Report of the Task Team on Satellite Communication Systems

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SOT-V - May 2009, Geneva, Switzerland

Task Team on Satellite Communication Systems

Tasks Assigned –

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

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

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

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

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

Task Team on Satellite Communication Systems

Task 1 - Evaluate the operational and cost-effective use of sat-com systems

- **E-SURFMAR has been further evaluating the relative merits of different satcom systems for AWS systems**
- **This work has mainly concentrated on the advantages and limitations of the Inmarsat, Iridium and Meteosat transmission systems which are now most commonly used for AWS systems**
- **Argos is still used for some AWS (Minos) and drifting buoys but is increasingly being replaced by iridium due to data timeliness issues**

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

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

Caution - figures do not include VAT and are for guidance only

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Task 1 - conclusions

Iridium currently appears to offer distinct cost advantages

- **It is already in common use for drifting buoys and AWS systems (e.g. BAROS, MetPod, Vaisala MAWS etc)**
- **Messages can be received as email attachments to a number of different mailboxes**
- **It offers two way communications and has global coverage**

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

Several members of the TT also participate in the SOT and DBCP iridium teams.

Météo France have been investigating and developing the use of Iridium SBD data for BAROS and BATOS AWS systems.

12 BAROS AWS stations reporting hourly pressure built since SOT IV

- **4 are in operation on E-ASAP ships and 8 remain to be installed.**
- **Data format is 15-byte long, and includes the observation time, ship's heading and speed, GPS latitude and longitude, sea level pressure and tendency over the past three hours**
- **Excellent Data timeliness with email received only a couple of minutes after transmission. The data is processed (FM13-SHIP and FM94-BUFR code) and then inserted onto the GTS (FM13-SHIP only at present).**

Task Team on Satellite Communication Systems

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

- **Météo-France is investigating interfacing an Iridium SBD modem in place of an Inmarsat-C one and using the same data format as for Inmarsat-C Data Reporting. This will permit longer binary reports and the possibility of adding extra parameters to the message . Communication costs will be half as much with Iridium (provided that only one 30 byte block of data is used)**

- **The Met Office have installed iridium deck drifters on two vessels (a research ship and a ferry) reporting pressure only. Data quality is good although it is understood that if a GPS position fixing can be a problem**

- **The Met Office is also testing a Vaisala MAWS automatic weather station fitted with Iridium, prior to putting it on a suitable ship.**

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

- **Since SOT IV there have been a number of changes to the Code 41 list.**
- **The first major change occurred just before SOT IV when Goonhilly LES was closed (in November 2006) and the Inmarsat C services transferred to Burum LES in the Netherlands**
- **This followed the take over of Xantic (the company that previously operated Burum) by Stratos and resulted in serious data transmission losses, message header format issues and significant data delays. It also impacted on the issuance of SafetyNet broadcasts and warnings.**

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

- **The closure of Goonhilly had a notable impact on the timeliness and availability of upper air TEMP code data from E-ASAP ships causing the E-ASAP Programme team to instruct its participating ships to switch their satcom configurations to use alternative Inmarsat LES (e.g. Aussaguel).**
- **However since SOTIV all E-ASAP ships have now transferred to the use of a dedicated new E-ASAP email system whereby the temp messages are mailed direct to DWD, who currently manage the programme. This has resulted in a marked drop in the cost of Code 41 transmissions via Goonhilly**

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

There have been several changes to Code 41 ID Numbers since SOT IV including..

Vizada notified their intention to redirect their x01 ID series to the x04 ID series in order to expedite their data routing systems. Vizada advised that transmission delays were increasingly likely and that it was imperative that ships should switch to using the X04 ID Series,

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

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

- **The changes to Vizada operated LES not only affect the US based LES (i.e. Southbury and Santa Paula) but also the Norwegian hosted LES (Eik). NOAA pick up the charges**
- **Because many non US operated VOS also send their observations via US based LES it is therefore incumbent on individual VOS operators to make the changes known to their VOS fleets *[Action – VOS Operators].***

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

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

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

- **Contact was also made with Stratos who confirmed that the ID X02 series supports Code 41 in all four ocean regions - so that LES ID numbers 302 (for the IOR region) and 202 (for the POR region) could be added to the Code 41 list**
- **Although these messages are now actually handled by Burum rather than Goonhilly it is believed that the costs associated with messages sent to ID 302 and 202 are still be collected by the Met Office.**
- **To avoid confusion it is suggested that these LES should be listed as Goonhilly/Burum in the WMO Code LES list.**

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

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

- **An initial review of Inmarsat costs borne by National met services whose countries host LES was undertaken by the Task Team in 2003.**
- **In view of the Code 41 changes since that time the Task Team recommends that a further review is needed to help guide future decisions about reducing the Inmarsat cost burden *[Action]***

Note - IMO Resolution A707 (19) issued in 1991 recommended '… that States make every effort, consistent with domestic laws and policies, to arrange that meteorological reports, ship position reports and medical advice and assistance messages …. Shall be free of charge to shipping'

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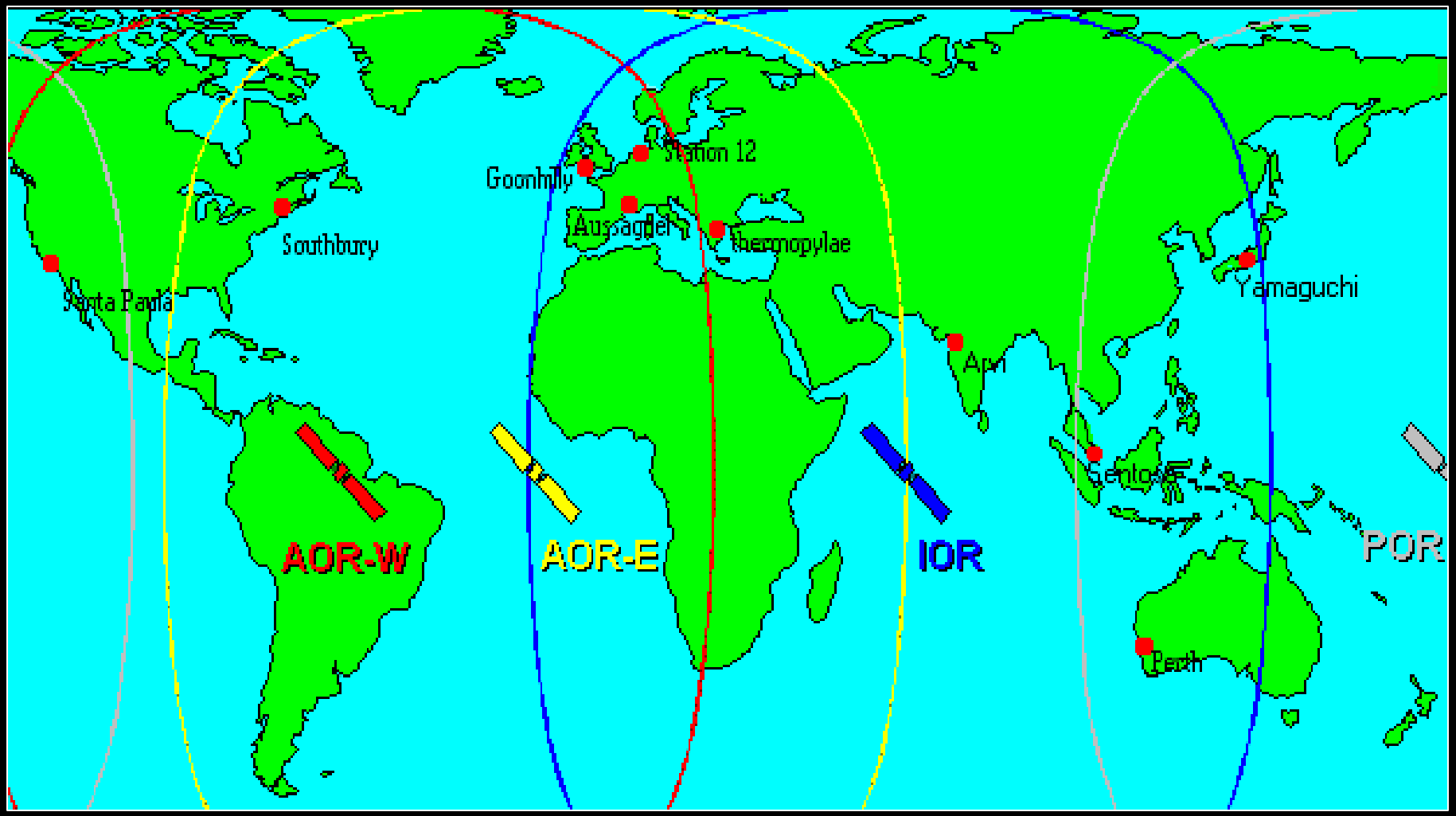

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Task 3 - Continue to monitor the cost implications of Inmarsat satellite communications sent by Code 41

- **As Code 41 observations are now routed globally it brings into question the principle laid down in WMO guidance that weather reports should be sent to the nearest LES.**
- **This is not happening nowadays and is complicated by the fact that some shipping companies instruct their ships to use only prescribed LES suppliers**
- **Also because the majority of Code 41 LES are located in the Northern hemisphere it can be difficult to be sure which is the nearest. (Proposed changes to the TurboWin program could help in this respect).**

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

Issues that have <u>not</u> been resolved by the Task Team are

- **the need for ownership of the code 41 list to be clearly assigned.**
- **the need for emergency back-up arrangements whereby data can be quickly routed to another LES/Supplier in the event of a failure.**

Task Team on Satellite Communication Systems

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

The Task Team recommends that the

- **The Code 41 list in WMO Publication 9 Volume D should be revised - and details promulgated by WMO to all VOS operating countries listed WMO Publication No 47** ***[Action]***
- **The Code 41 list maintained on the WMO website (http://www.wmo.int/pages/prog/amp/mmop/inmarsat_les.html) should also be updated** ***[Action]***
- **The GTS bulletins for ship observations listed in WMO Volume C1 (Catalogue of Meteorological Bulletins) need to be reviewed** ***[Action]***

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

Issues identified include the following….

- **GTS Bulletins for Inmarsat Code 41 observations**
- **AIS over Satellite**
- **Coding and Transmission errors**
- **Broadband/email**
- **Masking of ship's call signs**

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Task 5 …Other issues - GTS Bulletins

It has recently become apparent that some SHIP observations are not being put on the GTS e.g.

- non standard hour or intermediate hour observations that are sent to certain LES,
- Observations that are sent from certain geographical areas, e.g. Antarctica below 60 deg South

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Task 5 Other issues - ... GTS Bulletins

- WMO Volume C1 (Catalogue of Meteorological Bulletins) appears to suggest that non standard hour observations sent to Perth, Sentosa, Thermopylae and Burum LES may not always be circulating on the GTS
- Given the value of these observations in real time, and the fact that SOLAS requires ships to undertake more frequent observations when in the vicinity of tropical cyclones, it is suggested that all observations should be put on the GTS
- the WMO Secretariat should invite members to check the accuracy of their entries in WMO Volume C1 *[Action]*

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Task 5 Other issues - …AIS over Satellite

- The US Coast Guard has established a contract with Orbcomm to develop and build the capability to receive, process and forward AIS signals from space.
- At the start of 2009 Orbcomm's constellation of more than 30 spacecraft included six recently-launched satellites carrying AIS receivers, making it the first commercial provider of globally collected AIS data from space.
- Lloyd's Register – Fairplay has signed a global distribution agreement with ORBCOMM to allow it to distribute information obtained from ORBCOMM's AIS equipped satellite constellation.

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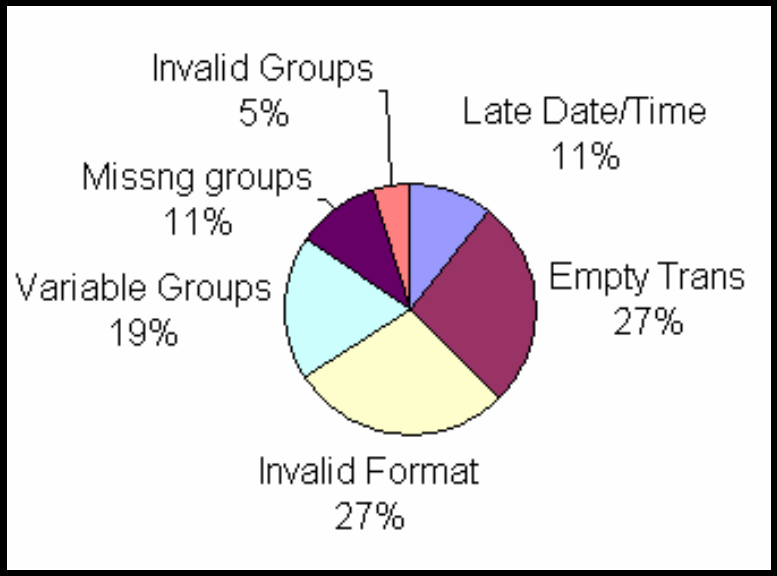
Task 5 Other issues - … Coding and Transmission errors

- As reported at SOT IV a substantial number of observations are rejected for a variety of coding errors e.g. BBXX or call sign missing, empty transmissions with no data, use of O instead of 0, incorrect code group lengths etc. These errors represent wasted communications costs



- Details of transmission errors arising from Goonhilly LES continue to be circulated by the Met Office to VOS operators via the JCOMMOPS mailing lists, so that remedial action can be taken.

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Task 5 … .Broadband/email

- The number of VOS sending their weather observations direct by email, rather than via Code 41, has grown since SOT IV - helping to reduce the cost burden. This trend is expected to continue
- Increased use of broadband communication systems will also allow the use of web based electronic logbooks (e.g. TurboWin)
- SOT is invited to advise VOS operators, whenever possible, to encourage their manually reporting VOS to consider moving to the use of email in lieu of using Inmarsat Code 41 (but subject to individual shipowners being willing to absorb the costs) *[Action]*

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Task 5 ... . Masking of ship's call signs

- Call sign masking has implications for determining Inmarsat costs.
- When call signs are ‘masked’ by securely held, but unique, generic identifiers, it is possible to assign individual ship communications costs back to the originating VOS operator (necessary for E-SURFMAR)
- When call signs are disguised by the non-unique identifiers such as ‘SHIP’ it is difficult to correctly assign the costs associated with individual ships, The use of ‘SHIP’ on European VOS would make it extremely difficult for the E-SURFMAR program to arrange compensation for its member countries

Met Office

SHIP OBSERVATIONS TEAM

JCOMM

Questions