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