number of MILOS AWS systems fitted on German and Irish VOS, and are also used on moored buoys AWS systems, such as those developed by the Met Office. 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 expensive and the system is subject to allocated time slots. Users must also manage the integrity of the data to reduce transmission errors, and availability of suitable digital DCP's for use with the second-generation Meteosat system is 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

49.4 **Globalstar –** Whilst this system also uses a global array of satellites, it does not offer full global coverage. As with the Iridium system the costs are relatively low when compared with Inmarsat. The system is used on the Norwegian Weather ship 'Mike' and is being trialed for use on some E- ASAP ships

49.5 **Broadband/E-mail –** a growing number of ship-owners are now equipping their ships with broadband communication facilities using Inmarsat or other communications systems. It is likely that this trend will continue, especially with the introduction of new services such as Inmarsat's 'FleetBroadband' services which will be delivered by the Inmarsat 4 satellites and is planned to be commercially available in the second half of 2005. It is increasingly being found that ship-owners are willing to absorb the relatively low cost of observations transmissions within their own communications budget. During 2005 almost all the manually reporting offshore installations recruited by the Met Office in the North Sea were migrated to the use of email communications and many government service vessels and Antarctic survey vessels are now using email to send their observations.

24. As part of the programme proposals for the next phase of the E-SURMAR programme (2007-11), Pierre Blouch, Programme Manager compiled a helpful table comparing the relative costs and merits of the main communication systems currently being used to send observations from manned VOS and ship borne AWS (**Appendix A**)

Other issues

Masking of ship's call signs

25. Another development since SOT III that has potential implications for determining Inmarsat satellite communication costs is the issue of masking ships call signs to avoid ships data being made available on external websites. In this respect the WMO Executive Council (EC-LVIII) has issued a Resolution recommending that members which, in consultation with ship owners, wish to protect the identity of VOS may implement ship call sign masking, for a trial period of one year, a process which would facilitate open distribution of masked data on the GTS

26. If call signs are masked by securely held, but unique, generic identifiers, this could potentially simplify the process of assigning individual ship communications costs back to the originating VOS operating countries. Provided a common scheme is adopted it could therefore be of help to programmes like E-SURFMAR, where participating countries are compensated for the communication costs incurred by their VOS. However, where ships identities are disguised by the non-unique identifiers such as SHIP it will make it extremely difficult to correctly assign the costs associated with individual ships

27. The introduction of the previously mentioned 'half compression' Inmarsat C system, combined with the ability to use a VOS identifier in the TurboWin programme, provides VOS operators with an opportunity to start migrating their manual VOS to the use unique masked call signs (e.g. TBWUK00 - TurBoWin United Kingdom 00 - could for example be a potential approach)

Code Formats

28. The migration to binary table driven code formats such as BUFR also has potential to impact on the VOS communication costs. If such formats are compiled at source, for transmission from a VOS, then the resultant increased message length is likely to increase the communication costs. From a quality perspective the ability to code messages into BUFR at source could be considered preferable than encoding the messages into BUFR when they are received ashore, and should not therefore be entirely discouraged.

29. However it should be remembered that BUFR code format is primarily intended for the international exchange of data between NMS. Consequently, as long as the incoming VOS messages can be encoded into BUFR by the receiving NMS, the originating message can now be in any suitable format – NetCDF, Hexadecimal, or any proprietary code. The use of alternative code formats will inevitably increase as we migrate away from the use of alphanumeric SHIP Codes It is therefore envisaged that, to keep communication costs at a minimum, the use of BUFR code on board ships is unlikely to present an economical solution for most VOS operators

SAC 41 LES lists & issues

30. At the time of the problems with Goonhilly, when TEMP messages were being routed via other LES, it became apparent that there was no listing for Aussaguel (under Inmarsat AOR-W) in the Code 41 list maintained on the WMO and VOS websites. This once again highlighted the importance of maintaining the Code 41 list up to date, and for the ownership of this responsibility to be clearly assigned. A list of the current Code 41 LES and their geographical locations are attached at **Appendix B** and **C**

31. As previously reported by the Task Team there are some LES that impose geographic limitations (e.g. based upon Metarea) on the areas from which they will accept Code 41 observations (e.g. Arvi). Similarly there are certain LES that are not included on the Code 41 list, but will accept code 41 observations and then invoice the ship-owners. In addition there are some LES, which are listed as accepting Code 41 messages, but where test messages have shown that this isn't necessarily always the case in practice. Such anomalies in the Code 41 system remain to be addressed in order to avoid the ship-owners incurring costs.

32. There is also a need to have a clear mechanism to keep LES ID numbers up to date and to ensure that any changes are promulgated to all affected ships at the earliest opportunity. Whilst this can be done via VOS contacts it should also be promulgated to ships staff via other means, such as Notices to Mariners.

33. In this respect it was recently notified that from 1 March 2007, the Perth LES ID 22 would change to ID 12 (Station 12). After this date ships operating in the Australian region were advised to use POR 212 or IOR 312 to lodge their weather reports. It was further requested that all ships operating in the Australian Region should change to using Special Access Code 1241 when lodging their weather reports to POR 212 or IOR 312. The use of SAC 1241 remains a free service to ships but ensures that the weather reports are diverted to the Australian Bureau of Meteorology rather than relayed to Burum in the Netherlands. Whilst ships would continue to use SAC 41 when sending their uncompressed weather reports to other LES, this introduction of another SAC introduces further complicates the long-standing Code 41 system. However it also affords the possibility to start migrating towards a system whereby each VOS operator could be assigned a dedicated SAC and therefore be responsible for their own VOS cost burden (para 20 above referred).

34. It is anticipated that the closure of Goonhilly LES will also mean that the Goonhilly IDs 102 and 002 may at some point cease in the future, although this has yet to be formally confirmed. Such a change would have cost implications for the bilateral and compensation arrangements mentioned earlier in this report

35. The closure of LES's (e.g. Goonhilly and Raisting) and takeovers or mergers between telecommunication companies (e.g. Xantic and Stratos) have resulted in a decreasing number of companies that operate the LES accepting Code 41 messages. In actual fact this consolidation of LES operators means that there are effectively two operators each selling about 45% of the pre-broadband maritime Inmarsat services. These 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 and agreed to purchase Telenor Satellite Services in October 2006). Whilst this helps to offer a more global service it remains to be seen whether it will permit a more competitive pricing regime for VOS operators. Moreover it brings into focus the question of whether Code 41 stations should in future be listed against the host LES country.

Recommendations

36. The Task Team invites the SOT meeting to consider the issues raised in its report and to advise on how its future work should be progressed. In particular the meeting is invited to note, and make recommendations as appropriate, as follows

49.1 Note the recent developments concerning 'half – compressed' messages and make recommendations to extend its use on manually reporting VOS (paras 13.1 to 13.6 refer)

49.2 Consider the merits of encouraging VOS operators to migrate their fleets to the use of dedicated SAC systems (in parallel with the current Code 41 procedures) as a method of fairly apportioning the Inmarsat cost burden, and advise accordingly (para 13.7 refers)

49.3 Invite operators and manufacturers to consider adapting their AWS systems that transmit via Inmarsat to consider using the Data Reporting Service (in conjunction with the data processing software developed by Météo France) as a method of reducing their transmission costs (paras 13.8 to 13.11 refer)

49.4 Consider the need to formulate suitable emergency back-up procedures to ensure that data is re-routed to assigned alternative LES in the event of the sudden failure or closure (as in the case of Goonhilly) and advise accordingly (para 22 refers)

49.5 Further consider the need to clearly assign responsibility for maintaining the list of SAC 41 Land Earth Stations up to date (bearing in mind also the potential for new dedicated SAC procedures) and advise accordingly (paras 30 to 34 refer)

49.6 Consider whether the scope of the Task Teams' Terms of Reference should be revised to include communication systems, other than Inmarsat, that can offer potential cost benefits to VOS operators (paras 23 to 24 refer)

49.7 Encourage the increased use of email for sending observations (see para. 23.5)

ANNEX A TO APPENDIX B

EXTRACT FROM E-SURFMAR PROGRAMME PROPOSALS
(prepared by Pierre Blouch, Programme Manager)

System	Service	Format	Tranmitter + Anten. cost	Op. cost per report	Total cost per report	Coverage	Remark
Inmarsat-C	Text	ASCII	0 € (GMDSS)	1.00 €	1.00 €	Quasi-global	Turbowin Code 41 or not
Inmarsat-C	Text	ASCII	0 € (GMDSS)	0.40 €	0.40 €	Quasi-global	Half compressed reports
Argos		Binary	150 €	0.33 €	0.33 €	Global	Transmission delays Minos station
Globalstar		Binary	1500 €	0.20 €	0.22 €	Regional	Under evaluation at Met.no
Inmarsat-C	Data R.	Binary	1600 €	0.15 €	0.17 €	Quasi-global	New Batos systems
Iridium	SBD	Binary	1000 €	0.08 €	0.09 €	Global	Planned for Batos
Meteosat	DCP	ASCII or binary	5600 €	0.00 €	0.07 €	Regional	German Milos AWS

Manned VOS

AWS systems

Table 8 - Communication systems used to report ships data ashore

ANNEX B TO APPENDIX B

INMARSAT-C LAND EARTH STATIONS ACCEPTING CODE 41 MESSAGES

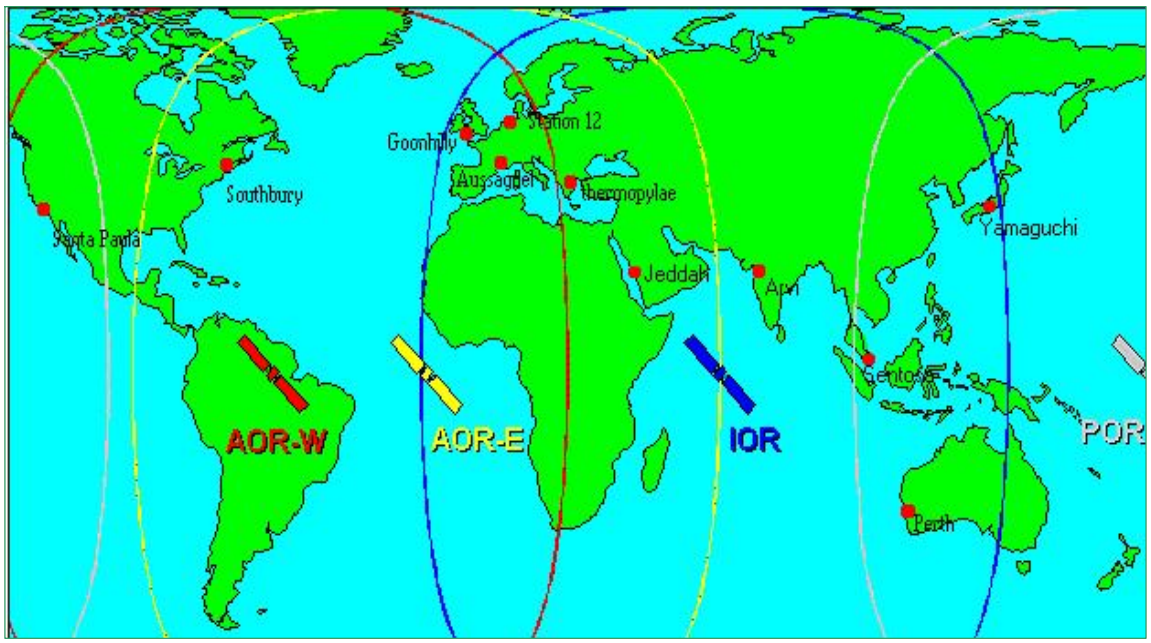
Name of station	Country	ID number
ATLANTIC OCEAN REGION-EAST (AOR-E)		
Aussaguel	France	121
Goonhilly	United Kingdom	102
Southbury	USA	101
Station 12	Netherlands	112
Thermopylae	Greece	120
ATLANTIC OCEAN REGION-WEST (AOR-W)		
Goonhilly	United Kingdom	002
Southbury	USA	001
Station 12	Netherlands	012
INDIAN OCEAN REGION (IOR)		
Arvi	India	(see note 1)
Aussaguel	France	321
Sentosa	Singapore	328
Station 12	Netherlands	312 (see note 2)
Thermopylae	Greece	305
Yamaguchi	Japan	303
PACIFIC OCEAN REGION (POR)		
Station 12	Netherlands	212 (see note 2)
Santa Paula	USA	201
Sentosa	Singapore	210
Yamaguchi	Japan	203

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

(last update - February 2007)

ANNEX C TO APPENDIX B

DISTRIBUTION OF CODE 41 LES WITH INMARSAT SATELLITE FOOTPRINTS



APPENDIX C

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

Background

WMO Publication No. 47 (Pub47), the *International List of Selected, Supplementary and Auxiliary Ships*, contains details about the names, call signs, vessel type, ship's dimensions, types of instrumentation, instrument location, instrument calibration dates and methods of observation used on VOS ships.

The Task Team on Metadata for WMO No. 47 (Pub 47) was established at SOT-II, London, 2003, with the stated objective to review the WMO No. 47 to ensure it continued to meet the requirements of all users. A comprehensive review was conducted and reported at SOT-III, Brest, 2005, where the recommendations of the Task Team were approved without change. The report by the Task Team also noted the need to greatly improve the level of documentation describing WMO No. 47, including the provision of guidance material to assist, in particular, Port Meteorological Officers to collect the metadata.

Tasks from SOT-III

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

2. (not recorded) Prepare documentation for WMO No. 47 Metadata version 3.

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

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

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

Task 1: Submission to JCOMM-II

The Task Team submitted the proposed changes to JCOMM-II, Halifax, September 2005. The following is an extract from the Final Report from JCOMM-II.

The Commission:

(a) Noted with approval the changes developed and implemented by SOT, in accordance with the authority provided by the former CMM through Recommendation 9 (CMM-XII) and after consultation with the Expert Team on Marine Climatology, to the contents of the existing code tables associated with the International List of Selected, Supplementary and Auxiliary Ships;

(b) Adopted Recommendation II (JCOMM-II) to implement modifications to the definitions and details of the fields (and format), and to initiate the preparation, by SOT, of an XML version for the future exchange of the metadata for that publication;

(c) Noted with approval the adoption by SOT of a semi-colon delimited format for the immediate current exchange of the metadata;

(d) Agreed that SOT should be the subsidiary body of JCOMM of the International List of Selected, Supplementary and Auxiliary Ships, in consultation with the Expert Team on Marine Climatology and other relevant bodies, including user groups.

Task 2: Prepare documentation for WMO No. 47 Metadata version 3

The Task Team issued documentation for WMO No. 47 Metadata version 3 on 1 June 2006, to provide NMS with ample lead-time before the introduction of WMO No. 47 Metadata version 3 on 1 July 2007. The documentation was made available on the JCOMM VOS website, and reference to the new version was also included on the Pub. 47 page on the JCOMM via a link to the JCOMM VOS website.

The documentation developed by the Task Team, currently at version 3.1, is provided as Annex 1 to this document and includes:

1. Complete set of Code Tables;
2. Description and format of the semi-colon delimited metadata exchange format;
3. Description and format of the XML metadata exchange format;
4. Ship's layout diagram including a definition of the required dimensions;
5. Recommended minimum suite of digital images/photographs for VOS and VOSClim;
6. Suggested photograph descriptions;
7. Suggested ship's drawings and sketches; and
8. Summary of changes from WMO No. 47 Metadata version2.

The Task Team also developed the XML Schema to be used in conjunction with the XML metadata exchange format.

Task 3: Consolidated list of ship routes

The Task Team, after much deliberation and recognizing that one of the main operational uses of the ship routes is to help identify ships to deploy drifting buoys and profiling floats, developed a global VOS route scheme based on buoy deployment areas (WMO No. 306, Manual on Codes, Code Table 1601). The proposal is given in Annex 2.

VOS FPs and Port Meteorological Officers will be advised via their respective mailing lists when updated documentation incorporating the global VOS route scheme becomes available on the JCOMM VOS website.

Task 4: Regularly review the Pub. 47 metadata requirements and make recommendations as appropriate.

Ongoing.

Task 5: Monitor the receipt of regular Pub. 47 updates at WMO from participating VOS members.

Through its ongoing efforts, the Task Team is pleased to report an increasing number of NMS regularly providing quarterly updates. Significantly, the past twelve months has seen both the USA and Canada commence regular Pub 47 submissions.

ANNEX 1 TO APPENDIX C

APPENDIX D
REPORT BY THE TASK TEAM ON VOSCLIM

1. VOSClim Project Status

Although further progress has been made since SOT-III in March 2005 the levels of participation, and the volume of project data collected, continue to be slightly disappointing. Nevertheless it is considered that the project has achieved many of it is initial objectives and the procedures established for the project should gradually help to improve the quality of all VOS data and increase the contribution of the VOS/VOSClim to the Global Climate Observing System (GCOS).

At SOT-III it was agreed that the project should progress from an 'implementation phase' into an 'evaluation phase' aimed at determining the added value of the VOSClim datasets. It was further decided that the VOSClim project should in future operate as a Task Team under the VOS Panel (VOSP) of SOT. An overview of the project status is at **Appendix A** while developments since SOT-III are detailed in the following paragraphs, together with issues that remain to be addressed

1.1 VOSClim Project Participation

At SOT-III (March 2005) the number of ships recruited to participate in the project stood at 113, whilst at the close of 2004 the number of ships recorded on the project website stood at 169 which is still short of the target figure of a minimum of 200 ships established at the start of the project. Details of participating ships are available on the project website at http://lwf.ncdc.noaa.gov/oa/documentlibrary/vosclim/vosclimshiplist.xls.

However, there have been delays between the notification of recruited ships to the Data Assembly Centre (DAC, based at the NCDC, Asheville NC, USA) and their listing on the project website (which at the time of writing this report was last updated six months ago, in September 2006). In recent months there has been some additional recruitment of ships equipped with Automatic Weather Stations (AWS). France, in particular, has increased its level of participation to 21 ships, all equipped with BATOS AWS systems capable of collecting delayed mode project data in the required IMMT-3 format. Similarly it is understood that that number of Canadian project ships equipped with AVOS AWS systems has been increased. Levels of manually reporting VOSClim ships have also increased since SOT III with the UK, Germany, the Netherlands and Australia having contributed additional ships. Details of the Netherlands recruits, including ship photos, are also now available on the KNMI website at http://www.knmi.nl/vos/vosclim/

Accordingly it is anticipated that, by the time of the SOT-IV meeting, the target of 200 ships should be almost achieved. The levels of national participation drawn from the project website, together with details of the actual numbers anticipated by the time of SOT-IV and details of the number of ships that are actually reporting, are given in Table 1. An update on the current status will be given at SOT-IV

Country	Number of VOSClim ships at end 2004 (reported to SOT-III)	Number of VOSClim ships recorded on project website (updated 28 Sep. 2006)	Anticipated number of VOSClim ships by SOT IV (to be updated at meeting)	Number of VOSClim ships reporting (number of reports) Feb. 2007	Target number of ships to participate (notified at previous VOSClim meetings)
Australia	10	12	12	8 (140)	20+
Canada	14	14	[26]	20 (2469)	75
France	6	6	21	2 (257)	8
Germany	11	20	[22]	17 (446)	14
India	21	221	22	4 (113)	-
Japan	5	5	5	5 (1761)	5
Netherlands	1	18	23	14 (383)	-
UK	33	60	63	31 (862)	30+
USA	12	12	12	9 (221)	[~ 50]
TOTALS	**113**	**169**	**~200**		

Table 1: Contribution of ships to VOSClim by country

One of the reasons for the slow rate of recruitment to the project has been the increasing resource limitations faced by VOS operators, which in some cases has led to reduced PMO numbers (as noted at JCOMM-II) and less frequent ship inspections. It is however encouraging to see that despite these resource limitations the level of participation continues to increase.

Issue 1: ***To ensure that the project data can be correctly monitored, and the datasets maintained up to date, it is essential that new recruitments and withdrawals are notified promptly to the DAC and that the ship list is maintained up to date on the project website. It is also important that full details of any call sign changes are notified to the DAC at the earliest opportunity. The VOS Quick Reference Guide for VOS Programme Managers (http://www.bom.gov.au/jcomm/vos/information.html#info1) indicates that both the DAC and the RTMC should be informed of any changes. However, it is apparent that this procedure is not operating efficiently. The meeting is therefore invited to consider how this procedure could be improved.***

Issue 2: ***Although the number of ships is now reaching the target level, the volume of project data being collected is less than had originally been expected. The inclusion of a Pub 47 metadata module in the latest version of TurboWin should make recruitment of project ships a simpler process and therefore offers the opportunity to widen the current participation. The meeting is invited to consider strategies for increasing participation, whilst at the same time ensuring that data quality is not diluted.***

Issue 3: ***Whilst the majority of manually reporting VOSClim ships are equipped with TurboWin electronic logbooks, a significant number are equipped with SEAS or OBSJMA software. Similarly there are a growing number of different AWS software systems in use on both VOS and VOSClim ships nowadays. As yet no comparison of the algorithms associated with these different software systems has been undertaken (although this issue has been raised at previous VOSClim project meetings). Bearing in mind changes made to the 10 metre reference height for wind speeds in TurboWin software the meeting is invited to consider whether there is a need to initiate an analysis of the different software systems now in use, and to document their different capabilities***

1 Indian VOSClim ships do not report the additional parameters

Issue 4; ***It has been noted since SOT-III that there are a growing number of ships 'self-recruiting' to the project i.e. some ships are ticking the VOSClim check box in the TurboWin program to participate in the project despite the fact that they have not been formally recruited by a Port Met. Officer. One way in which this might be avoided could be through incorporating a PMO password protected area in the TurboWin software. However participation in VOSClim is actually triggered by the National VOSClim focal point advising of recruitment to the DAC & RTMC. Consequently it could be argued that all ships using suitable electronic logbooks should be allowed to report the additional delayed mode IMMT-3 parameters, as this additional data from all ships would be extremely useful for quality assurance and bias correction. To some extent this is already being done with some AWS systems, which automatically store the additional IMMT-3 data. This subset of data with the additional parameters would not be confused with the higher quality data from VOSClim ships (which are reported separately to the DAC and the RTMC). The meeting is therefore invited to consider;***

- ***a) whether all ships using appropriate electronic logbooks or AWS logging software should record the additional 'VOSClim parameter's whether or not they formally participate in the project, and consequently,***
- ***b) whether any changes are needed to electronic logbooks, such as TurboWin***

1.2 Real Time Data

The transmission of VOSClim ship observations from the RTMC to the project DAC continues to operate in accordance with the project requirements. Reports are transmitted by the project ships (normally via Inmarsat C) in WMO Ship Code, in the same manner as for normal VOS. The RTMC thereafter 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. These data have been transferred to the DAC since July 2002, and data up to and including August 2006 are available from the project website. Although these data are transferred via the GTS to the DAC in BUFR Code, it is now planned to also make back-up copies of the data available via the Met Office's external FTP server. A more detailed RTMC report will be submitted under agenda item IV-3.4.

1.3 Delayed Mode Data

The delayed mode observations from VOSClim ships (including the additional project code groups) are recorded on the electronic logbooks used by project ships and are subsequently downloaded by visiting Port Meteorological Officers, on a recommended three monthly basis. Minimum quality control procedures are applied to the collected delayed mode datasets before they are sent to the two Global Collecting Centres (located in Hamburg and Edinburgh). Having checked the data quality flags, and clarified any problems bilaterally, the GCC's then send the delayed mode data to the DAC for insertion on the project website. This has been done on a quarterly basis since March 2003. Unfortunately it is not currently possible to access the delayed mode data from the DAC website

In September 2006 the IMMT-3 format formally came into use and permits QC flags to applied to the additional project elements. It replaced the previous IMMT-2 format that allowed the collection of the additional project elements and which was introduced in 2003. Unfortunately not all participating countries are submitting the necessary delayed mode data and the quantity of data submitted has been disappointing with only a quarter of the observations from project ships containing the additional delayed mode elements in 2005. A separate GCC report including information on the processing of delayed mode VOSClim data will be submitted under VOSP agenda item IV-3.3.

Issue 5: ***There is a pressing need to encourage all project participants to collect and to submit their ships delayed mode IMMT data to the GCC's on a regular quarterly basis. It has become apparent that some countries were not fully aware of the procedures for IMMT submissions, while others were not able to apply the required MQCS procedures prior to submission to the GCC's, or had insufficient resources to do so (including possible resource contention with existing national QC procedures). Although this situation is gradually improving, the meeting is requested to encourage all project countries to review their procedures and to make arrangements for the routine submission of quality controlled delayed mode data in the current IMMT-3 format—with the highest priority on submission of the IMMT-3 data, even if MQCS is not yet practical. Although not currently within their remit, it is further suggested that the GCC's should be requested to take a more proactive stance with respect to the collection of delayed mode data from both VOSClim (and VOS) ships.***

Issue 6: ***One of the key features of the VOSClim project was the concept that all relevant datasets (i.e. real time data and associated model data, delayed mode data, and metadata) should be available via a single location on the project website and readily available to climate researchers. Failure by the DAC to make the delayed mode data readily accessible via the project website, along with discrepancies between data streams and the often delayed availability of metadata, has therefore hindered the evaluation of the data by the scientific advisers to the project. The meeting is invited to discuss this issue and to provide guidance how this issue can best be resolved.***

1.4 Metadata

VOSClim metadata is now collected in the same WMO Publication No. 47 format as used for normal VOS, although PMO's are expected to take additional digital images showing the location and exposure of instruments and to make schematic drawings of the ships arrangements. At the last session it was agreed that these should 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.

The collected metadata is supposed to be made available quarterly via the WMO website [http://www.wmo.int/web/www/ois/pub47/pub47-home.htm] which is linked from the VOSClim website. Unfortunately, at the time of writing the most recent metadata available is for June 2006 (i.e. 2 quarters behind schedule). A new format for the WMO Pub. 47 metadata will be implemented in July 2007 and will be addressed under agenda item I-4.3.This new format includes recruitment/withdrawal dates for VOSClim ships and may therefore, in due course, simplify the process of listing VOSClim participating ships on the project website. VOSClim participants are therefore requested to start collecting metadata in the new format at the earliest opportunity

Issue 7: ***The storage and availability of Pub 47 metadata has been an ongoing problem throughout the life of the project. This issue will be considered under agenda items I-5.1.2 and IV3.6.***

Issue 8: ***Although some photographic metadata for project ships has been inserted on the project website this information is limited. As digital imagery is now also a requirement for standard VOS, the meeting is invited consider whether a more appropriate method of storing digital information is needed.***

Issue 9; ***For those countries using TurboWin electronic logbooks the inclusion of a new metadata module in the latest version of the software (V 4.0) should, with time, simplify the collection of metadata by PMO's. As this metadata is maintained in electronic format at source it would be relatively simple for this data to be transmitted back to VOS operators on a regular, say monthly, basis. It may also be possible to program the TurboWin software, which is linked to computer time, to request observers to make submissions at the required intervals. Monthly submissions would also assist the RTMC in preparing its monthly monitoring statistics. The meeting is invited to discuss this proposal and advise as necessary. The value of inclusion of similar features in other electronic logbook software should also be considered.***

Issue 10*; Because the new metadata module in TurboWin V4.0 is not password protected it is possible for ships observing officers to amend the recorded metadata themselves on board ship. Although some observers can be trusted with this responsibility it nevertheless introduces the possibility of increased metadata errors. Whilst the responsibility for the collection of metadata from ships should primarily rest with the PMO it could perhaps be helpful for observers to help with this task in certain cases e.g. when ships don't return to a homeport and inspections can be years apart. It would also help with keeping track of call sign changes for monitoring purposes. In such cases it would however still be the responsibility of the recruiting NMS to vet the metadata before entering it into their databases and before making submissions to WMO Pub 47. The meeting is invited to consider whether metadata in electronic logbooks should be password protected*

Issue 11: ***The collection of metadata in electronic format at source also brings into question the need for VOSClim-specific hardcopy recruitment/update forms to be completed for participating ships. One of the reasons why some PMO's may have been reluctant to recruit new ships is the complexity of the hardcopy form, which, together with the associated instructions, was originally intended to be a means to collect the required metadata. The meeting is therefore invited to consider whether the requirement to complete a hardcopy VOSClim recruitment form should be discontinued for ships equipped with the latest version of TurboWin. National practices for recording inspection would be unaffected.***

1.5 Monitoring Statistics

Monthly 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 now made available to the DAC via the Met Office external FTP server. VOSClim focal points and PMO's are encouraged to take early remedial action to resolve any monitoring problems.

Issue 12: ***Unfortunately there have been ongoing problems with the availability of the monitoring statistics on the Project website [http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim-stats.html]. Although statistics are available up to and including November 2005, error messages are received when trying to access more recent statistics. This issue had been raised with the DAC but at the time of writing this report the problem has not been resolved. (It is understood that additional resources may be made available at the NCDC to resolve such issues in the not too distant future).***

1.6 Project Website

The project website [http://www.ncdc.noaa.gov/oa/climate/vosclim/vosclim.html] is maintained by the DAC, and is intended to act as the main focal point for the project, providing users with easy access to the necessary data. In liaison with members of the Task Team significant improvements were made by NCDC to the website design and layout in 2006. Although these improvements will help to promote the project, it is regretted that the problems of access to the underlying data, referred to in other sections of this report, have still to be resolved. A separate report by the DAC will be submitted under VOSP agenda item IV-3.4.

1.7 Project promotion – Project Brochure

Copies of the project brochure were published at the outset of the project and can also be downloaded for printing from the website. The brochure is also available in pdf format within the TurboWin program.

Issue 13; ***It is understood that printed copies of the VOSClim brochure are now in short supply amongst VOS operators. Printed copies of the brochure have been useful in encouraging new ships and masters to participate in the project, and look more professional than printing of hardcopies locally from electronic pdf files. The meeting is invited to consider whether the content of the brochure needs revision and whether electronic availability is sufficient. If a reprint is considered necessary the meeting is invited to consider how it should be funded.***

1.8 Project promotion – Project Newsletter

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. Although resource limitations have prevented further copies of the newsletter from being issued, articles on the progress of the project have been included in publications such as the Mariners Weather Log, the Ocean Views, and the KMNI Marine Information Bulletin

1.9 Project promotion – Certification

The formats of the VOSClim Certificate of Appreciation (for presentation, unsigned, to ships observers) and the Certificate of Participation (for presentation, signed, to participating ships) were finalised in made available to participants in 2002, with copies are available for pdf download from the project website. Several participants are issuing framed Certificates of Participation to ships although it is unclear whether Certificates of Appreciation are being issued to observers

Issue 14: ***There are now a variety of different types of certificate being issued to observing ships (e.g. SOT participation certificates, AMVER certificates, national award certificates etc). The meeting is therefore invited to consider whether the certificate of appreciation should be discontinued***

1.10 Masked Call signs

The masking of ship call signs in response to security concerns will be addressed separately under agenda item IV-4.1.2 and its implications for observation monitoring will also be considered in the RSMC report under agenda item IV-3.1. This issue clearly has implications for the success of the VOSClim Project, especially if national met services adopt non-unique masked 'SHIP' solutions. Although Japan has already adopted such a scheme for its ships that send observations via Yamaguchi LES, it is understood that this will not apply to the Japanese research ships, which have been recruited to the project. Unique masked call signs such as those proposed by the E-SURFMAR programme will also have implications for the project as a secure look up table, accessible by FTP server, will be needed to correctly identify the masked ships that have submitted data

Issue 15: ***Details of the masked project ships will need to be made known to the RTMC to enable observation monitoring to continue, and to enable project ship data to be correctly identified by the DAC. This will inevitably require changes to the data traffic systems in the RTMC, which will incur costs and may take some time to implement. A uniform international approach to this problem is therefore needed to avoid the RTMC having to develop different systems for individual national met service requirements. This will be discussed under agenda item IV4.1.2.***

2. VOSClim Project Datasets

2.1 Dataset Construction

Because there have been a variety of issues with the availability of VOSClim data in recent years, attempts have had to be made to construct a version of the data from the following alternative sources;

- All surface marine observations (VOS, moored buoys and drifting buoys) from the Global Telecommunications System (GTS), along with co-located Numerical Weather Prediction (NWP) model output have had to be provided to the National Oceanography Centre, Southampton by the Met Office. The data are being updated in near real time (typically with a 2 day delay).

- The International Comprehensive Ocean-Atmosphere Dataset (ICOADS, http://icoads.noaa.gov/).

These data, along with Pub. 47 metadata (as available), and are now being used to construct a dataset of VOS reports, with associated model output and metadata. It is hoped to extend this using the delayed mode VOSClim parameters from the DAC when made available (or the GCCs if necessary) but it has not proved possible to do this yet. VOSClim data within the dataset are identified using a flag. Some results of the VOSClim analysis will be reported in the SOT-IV Technical Workshop.

Issue 16: ***Several differences between the contents of the different data streams have been identified. Around 10% of reports are available from only one stream and there are differences between the content of the records due to the different procedures and adjustments applied at the different data centres. The JCOMM Expert Team on Marine Climatology will consider these differences at their 2nd Session in March 2007.***

2.1 GTS data exchange and BUFR format

From 2012 all GTS international data exchange between National Met Services will be required to use either BUFR or CREX table driven formats. However, the use of existing BUFR templates for data exchange has its drawbacks and their use for VOSClim data exchange has implications for the consistency of the data

Issue 17: ***Although amendments to the VOS BUFR templates to include the additional VOSClim parameters have been developed for consideration by CBS working groups, the suitability and necessity of BUFR for VOSClim data exchange remains in question. The meeting is invited to consider this question and to consider the current status of the VOS BUFR template (which includes the VOSClim parameters), which will be discussed under agenda item I6.2.2.***

Issue 18: ***Bearing in mind that it is planned to make a backup of the project BUFR data available to the DAC via the Met Office's external FTP server, the meeting is also invited to consider whether the GTS remains the preferred system for the exchange of VOSClim data between the RTMC and the DAC or whether a move to FTP is desirable.***

3 VOSClim 'Project' or 'Programme'

One of the original objectives of the VOSClim project, outlined in the Project Document, is the intention that it should eventually transform into a long-term operational programme. Although there have been some problems with data availability on the project website, the data delivery process is now effectively in place, and the target number of ships has almost been achieved. It is recognised that there remain a number of issues to resolve, such as those identified above, but these are now mostly matters of detail rather than substance.

Issue 19: ***Given the current state of progress of VOSClim given in this report, the meeting is therefore invited to consider whether it should remain as a 'project', or whether the time is now approaching when it should be established as a fully integrated component of the VOS Programme. If so how best can this be achieved? e.g. should it continue as VOS Climate subset within the VOS Scheme? , or should a decision be made to progressively aim to upgrade all suitable VOS to higher quality VOSClim standards?***

ANNEX A TO APPENDIX D

Overview of VOSClim Project Status

Element of VOSClim Project	Implemented?	Status
Recruitment	Yes - but more needed	Initial target of 200 ships almost met.
Real time data exchange	Mostly	Data after July 2006 not available from DAC website. Backup FTP transfer to be implemented BUFR template not ideal for exchange.
Metadata availability	Partly	Metadata often only available with significant delay. Availability of digital imagery not fully resolved
Delayed mode data exchange	Mostly	IMMT-3 approved by JCOMM-II. MQCS-V being implemented by participating countries. Data not available from DAC website.
Monitoring	Mostly	Monthly statistics for full range of variables being produced by RTMC. Monitoring information available up to November 2006 from DAC website. Mechanisms for logging monitoring follow up not fully resolved
Project Promotion	Yes	Brochure available. Newsletter and articles issued Certification being issued
VOSClim website	Partly	Website updated in 2006 Not all data streams available on website. Recent monitoring information not available.
VOSClim Dataset	Partly	Assembled from a variety of sources (still need update for recent metadata and delayed mode data). No mechanism for regular updating.
Scientific Analysis	Partly	Exploitation of dataset delayed by past lack of availability of data streams. Scientific journal paper published using VOSClim dataset. Some comparison of VOS and VOSClim reports (SOT-IV Scientific and Technical Workshop). No wide engagement from scientific community (interest expressed but suitable datasets not yet available).
Review	Starting	Review of requirements for both VOS and VOSClim requested by JCOMM-II.

Review of Status of action items from SOT-III

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**
III-B/1.3.3	Increased recruitment of VOSClim ships.	VOSClim operators, VOS operators who have yet to contribute	**Ongoing/ done**
III-B/2.1.2	RMTC 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	**Part 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**
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	**Part done**
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	**In hand**
III-B/2.2.2	Mechanisms for simplifying data delivery between RTMC and the DAC, such as ftp, to be considered	DAC and RTMC	**In hand**
III-B/2.2.2	DAC to simplify data delivers to users using ftp site.	DAC	**Part 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**
III-B/2.3.3	France to attempt to revise the BATOS system.	France	**Done**
III-B/3.1.1	Since the lack of delayed mode data for the VOSClim project is a problem, as an interim measure VOSClim operators to provide raw data from the data entry software direct to the Scientific Advisers.	VOSClim operators	**Not done**
III-B/3.1.2	Scientific Advisers to convene an informal 'Scientific 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.	Scientific Advisers	**Part done**
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	**In hand**
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	**This report**

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	**Part done**
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	**Not done**
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 to take 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**

APPENDIX E
REPORT BY THE TASK TEAM ON CODING
(submitted by Craig Donlon, chair, Task Team)

Dr Craig Donlon (United Kingdom) made a presentation at the SOT-III Scientific and Technical Workshop, entitled "Validation of SST data products within the Global Ocean Data Assimilation Experiment (GODAE) High Resolution Sea Surface Temperature Pilot Project (GHRSST-PP)", which provided background information on the GHRSST-PP, which is primarily concerned with developing the best SST data sets from satellite systems for assimilation into ocean and atmospheric forecast systems and for use in climate monitoring. In situ observations are required as input to empirical retrieval algorithms that account for the impact of atmospheric absorption and emission that bias infrared satellite SST retrievals, for bias correction of different satellite data sets when used in combined level-4 (L4) analyses, for independent validation of individual satellite data sets and, as input to the climate data record. In all of these cases the in situ observations are generally taken to represent the 'true' SST despite the fact that strong vertical gradients may exist in the upper ocean that require that SST measurements must always be reported with an accompanying measure of the depth beneath the water surface for that given observation. (Annex to this Appendix). Consequently, the GHRSST-PP notes that ideally, wind speed and solar radiation should be reported together with SST for use in diurnal variability parameterizations.

The meeting noted that given the rapid development of a new class of real-time reporting of in situ technology for VOS style deployment, here was a need for a new set of reporting codes that would enable this new class of observations to be used in operational agencies. The meeting agreed that the SOT, with the agreement of JCOMM, should propose BUFR descriptors for this purpose. The meeting therefore decided to establish a Task Team on SST Coding chaired by Dr Donlon with the following terms of reference

1. Develop a draft new code table for BUFR, which accommodates new types of SST measurements.
2. Submit the draft proposal to a relevant body of the CBS.
3. Investigate possible future inclusion of bio-chemical data in BUFR through various interactions with other ship-based observation communities.
4. Reports to SOT-IV.

Members:

Craig Donlon (TT chairperson, United Kingdom)
Graeme Ball (Australia)
Etienne Charpentier (JCOMMOPS)
Bob Keeley (Canada)
Loïc Petit de la Villéon (France)

The Task team conducted all of its work via email communication during the intersessional period. Initially the GHRST-PP definitions were reviewed and a common understating of the issues established. Bob Keely provided a new BUFR Master Table 10 for consideration by the group, which contained an extensive structure for oceanographic variables and common atmospheric variables. A new set of codes for SST that included reporting the depth of SST measurement were developed and submitted to the CBS by the secretariat. The new BUFR codes also included the GHRSST-PP standard SST definition names SSTskin, SSTsub-skin, SSTz (depth) and SST foundation. The TT urges all operators to report the depth of SST observation and for adequate alphanumeric codes to be developed, especially for use in electronic logbooks.

Noting the important role of in situ SST observations in the context of satellite observations, the TT urges the SOT to consider that accuracies of better than 0.1K ±0.05K should be the target for SSTz observations. Furthermore, as satellite validation work is often conducted using in situ data matched to within ±0.5 hours, it recommends that sampling of SST should be conducted on a ½ hourly basis or hourly basis. Noting that the smallest satellite SST pixel is 0.5km and assuming a ship speed of 15kt, when using automated sampling systems, the mean SST value obtained over a

one-minute sample provides an adequate sampling strategy.

The Team urges the utmost care and attention to calibration of in situ SST sensors and the proper reporting of the location of sensor relative to ships datum (via WMO Pub. 47) and notes the excellent work conducted by Port Meteorological Officers in this respect. However the team remains concerned at the falling number of PMOs available to service ships in some countries. Ultimately, poor calibration and installation metadata records will lead to reduced quality of SST observations, reduced quality of satellite validation results and incorrect bias correction of satellite data when blending complementary satellite observations.

Unfortunately, while the TT completed the major task of upgrading the BUFR definitions of SST, only moderate progress was made under item 3. Master Table 10 requires further review and harmonization with Master Table 1 – especially for the definition and inclusion of 'standard' MetOcean variables, which probably should appear in both tables. The work is urgent as ocean forecast systems require bio-geo-chemical observations (particularly of Chlorophyll-a, nutrients, Oxygen) and partial pressure CO2 observations for both atmosphere and ocean are routinely reported from ships for use in carbon cycle monitoring.

The TT recommended revise its terms of reference to focus on the development of BUFR Master Table 10 for use across all of the SOT, ready for operational use as soon as possible, bearing in mind the requirements of operational ocean forecast systems, environmental and climate monitoring requirements and ecosystem modeling. Accordingly the TT further recommends that the TT on Codes liaise closely with the DMPA TT on Codes (See SOT-IV preparatory document I-6.2.2, "Coding Issues") and merge the TT by PM03 on Codes. The aim of this combined and revised TT is to develop MT10 for operational use and to submit this for approval to CBS.

The following ToR are suggested:

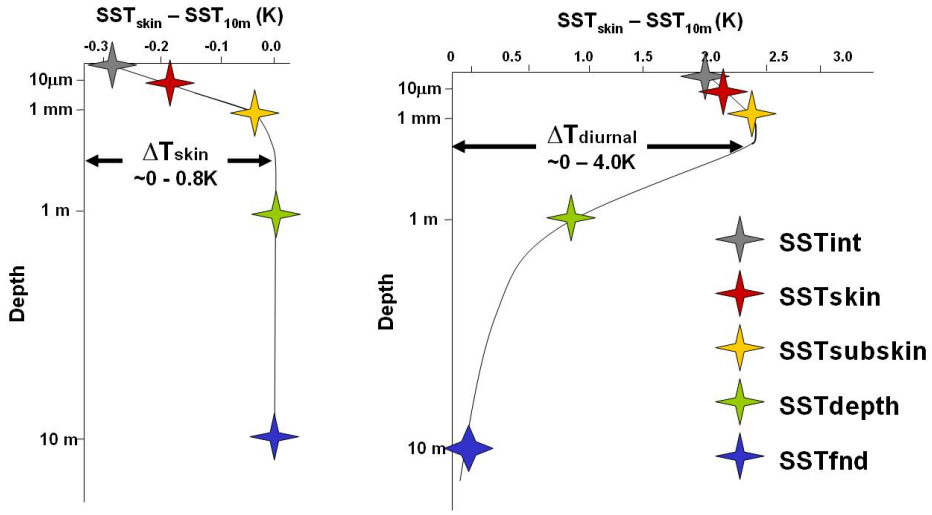
Tasks:

1. In collaboration with ocean forecasting system operators (GODAE) including ecosystem modelers, and other appropriate user communities, establish a core set of bio-geo-chemical variable definitions for MT10
2. Review and revise the draft MT-10 BUFR code table.
3. Submit the draft proposal to a relevant body of the CBS.
4. Report to SOT-V.

Membership to be defined by SOT-IV.

ANNEX TO APPENDIX E

SST is a difficult parameter to define exactly because the upper ocean (~10 m) has a complex and variable vertical temperature structure that is related to ocean turbulence and the air-sea fluxes of heat, moisture and momentum. A theoretical framework is required to understand the information content and relationships between measurements of SST made by different satellite and in situ instruments, especially if these are to be merged together. The definitions of SST developed by the GHRSST-PP SST Science Team achieve the closest possible coincidence between what is ***defined*** and what ***can be measured operationally***, bearing in mind current scientific knowledge and understanding of how the near surface thermal structure of the ocean behaves in nature.



(a) Night time situation, light wind

(b) Day time situation, strong solar radiation and light winds

The hypothetical vertical profiles of temperature in low wind speed conditions during the night and day shown in the figure encapsulate the effects of the dominant heat transport processes and time scales of variability associated with distinct vertical and volume regimes (horizontal and temporal variability is implicitly assumed). At the exact air-sea interface a hypothetical temperature called the interface temperature (SSTint) is defined although this is of no practical use because it cannot be measured using current technology. The skin temperature (SSTskin) is defined as the temperature measured by an infrared radiometer typically operating at wavelengths 3.7-12 μm (chosen for consistency with the majority of infrared satellite measurements) that represents the temperature within the conductive diffusion-dominated sub-layer at a depth of ~10-20 μm. SSTskin measurements are subject to a large potential diurnal cycle including cool skin layer effects (especially at night under clear skies and low wind speed conditions) and warm layer effects in the daytime. The subskin temperature (SSTsubskin) represents the temperature at the base of the conductive laminar sub-layer of the ocean surface. For practical purposes, SSTsubskin can be well approximated to the measurement of surface temperature by a microwave radiometer operating in the 6-11 GHz frequency range, but the relationship is neither direct nor invariant to changing physical conditions or to the specific geometry of the microwave measurements. All measurements of water temperature beneath the SSTsubskin are referred to as depth temperatures (SSTdepth) measured using a wide variety of platforms and sensors such as drifting buoys, vertical profiling floats, or deep thermistor chains at depths ranging from 10^{-2} - 10^{3}m. These temperature observations are distinct from those obtained using remote sensing techniques (SSTskin and SSTsubskin) and must be qualified by a measurement depth in meters (e.g., or SST(z) e.g. SST5m). The foundation SST, SSTfnd, is defined as the temperature of the water column free of diurnal temperature variability (daytime warming or nocturnal cooling) and is considered equivalent to the SSTsubskin in the absence of any diurnal signal. It is named to indicate that it is the foundation temperature from which the growth of the diurnal thermocline develops each day (noting that on some occasions with a deep mixed layer there is no clear SSTfnd profile in the surface layer). Only in situ contact thermometry is able to measure SSTfnd and analysis procedures must be used to estimate the

SSTfnd from radiometric satellite measurements of SSTskin and SSTsubskin. SSTfnd provides a connection with the historical concept of a “bulk” SST considered representative of the oceanic mixed layer temperature and represented by any SSTdepth measurement within the upper ocean over a depth range of 1-20+m. SSTfnd provides a more precise, well-defined quantity than previous loosely defined “bulk” SST and consequently, a better representation of the mixed layer temperature. In general, SSTfnd will be similar to a night time minimum or pre-dawn value at depths of ~1-5 m, but some differences could exist. Note that SSTfnd does not imply a constant depth mixed layer, but rather a surface layer of variable depth depending on the balance between stratification and turbulent energy and is expected to change slowly over the course of a day.

APPENDIX F
REPORT BY THE TASK TEAM ON INSTRUMENT STANDARDS

1. INTRODUCTION

1.1. The third meeting of the Ship Observations Team (SOT-III) established this task team to complete the following efforts:
- 1.1.1. 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.
- 1.1.2. Using guidance contained in existing guides including the WMO Guides on Instruments and Methods of Observation (WMO-No.8) communicate with manufacturers regarding new technologies and recognized equipment problems.
- 1.1.3. Prepare a JCOMM Technical Report containing this information, to be made widely available through relevant web sites (JCOMM, JCOMMOPS, VOS, DBCP, SOOP, SOT).
- 1.1.4. Provide guidance on testing and the intercalibration of marine meteorological and oceanographic observing systems.
- 1.1.5. Liaise closely with WMO/CIMO, both in the compilation of the information and also in assessing what additional work in this are might be required under JCOMM.
- 1.1.6. Liaise closely with IOC in the preparation of the wider compilation of existing instrumentation and observing practices and standards in oceanographic observations in general, with a view to inputting an appropriate contribution from JCOMM.

1.2. This task team encompasses the Voluntary Observing Ship (VOS), Ship of Opportunity (SOOP), and Automated Shipboard Aerological (ASAP) programs. Other sub functions may be included as per guidance from the SOT governing body.

1.3. As of SOT-IV, the Task team is in the process of collating information about national guidance material and instrument types that will be available for posting on the specific SOT panel web sites.

2. GUIDANCE

2.1. VOS
- 2.1.1. WMO
  - 2.1.1.1. Guide To Meteorological Instruments And Methods of Observation (WMO-No. 8)
- 2.1.2. NMS
  - 2.1.2.1. Australia
    - 2.1.2.1.1. Port Meteorological Agents Guide
    - 2.1.2.1.2. TurboWin User Guide
    - 2.1.2.1.3. TurboWin Setup Manual
  - 2.1.2.2. United Kingdom
    - 2.1.2.2.1. UK Met O.740
  - 2.1.2.3. United States of America
    - 2.1.2.3.1. Military Specification MIL-B-17089
    - 2.1.2.3.2. National Weather Service NWS G101 – SP004
    - 2.1.2.3.3. National Weather Service NWS G222 – SP002
    - 2.1.2.3.4. NWS Instruction 10-201
    - 2.1.2.3.5. AmverSeas Users Manual
    - 2.1.2.3.6. Observing Handbook No. 1

2.2. SOOP
- 2.2.1. IOC
  - 2.2.1.1. Guide to IGOSS (now JCOMM) Data Archives and Exchange (BATHY and TESAC) - IOC Manual and Guides No.1
  - 2.2.1.2. Guide to Operational Procedures for the Collection and Exchange of IGOSS (now JCOMM) Data - IOC Manual and Guides No.3

2.2.1.3. IGOSS (now JCOMM) Plan and Implementation Programme - IOC Technical Series No. 43

2.2.1.4. Best Guide And Principles Manual For The Ships Of Opportunity Program (SOOP) and Expendable Bathythermograph (Xbt) Operations

2.2.2. NMS

2.2.2.1. Australia

2.2.2.1.1. Devil XBT User Manual

2.3. ASAP

2.3.1. WMO

2.3.1.1. No guidance available at this time.

2.3.2. EUCOS

2.3.2.1. No guidance available at this time.

2.3.3. NMS

2.3.3.1. No guidance available at this time.

3. CURRENTLY FIELDED EQUIPMENT

3.1. VOS

3.1.1. 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	Aneroïd Aneroïd	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	PAB MK2 Negretti & Zambra Precision Aneroid Mk 2	Aneroid Aneroid Aneroid	Station Level MSL	U.K. Met. O. 740 NIL
United States	Belfort	Aneroid	MSL	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

3.1.2. 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	Aneroïd	MSL
New Zealand		Open Scale	MSL
Singapore		Open Scale MK3	MSL
South Africa	Mason		MSL
United Kingdom		Open Scale (7 Day)	MSL
United States	Belfort	Open Scale (4 Day)	MSL

3.1.3. Thermometers

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

3.1.4. 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	C C
United States		Ship's Intake	Either (ship Dependent)

3.1.5. Automated Systems

VOS AUTOMATED SYSTEMS			
National VOS	**Sensor**	**Communication**	**Augmentable**
Australia	ShipAWS	Inmarsat-C Data Reporting	Yes
Canada	AVOS	Inmarsat-C Text	Yes
Denmark	BATOS	Inmarsat-C Data Reporting	Yes
EUCOS	BATOS	Inmarsat-C Data Reporting	Yes
France	BATOS BATOS MINI-BATOS MINOS	Inmarsat-C Data Reporting Inmarsat-C Text Inmarsat-C Text Argos	Yes Yes No No
Germany	Ship's datalogger Vaisala MILOS-500	Meteosat Meteosat	 Yes
Ireland	Vaisala MILOS-500	Inmarsat-C Text	No
New Zealand	Sutron 9000RTU	MTSAT	Yes
Norway	QLC-50	VSAT	??
Spain	Vaisala MILOS-500	Inmarsat-C Text	No
United Kingdom	AVOS BATOS CMR Automet MINOS	Inmarsat-C Text Inmarsat-C Text Inmarsat-C Text Argos	Yes Yes No No
NOTE: More detail information regarding automated systems is covered under SOT-III Action Items III-A/3.2.1 and III-A/3.2.4.			

3.2. SOOP

3.2.1. Expendable BathyThermograph (XBT)

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

3.2.2. XBT Recorder System

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

3.2.3. ThermoSalinoGraph (TSG)

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

3.2.4. Conductivity, Temperature, and Depth (CTD)

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

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

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

3.2.6. Acoustic Doppler Current Profile (ADCP)

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

3.2.7. Partial Pressure of CO_2 (pCO_2)

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

3.2.8. Moving Vessel Profiler

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

3.3. 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	MW21, version 2.17, Win2k	

4. TESTING PROCEDURES AND PRACTICES

4.1. VOS

4.1.1. WMO

4.1.1.1. SOT-III Action Item III-A/2.3.2 Post calibration practices on VOS web site

4.1.2. NMS

4.1.2.1. United States

4.1.2.1.1. Barometer – Refer to section 3.6 of NWS G101 – SP004

4.1.2.1.2. Barograph – Refer to section 4.2 of NWS G222 – SP002

4.2. SOOP

4.2.1. Extensive testing and evaluation is completed and available on SOOP website at: http://www.brest.ird.fr/soopip/

4.3. ASAP

4.3.1. Not available at this time

5. INTERCALIBRATION COMPARABILITY

5.1. VOS

5.1.1. NMS

5.1.1.1. United States

5.1.1.1.1. Comparison testing between Belfort Aneroid barometers/barographs and KNMI Fuess barometer/barographs were completed (May2006) with negative results (sent to KNMI)

5.2. SOOP

5.2.1. Extensive testing and evaluation is completed and available on SOOP website at:

http://www.brest.ird.fr/soopip/

5.3. ASAP

5.3.1. Not available at this time.

6. WHAT's NEXT?

6.1. More NMS support

6.1.1. Review of TT Report and update input specifications.

6.1.2. Report previous intercalibration findings.

6.1.3. Develop new intercalibration studies.

6.1.4. Submit updates via SOT Panel chairs for consolidation and posting on respective web sites.

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