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. IV-4.1
(15.II.2007)

ITEM IV-4.1

Original: ENGLISH

**VOSP-V**
**ISSUES FOR THE VOS**

# Industry Concerns Regarding the Transmission of Meteorological Data from Ships

*(Submitted by Graeme Ball, Chairperson of SOT)*

**Summary and purpose of document**

This document describes the options that are available to mask ships' callsigns as recommended by the WMO Executive Council. The document includes a number of recommendations, including the establishment of a Task Team on Callsign Masking.

## ACTION PROPOSED

The Ship Observations Team is invited to:

(a) Review the information contained in this report and comment as appropriate;

(b) Approve the recommendations contained in the report.

**Appendix**: A. Technical Implications following Resolution 7 (EC-LVIII).

## IMPLEMENTATION OF MASKED CALLSIGNS

### BACKGROUND

The WMO Executive Council at its fifty-eighth session (EC-LVIII) reconsidered the issue of ship security that was first raised at SOT-III. The solution proposed by the SOT to reclassify BBXX data as *non-essential,* despite strong support from JCOMM-II and PMO-III, was not adopted by EC-LVIII.

EC-LVIII, through Res. 7, instead authorised WMO members to implement as a trial solution, the masking of the callsigns of some of the VOS reports for GTS distribution. As well as only partially addressing the primary problem, the solution also enormously complicates the management of the ship metadata for real-time data quality monitoring and feedback, as well as for climate studies.

The WMO Secretariat was tasked to progress the use of masked callsigns. In this regard, and with extensive input from the Chairs of the SOT, VOSP, DMPA and ETMC, the WMO Secretariat prepared a document describing the technical implications associated with implementing masked callsigns. The document prepared by the Secretariat is at Appendix A.

This current document provides a summary of the document at Appendix A, and makes a number of recommendations regarding the options considered.

Whilst both this document and Appendix A refer specifically to the VOS, the content is equally applicable to other ship-based observing programmes such the Ship of Opportunity Programme (SOOP) and the Automated Shipboard Aerological Programme (ASAP). On the assumption that most ships participating in the SOOP or ASAP are also members of a national Voluntary Observing Fleet (VOF), it logically follows that whatever masking solution is adopted for the national VOF would translate to the other programmes.

### DEFINITIONS

For the purpose of clarity, the callsign masking schemes presented here, as well as in the implementation document at Appendix A, are defined as follows:

| Label | Description |
|---|---|
| **REAL** | Official ITU callsign of the ship. |
| **SHIP** | Non-unique identifier. The letters SHIP unilaterally replaces the callsign. |
| **MASK** | Unique, repeating identifier. The masking identifier is assigned by the NMS that recruited the ship. |
| **ENCODE** | Unique, non-repeating identifier. The identifier is derived from encrypting elements in the message, e.g. callsign + latitude + longitude. |

Annex IV of Appendix A shows a composite diagram of all the schemes described in this document. The diagram assumes the recommendation that JCOMMOPS becomes the host of WMO No. 47 (doc. I-5.1.2) is approved by the SOT and is subsequently endorsed by the WMO.

**OPTION 1: REAL**

| Advantages | Disadvantages |
|---|---|
| Default option of all NMS. | Ships can easily be identified on publicly available NMS or similar products displaying callsign. |
| Real-time and delayed-mode quality monitoring are not compromised. | |
| **REAL** included in national updates to WMO No. 47, hence the integrity of WMO No. 47 is retained. | |

**Commentary**

The VOS has traditionally used **REAL** to send and distribute BBXX messages. The use of **REAL** now however severely compromises the security and safety of ships and personnel in some parts of the world.

**OPTION 2: SHIP**

| Advantages | Disadvantages |
|---|---|
| Identity of the ship is hidden. | Non-unique. |
| Can be implemented at source before sending of the observation, e.g. Navy. | Real-time and delayed-mode quality monitoring of **SHIP** is impossible unless the non-masked data are supplied separately to the monitoring centres and NMSs. |
| Can be implemented by the NMS before GTS distribution, making the masking transparent to the ship. | Renders WMO No. 47 largely unusable. |
| Immediate implementation if quality-monitoring concerns are ignored. | |
| Except in data sparse areas, ships cannot be tracked individually on publicly available NMS or similar products that routinely show callsign. | |

**Commentary**

The **SHIP** solution provides anonymity and has been used for many years, particularly by navy vessels, when sending their BBXX from ship to shore. The solution considered here however occurs when an NMS replaces **REAL** with the letters SHIP before distributing the BBXX on the GTS. The use of **SHIP** poses several problems:

1. Inability by monitoring centres and NMSs to perform effective real-time quality monitoring;

2. Inability by the RSMC to compile monthly global VOS monitoring statistics as required by WMO;

3. Inability to perform delayed-mode quality monitoring; and

4. Exclusion of the data from long-term climate studies.

One NMS has indicated it will implement this scheme across its own VOF and could extend it to other ships reporting through its local LES if requested either by the ship or the responsible VOS FP. Another NMS has however indicated a blanket approach, meaning that some ships could be involuntary participants.

Whilst quality monitoring of **SHIP** is not possible, there are proposed solutions, each requiring development and considerable effort, to address the problem:

1. NMSs implementing **SHIP** would be responsible for the real-time quality monitoring of ships that are masked by **SHIP**. It would be the responsibility of these NMSs to provide the necessary quality monitoring feedback to the appropriate VOS FP, either directly or through the JCOMMOPS QCrelay.

2. To ensure the RSMC continues to meet its monitoring role for WMO, countries implementing **SHIP** would be required to collect the raw (non-masked) data in a secured database and provide the data in near real-time to enable automatic bias correction or the removal of ships displaying systematic errors. Because several countries have indicated an intention to implement **SHIP**, each country would maintain its own secured database and routinely 'push' the data to the monitoring centres.

**OPTION 3: MASK**

| Advantages | Disadvantages |
|---|---|
| Identity of the ship is hidden. | Administrative overheads in the NMS to maintain a database of **REAL** v **MASK**. |
| Short to medium term implementation. | Possible that **MASK** may impinge on **REAL** of another country. |
| Enables real-time and delayed-mode quality monitoring by monitoring centres and NMSs. | Monitoring centres and NMSs need real-time access to a centralised database of **MASK** v **REAL**. The untenable option is to access individual national databases of **MASK** v **REAL**. |
| **REAL** included in national updates to WMO No. 47, hence the integrity of WMO No. 47 is retained. | NMSs must keep up-to-date the **MASK** v **REAL** database for access by the monitoring centres. |
| Independent of the official ITU callsign of the ship which often changes. The benefit is that the BBXX will continue uninterrupted with a single identifier. | Ships can be tracked on publicly available NMS or similar products routinely showing callsign. |
| | Lack of correlation between **MASK** and **REAL**, as is the situation now with E-SURFMAR, impacts on long-term climate monitoring. |

**Commentary**

The **MASK** solution provides anonymity through the use of a unique masked identifier given to each ship. The identifier is assigned by the recruiting NMS, where the national **MASK** scheme could be developed to satisfy local requirements, e.g. categorised by equipment type for E-SURFMAR. **MASK** however does not eliminate vessel tracking if the identifier is plotted on NMS or similar products routinely showing callsign.

**MASK** does enable real-time and delayed-mode quality monitoring to be performed because of the repeating nature of **MASK** together with the ability to cross-reference against **REAL**. Furthermore, **MASK** does not impact on WMO No. 47 because **REAL** will continue to be provided in the quarterly WMO No. 47 updates.

**MASK** can be implemented immediately by the VOS FP, but to be totally effective (i.e. real-time quality monitoring, RSMC monthly statistics, delayed-mode quality monitoring, long-term climate monitoring) it requires development and installation of:

1. A centralised database of up-to-date **MASK** v **REAL**; and

2. Routines to access the **MASK** v **REAL** database by monitoring centres and NMSs.

**OPTION 4: ENCODE**

| Advantages | Disadvantages |
|---|---|
| Identity of the ship is hidden. | Requires all monitoring centres and NMSs to upgrade their message recognition and switching systems to include encoding and decoding routines. |
| 3rd party users of ship data could receive **ENCODE** whilst monitoring centres and NMS would use the decoded data. | The length of **ENCODE** may exceed the currently permitted callsign length in the message recognition software in some NMSs. |
| Ships cannot be tracked with **ENCODE** because the encrypted value changes with each observation. | BUFR is regarded by some as the preferred message format in which to transmit **ENCODE**, however BUFR is not mandatory until 2012. |
| Real-time and delayed-mode quality monitoring are not compromised. | |
| One proposed solution is to uses a public key for encoding and a private key (restricted distribution) for decoding. | |
| Permits the random selection of elements in the message to be encrypted as **ENCODE**. | |
| **REAL** included in national updates to WMO No. 47, hence the integrity of WMO No. 47 is retained. | |

**Commentary**

The **ENCODE** solution only requires action by NMSs and global monitoring centres to incorporate encoding and decoding routines in their messaging centres, otherwise its implementation is transparent to all other parties. Centres receiving the data would provide raw **ENCODE** data to satisfy any obligations to provide data to third parties, but for its own operational and monitoring purposes it would use the decoded data. Like **MASK**, the **ENCODE** solution does not impact on WMO No. 47.

The time frame for implementation is regarded as medium to long term due to:

1. The requirement that all NMSs and monitoring centres must upgrade their message switching software to incorporate SOT approved encode/decode algorithms; and

2. The possible dependence on the introduction of BUFR, which is not mandatory until 2012.

**DISCUSSION**

**SHIP** satisfies the requirement for ship anonymity, but does so at the expense of global quality monitoring, and therefore it cannot be recommended as a practical solution for the VOS. Solutions do exist however to ensure that real-time quality monitoring is performed, and include (1) real-time quality monitoring by each NMS that adopts **SHIP**, and (2) the supply of non-masked data in near real-time to the monitoring centres.

**MASK** can satisfy all of the primary requirements (ship anonymity, quality monitoring), plus it eliminates data loss when **REAL** changes during a voyage. This is an important consideration for NMSs that count the number of observations from individual ships on a monthly basis. **MASK** is therefore recommended as a practical solution for the VOS in the short to medium term.

**ENCODE** can satisfy all of the primary requirements (ship anonymity, quality monitoring) plus it eliminates vessel tracking on NMS or similar products that routinely show callsign. **ENCODE** is therefore recommended as a practical solution for the VOS in the medium to long term.

**RECOMMENDATIONS**

1. **MASK** or **ENCODE** are preferable to **SHIP**. The use of **SHIP** should be discouraged in the long term.

2. That **ENCODE** be promoted as the preferred long-term solution with a recommendation passed to EC-LIX requesting that all NMSs and monitoring centres incorporate SOT approved encoding and decoding routines in their message recognition and switching centres.

3. A combined **ENCODE/MASK** provides the added benefit that data loss is eliminated when **REAL** changes during a voyage.

4. To ensure that **MASK** meets the requirements of all users, it is proposed:

    a. That JCOMMOPS hosts the centralised **MASK** v **REAL** database;

    b. The database is password protected from unauthorised access; and

    c. Countries implementing **MASK** supply, in an approved format, (1) quarterly VOF list of **MASK** v **REAL**, and (2) monthly update of significant changes to its list of **MASK** v **REAL**.

5. To ensure that **SHIP** meets the requirements of all users, it is proposed that countries implementing this scheme:

    a. Perform the real-time quality monitoring on all ships that it masks, and to provide the necessary feedback to the appropriate VOS FP.

    b. Collect the raw (non-masked) BBXX in a secured database and ‘push’ these data to the RSMC Exeter, VOSClim RTMC, and to other monitoring centres or NMSs as required.

    c. With respect to (b), technical solutions should be discussed bilaterally to minimise the impact on centres receiving the non-masked BBXX data.

6. That the national VOS Programme Manager be recognised as the national focal point for callsign masking by other ship-based observing programmes, including the Ship of Opportunity

Programme (SOOP), the Automated Shipboard Aerological Programme (ASAP) or other related programmes.

7. That the ad-hoc team responsible for considering the callsign masking options, currently comprising the Chairs of the SOT, VOSP and ETMC, be re-established as the *Task Team on Callsign Masking and Encoding* with the addition of the DBCP/SOT Technical Coordinator. The Task Team would have the following tasks:

    a. Oversee the implementation of **MASK** and **ENCODE** and develop guidelines as necessary;

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

    c. Ensure the **MASK** v **REAL** database is kept up-to-date by NMSs implementing **MASK**; and

Develop the **ENCODE** encryption strategy, as well as the keys for encoding and decoding by NMSs and monitoring centres.

_____

Appendix: 1

## APPENDIX A

### TECHNICAL IMPLICATIONS FOLLOWING WMO EC-58 RESOLUTION ON SHIP OWNERS AND MASTER'S CONCERNS WITH REGARD TO VOS DATA EXCHANGE.

# *DRAFT*

*(v8, 2/Mar/2007)*

This document was compiled by the WMO Secretariat based on email coordination and discussions with the following people:

- Graeme Ball, SOT Chairperson, BOM, Australia
- Pierre Blouch, E-SURFMAR, Meteo France
- Julie Fletcher, VOSP Chairperson, MSNZ, New Zealand
- Toshifumi Fijimoto, JMA, Japan
- Bob Keeley, DMCG Chairperson, ISDM, Canada
- Frits Koek, KNMI, Netherlands
- Sarah North, Interim ASAPP Chairperson, VOSClim TT Chairperson, MetOffice, UK
- Colin Parrett, RSMC (Exeter), VOSClim RTMC, MetOffice, UK
- Scott Woodruff, ETMC Chairperson, NOAA, USA

### 1. Introduction

1.1 Ship owners and masters' concerns regarding availability of VOS ship's positions on public web sites not controlled by NMHS is an issue that has been discussed since early 2005 (see background in annex I). They justify their concerns because of piracy acts in certain regions (annex II) as well as because of commercial competitiveness reasons (e.g. fisheries).

1.2 The VOS data appear on the web sites because (i) VOS data are being distributed in real time on the Global Telecommunication System (GTS) of the World Weather Watch (WWW) and made available to all NMHS, (ii) marine data are defined as "essential" data according to WMO resolution 401 (Cg-XII), and (iii) "essential" data are provided on a free and unrestricted basis according to this resolution so private companies can legally access the data from NMHS. VOS data, which are assimilated in real time by NHMS from the GTS into Numerical Weather Prediction models, are essential for the provision of services in support of the protection of life and property and the well being of all nations, as well as critical for global climate studies.

1.3 Participation by maritime companies in the VOS scheme is done on a voluntary basis. Because of such concerns, ship owners and masters may withdraw their vessels from the VOS scheme because of the risk of having ship reports, including call signs and positions being made freely available on websites not controlled by NMHSs. Some ships have already withdrawn from the reporting system in order to preserve the security of their route and position. The International Chamber of Shipping recently explained that it would certainly prefer to find a solution that addresses shipowners' concerns and at the same time continues to support the excellent work of the forecasting and weather reporting services.

1.4 This serious problem, if not adequately addressed, could therefore ultimately lead to a substantial decrease in the number of recruited VOS ships and threaten the programme.

1.5 At the same time, unique ship identification is absolutely needed for the following activities:

(i) **Quality monitoring** (real-time and delayed mode). In order to monitor the quality of series of

1 WMO resolution 40 (Cg-XII) states: "…Members shall provide on a free and unrestricted basis essential data and products which are necessary for the provision of services in support of the protection of life and property and the well-being of all nations, particularly those basic data and products, as, at a minimum, described in Annex 1 to this resolution, required to describe and forecast accurately weather and climate, and support WMO Programmes; … "

observations provided by a given ship and in particular to identify ships reporting systematic errors, it is necessary for the monitoring centres to identify the ship in a unique way.

(ii) **Quality information feedback** to appropriate national focal points, and Port Meteorological Officers (real-time and delayed mode). Ship's identification cross referenced with the list of ships operated by the Members states (i.e. WMO Publication number 47) is required in order to identify the appropriate national focal point or Port Meteorological Officer.

(iii) **Global climate studies** (delayed mode). Access to ship metadata is necessary for global climate studies. Metadata are available from WMO publication number 47. It is therefore necessary to crosscheck the ship's unique identification with its corresponding records in the WMO publication.

1.6 The Regional Specialized Meteorological Centre (RSMC), Exeter is acting as CBS Lead Centre for monitoring the quality of surface marine observations and is routinely producing a biannual report on such quality as well as providing essential feedback to VOS operators regarding the quality of the data delivered by VOS ships. The MetOffice quality monitoring activities for VOS data are made on real time as well as delayed mode data. It provides for an independent source of quality information regarding ships operated by other countries. The Met Office is also acting as Real-Time Monitoring Centre (RTMC) for the VOSClim project. VOSClim as started providing a high-quality subset of marine meteorological data to support global climate studies. It is essential that the activities of RSMC, Exeter in this regard can be continued under any proposed VOS GTS data distribution scheme.

1.7 Restricting real-time ship's position and call sign access to users outside of the World Weather Watch system would satisfy the concerns of ship owners and masters. However, restricting real-time data access to the ship's call sign only would not completely address the concerns of these companies operating ships in data sparse areas where the ship traffic is low and where ships' tracks do appear clearly on plotted maps of VOS observations received from the GTS.

## 2. The WMO Executive Council Resolution 7 (EC-LVIII)

2.1 Based on above information and rationale, at its fifty-eighth session, Geneva, Switzerland, June 2006, the WMO Executive Council recommended that:

(a) 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;

(b) All Members implementing such a process to provide for the secure exchange of ship call signs and reports affected by the masking process, so as to assist in resolving real time monitoring and climate analysis problems.

2.2 At the same time, the Council requested the Secretary-General, as a high priority issue, to establish a high level dialogue, involving affected Members, the International Maritime Organization, the International Chamber of Shipping, shipping companies, and relevant organizations and technical commissions (e.g. Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology, Commission for Basic Systems), in order to determine if there is a link between VOS data availability on external Web sites and piracy and other ship security issues; to review the implementation and impact of masking; and to propose a general and universally acceptable solution to the issue that would address ship owners and masters' concerns as well as the data monitoring and quality information feedback requirements, for consideration by the fifty-ninth session of the Executive Council in 2007.

2.3 We are only addressing items (a) and (b) above in the technical implications of the WMO EC resolution below.

## 3. Masking schemes and current national implementations

3.1 There are different solutions proposed to mask the ship's identification and the WMO EC authorized national solutions to the problem. The following notation will be used in the text below:

**SHIP masking**: A generic call sign using the four letters "SHIP" is used in place of the ship's call sign in FM-13-XI Ext. SHIP reports that are distributed on the GTS.

**MASK**: the ship's call sign is masked using a unique identification number in place of the real ship's call sign in FM-13-XI Ext. SHIP reports that are distributed on the GTS. This unique identification number is allocated nationally or regionally. Allocation of unique numbers is coordinated regionally in case a group of countries from a region agrees to use the same scheme. The name of the NMHS recruiting country (i.e. not the country of the ship's registration) can2 be part of the masked call sign. To avoid confusion with ODAS and buoy numbers, the unique Identification Numbers should start with an alphabetic letter.

**ENCODE**: The actual call sign plus the date/time groups are encoded (encrypted) within the VOS reports issued by the ships (date/time is included in the encrypted part to make that group vary from one report to the next); the date/time group is also being provided separately without encryption to permit use of the observations by users outside of the WMO community. Traditional open-source encryption methods use a public key for encoding and a private key for decoding. Private key is known by all WMO Members but is not made available outside of the meteorological community.

**REAL**: The actual (real) ship's call sign is used in FM-13-XI Ext. SHIP reports that are distributed on the GTS.

3.2 At the time of writing this report, the following masking schemes are being proposed in practice:

(a) Australia: MASK. Unique identifier based on BOM numbering of its network of observing stations (i.e. AU9nnnn). Care was taken to avoid duplication with actual ship's call signs.
(b) Canada: SHIP masking for all Coast Guard vessels. Automated systems (AVOS) are being programmes to permit SHIP or MASK if requested by ship owners.
(c) E-SURFMAR: MASK. Unique identifier is formatted as following: TTTCCnn where TTT are three letters describing the type of acquisition system being used, CC are two letters for the country (ISO code, or non-ISO code if more confidentiality required), and nn are two alphanumerical characters to provide for unique identification of the ship for the considered country and acquisition system.
(d) Japan: SHIP masking. Letters "SHIP" replace the actual ship's call sign in reports inserted on GTS from Inmarsat Yamaguchi Land Earth Station (LES) upon request from (i) ships recruited by Japan, (ii) ships recruited by a foreign country, and (iii) ships registered in Japan but recruited by foreign countries (countries informed in that case). JMA is planning to make the original VOS reports routinely available in quasi real time (20 minutes delay at maximum) through a secured (authentication and encryption) server as of April 2007.
(e) USA: SHIP masking for ships recruited by a foreign country asking to SHIP mask the VOS reports inserted on GTS from USA.

3.3 Other countries have indicated that they would not be using any masking scheme:

(a) New Zealand explained that they have presently no plan to implement masking scheme but that in case ship owners and masters of ships recruited by New Zealand would express concerns, they would favour implementing MASK in order to permit quality monitoring activities to be conducted properly.
(b) South Africa is along the same lines as New Zealand
(c) USA for the ships they are recruiting.

## 4. Technical implications of WMO EC Resolution 7 (EC-LVIII)

### 4.1 Technical implications for the SHIP masking solution

4.1.1 Quality Evaluation:

2 Perhaps the SOT should discuss whether indicating the country name should be mandatory or whether for example the first two characters should provide for the country name with letters XX for example being used for those recruiting countries reluctant to show their names as part of the identification.

4.1.1.1 Unique identification is required for quality evaluation purposes:

- For building time series for any given ship, comparing the ship data with the model's first guess, and computing quality monitoring statistics (totals, RMS, bias, number of gross errors) in order to detect those ships reporting systematic errors (or biased observations);
- For automatically rejecting the observations originating from the ships which are considered as reporting systematic errors (black listing);
- For automatically correcting the observations originating from the ships considered as reporting systematically biased observations (bias correction);
- For RTMC transferring in real time BUFR reports to the VOSClim Data Acquisition Centre.

4.1.1.2 As the ship's identification is not available from the received GTS reports, assimilating centres doing the monitoring such as RSMC or VOSClim RTMC should have access to the ship's identification through other means. A solution is to provide access in quasi real-time via a dedicated secured server to copies of the original VOS reports (i.e. the non-masked FM-13 SHIP observations). Duplicate checks will have to be made in order to only keep the observations containing the real call sign in the assimilating centre's database.

4.1.1.3 The Member Countries implementing SHIP masking must provide international NMHS users with such secured access. While real-time access is recommended, delayed mode access is required for the monitoring activities (biannual, monthly) by RSMC. Real-time monitoring is the primary responsibility of the countries inserting the data onto the GTS. However, for those countries implementing SHIP masking and inserting VOS reports on the GTS for ships that are under the responsibility of other countries, it should be required that they provide for real-time quality monitoring activities and that they systematically inform responsible countries of any detected problems and undertaken corrective action.

4.1.1.4 It is understood that these Member Countries implementing SHIP masking, at least for the ships they are responsible of will perform minimum quality monitoring. However, the role of RSMC, Exeter, must continue to be ensured at the very least for the ships that are not under the responsibility of a country which is inserting SHIP masked reports onto the GTS directly from data received from Inmarsat Land Earth Stations. Even for the ships under the responsibility of such a country, RSMC, Exeter, provides for an independent and alternate source of quality monitoring information. Inter comparisons of ship data quality information requires consistent quality evaluation on a global basis by one or more recognized monitoring centre, e.g. RSMC, Exeter.

4.1.1.5 To a large extend, quality monitoring activities are based on comparisons of the observed data with co-located NWP model field output. The primary source of information for data assimilation schemes is the GTS. For operational NWP centres, GTS is a natural and relatively straightforward source of information for data assimilation. Access to a secured quasi real time distribution system of the original VOS reports can be an acceptable solution. However, the data processing systems operated by the RSMC, Exeter, VOSClim RTMC, and other overseas monitoring centres will be impacted and developments will have to be made in order to adjust to the new situation. Since the data timeliness is paramount for operational NWP centres, it is likely that the SHIP masked data will be assimilated first. If a parallel data distribution system is used for the original data, there will be a risk of assimilating the data twice. So a duplicate check that excludes checking the call sign will have to be set up in order to prevent this happening.

4.1.1.6 Regarding the role of the VOSClim Real Time Monitoring Centre (RTMC), impact will depend whether there are any VOSClim ships which data are being SHIP masked. The real time transfer of BUFR ship data by the UK MetOffice to the Data Assembly Centre at NCDC relies on a list of ship call signs. The provision in quasi real time of the original data via a secured server provides for a viable solution.

4.1.1.7 The UK MetOffice which is operating both the RSMC, Exeter and the RTMC, would have to make appropriate changes in its data processing schemes and has indicated that required developments could not realistically be completed before the end of 2007. The RTMC favours implementation of a global masking solution such as MASK.

4.1.2 Quality information feedback:

4.1.2.1 Corrective action can be taken immediately when required for the ships under the direct responsibility of a country implementing SHIP masking provided that quality monitoring activities for these ships are undertaken routinely. When a country implementing SHIP masking and undertaking quality monitoring activities detects systematic errors for a ship that is not under its direct responsibility, then the foreign national focal point needs to be contacted. This can be done relatively simply by using WMO Publication number 47 and the ship's real call sign which is known by the LES inserting the data onto the GTS.

4.1.2.2 When RSMC, Exeter, or an overseas monitoring centre performs quality monitoring activities, ship's identification is absolutely necessary for identification of the national contact point or Port Meteorological Office to whom the quality information should be provided. Monitoring centre willing to report systematic errors will have to identify the ship through procedures described above in paragraph 4.1.1.2. Once identification is made, the feedback exercise becomes easy and the existing JCOMMOPS QC relay web pages can be used as before using actual ship's call sign.

4.1.3 Global climate studies:

4.1.3.1 Provided the proposed option is adopted of providing access in quasi real-time via a dedicated secured server to copies of the original VOS reports, which are archived in preference to the SHIP masked duplicates in assimilating centres' databases. impact should be minimal because users can work directly on the non-masked data and real-time access is not required.

4.1.4 Remark concerning Japan: Since many of the ships recruited by Japan sail in piracy-prone areas, the Japan Meteorological Agency (JMA) has discussed the issue with concerned Japanese authorities, i.e. the Japanese Ship Owners' Association, and the national authority for maritime security. The issue is so serious for some ship-owners that they insist that all data should be reported without call sign. They indeed consider that replacing the ship's call sign with unique identification numbers managed by NMHS cannot prevent pirates from accessing the ship's track and some information regarding the country recruiting or owning the ship. While JMA recognizes the importance of quality management of the data for met services (i.e. the needs of unique identification), SHIP masking was considered by JMA the most acceptable option for all parties.

4.1.5 Remark concerning Canada: For the Canadian Coast guard vessels distributing their meteorological reports using SHIP masking, AVOS onboard real-time Quality Control (QC) will be the only QC being performed. Canada is not planning at this point to make a copy of the original reports available via a secured database. RSMC, Exeter and other quality monitoring centres will not be able to evaluate the quality of such ships because the identification will be lacking and there will be no way to resolve identification.

4.1.6 Impact summary: Member or LES must make the original VOS reports available in quasi real time through a secured server. The latter information needs to be accessible to RSMC, Exeter, monitoring centres overseas, and scientists conducting global climate studies. This will permit (i) identification of all observations from a given ship (monitoring), and (ii) identification of the operator responsible for the ship (feedback). RSMC, Exeter, VOSCLim RTMC, and overseas monitoring centres, must be able to access this information routinely and will have to make software developments (in particular to prevent duplicates from being assimilated in the operational models). If only one Member does apply SHIP masking of ship's call sign then the secured distribution system could be developed, maintained, and operated by that Member. However, if more than one Member does it, it will then be required to develop an international

secured distribution system containing VOS reports collected from the different national or regional centres implementing SHIP masking. JCOMMOPS could for example host such a global system. Feasibility will have to be demonstrated, and it would take time to implement. Real time monitoring remains a responsibility of those countries inserting the VOS data onto the GTS.

## 4.2 Technical implications for the MASK solution

4.2.1 Quality evaluation: the monitoring centres can conduct Quality evaluation exercise as before because the ship's identification that appears in FM-13 SHIP reports is unique for a given ship.

4.2.2 Quality information feedback: In case the country name is part of the masked ship's call sign, then, if reachable, the National Focal Point can be contacted and asked to relay the information to the appropriate national contact or Port Meteorological Officer. In case the country name is not part of the masked ship's call sign, or in case the NFP is not reachable, then the national contact point can be identified provided that a secured database containing cross references of masked call signs with national contact points is available. As more than one Member Country are implementing that MASK solution, then the database must be global. However, the global database does not have to be updated in real-time. Monthly submissions of lists of masked call signs together with real ship's call signs would for example be sufficient for updating the database. This would permit identification of ships from the monthly monitoring statistics provided by RSMC, Exeter. Database could be implemented at JCOMMOPS as a quality information relay mechanism is already in place there and uses input from WMO Publication number 47 in order to identify appropriate contact points to whom to relay the information.

4.2.3 Global climate studies: WMO Publication number 47 will remain as it is with real call signs. Delayed mode access to a global secured database that is cross referencing the masked ship's call signs with the real ship's call signs would be required in order to resolve ship's call sign and access corresponding required metadata records in WMO Publication number 47. The global database must be routinely updated with masked versus real call sign information provided by Member Countries implementing the MASK solution. The unique identification scheme(s) being developed must be careful to avoid too lengthy identification numbers; for example, some abbreviated marine GTS formats that are being used by certain Members are limited to 7 characters. Proper communication with the Expert Team on Marine Climatology (ETMC) and its Task Team on Delayed Mode VOS data (TT-DMVOS) must be established.

4.2.4. Limited confidentiality of ship's identification: Let us assume a ship with call sign "VGVF" is reassigned a MASK of "AU007". Every time it reports on GTS it will use "AU007". So pirates can consult their favorite web site and see the progress of "AU007" until it gets to port. They can then identify it as a desirable ship to attack the next time around.

4.2.5 Impact summary: Impact is relatively minor. Each member that implements MASK will be required to provide a unique masked call sign for each ship of an agreed upon maximum length and make sure that the masking scheme proposed does not reproduce existing real call signs that could be operated by other countries. The latter can be checked with the ITU International Call Sign series3. Unique call sings are basically required for quality monitoring purposes. Also, there is no need to maintain records of the observations distributed with a masked call sign. National submissions to WMO Publication number 47 can be made as before on a quarterly basis and can include the real ship's call signs provided that the database of masked call signs is separate and secured. In that case WMO publication can remain public. JCOMMOPS requires access to the secured database of masked ship's call signs versus real call signs for quality information relay purposes so it could be an appropriate place to host the secured database. It would update its database monthly based on input provided by Member Countries implementing MASK.

3 See http://www.itu.int/cgi-bin/htsh/glad/cga_callsign.sh?lng=E

### 4.3 Technical implications of the ENCODE solution

4.3.1. As long as users will be able to decode the call sign immediately upon VOS report decoding, the requirements for quality monitoring, feedback, and climate studies will be met. So the solution has merits in this regard.

4.3.2. Decoding will be difficult with traditional code forms (e.g. FM-13 SHIP) as the Commission for Basic Systems (CBS) is now reluctant to modify these codes because of the migration to table driven codes. While the WMO Manual on Codes does not specifically state the maximum size of ship's call sign within FM-13 SHIP reports4, encryption within traditional code forms might become acceptable provided that the encrypted field does not exceed the size of the maximum ship's call sign that presently appear in such reports5 (i.e. 7 or 8 characters). A simple encryption method would have to be used in that case (i.e. avoiding complex algorithms using private and public keys). A simple method would be very similar in essence to what is described in the MASKED solution. It would perhaps be preferable to use table driven codes and wait until the migration to such code forms is completed before proposing ENCODE (use of complex algorithms would then become acceptable).

4.3.3. The same encryption method and private/public key will have to be used by every country inserting VOS data on the GTS and using the data. A BUFR descriptor providing for an encrypted call sign plus date/time is feasible through submission of a proper proposal to CBS. However, every centre, including in developing countries, will have to develop the capability of decoding encrypted fields. All operational centres using VOS data (so all NWP centres in particular) will have to upgrade their operational data assimilation systems accordingly.

4.3.4. The private key will have to be known by every real-time user of the data within the WMO community with the risk of having it inadvertently released to unauthorized users. If the private key is compromised, a new public-private key could be issued and all users informed in advance. The international coordination is required at the switchover and whenever keys must be changed.

4.3.5. One advantage of the ENCODE solution compared to the MASK solution is that the encoded field will vary from one VOS report to the next because the date/time group is included. Hence, in that sense, it has the advantages of the SHIP solution when plotting such reports on a map because there will be no way for users outside of the meteorological community without access to the private key to identify two reports originating from the same ship, and therefore to identify a given ship's track (except if the ship is sailing in data sparse regions).

4.3.6. Another advantage is that the users decoding the data will immediately access the call sign and won't have to access a cross-reference list of masked vs. real call signs prior to seeking metadata information from WMO Publication No. 47.

4.3.7. As some WMO Members may chose not to use ENCODE, some solution will have to be proposed to differentiate an encoded call sign from a non-encoded one. This will be natural with table driven code forms as different descriptors would be proposed for non-encrypted call signs and encrypted ones. For traditional character codes, encrypted call sings could be prefixed with specific letters6 (e.g. SHxxxxxx) which reduces the size of the encrypted part (6 characters max if using "SH" and maximum size of encrypted call sign limited to 8 characters). However, for traditional character codes, the fact that users of the data would have to look at the call sign in order to ascertain whether it is encrypted or not will be regarded by CBS as a new coding practice and therefore as a code change. CBS is now reluctant to changes in character codes

---

4 The Manual on codes (WMO No. 306 Vol I.1 part A) states "D…D: Ship's call sign consisting of three or more alphanumeric characters (FM 13, FM 20, FM 33, FM 36, FM 62, FM 63, FM 64, FM 65, FM 85)."

5 Encrypting callsing+date+time will basically require encrypting 7+8+4 characters, i.e. 19 characters. Encrypting 19 characters in character form will require more than 19 characters.

6 Note however that "SH" conflicts with some REAL call signs allocated by Sweden, see http://www.itu.int/cgi-bin/htsh/glad/cga_callsign.sh?lng=E so other letters that "SH" might have to be proposed; real call signs starting with letter "Q" might also be used in the future, see http://life.itu.int/radioclub/rr/res013.htm.

because it is promoting migration to table driven codes. So the ENCODE solution will be acceptable only if the data are distributed in BUFR or CREX format.

4.3.8. Impact summary: Identification of the ship is well hidden to potential pirates. Table driven code form is preferable for this solution. International coordination is required to make sure every user can develop the decoding capability (i.e. write/buy/get software) and maintain it (i.e. remain aware of public/private key changes) at any time. Under those conditions, impact for quality evaluation, feedback, and climate applications is minimal. Impact for developing countries would have to be investigated.

## 5. Other ship-based observations with potentially similar concerns

5.1 Other ship-based observations such as those made under the Ship Of Opportunity Programme, and the Automated Shipboard Aerological Programme (ASAP) Panel (ASAPP) might eventually have to face similar concerns as they rely on commercial vessels recruited by JCOMM Members/Member States and promote free and unrestricted data exchange. Are also concerned ships equipped with ThermoSalinoGraphs (TSG).

5.2 SOOP ships are reporting in FM 62–VIII Ext. TRACKOB format, ASAP ships in FM 36–XI Ext. TEMP SHIP format, and TSG ships in FM 62–VIII Ext. TRACKOB. However, the concern has not been raised yet as apparently such reports do not appear on public web sites.

5.3 Similar masking schemes might therefore have to be proposed by the SOOPIP and the ASAPP. Implications in terms of quality monitoring and global climate studies will be similar. Any masking scheme developed under SOOPIP and/or ASAPP would have to be compatible somehow with the VOS masking scheme(s) in order to avoid clashes between identification numbers. Also a ship recruited by one or more programmes (VOS, SOOP, ASAP) should be reporting its data using the same identification number. The SOT is invited to look at the issue in more detail.

## 6. Conclusion, and technical proposal

6.1 For all ships participating in the global VOS fleet, it is essential to ensure continuity of quality monitoring activities by the monitoring centres and by RSMC, Exeter, and VOSClim RTMC in particular. Quality of the data must be known, hence the importance of monthly monitoring statistics provided by RSMC, Exeter. National contact points must be informed of detected systematic errors in order to take corrective action as soon as possible.

6.2 Real time monitoring remains a primary responsibility of those countries inserting the VOS data onto the GTS. Those countries implementing SHIP masking are therefore invited to monitor the quality of these data in real time and to report on detected problems and undertaken corrective actions to the countries responsible for operating the ships. Unique identification is required for real-time quality monitoring by operational data assimilation centres, black listing of suspicious ships, and automatic bias correction of reports from ships identified by them as reporting systematic bias.

6.3 Scientists conducting global climate studies rely very much on VOS data received from the GTS. They must be able to access associated metadata through WMO Publication number 47.

6.4 Member states implementing ship's identification masking have been invited by WMO-EC to provide for a national database. As different national or regional solutions will exist, two secured international global databases need to be implemented to facilitate access by the monitoring centres, i.e.

(i) A monthly updated database of unique masked call signs versus real call signs (MASK), and
(ii) A database providing access in quasi real-time via a dedicated secured server to copies of the original VOS reports (i.e. the non-masked FM-13 SHIP observations).

6.5 JCOMMOPS is the logical centralized choice at least for the unique masked call signs database. It has routine access to WMO Publication number 47 and the VOS National Focal Points list and would continue to operate the JCOMMOPS web based Quality Information Relay mechanism (QCRelay) for

both real ship's call signs and unique masked call signs. Individual monitoring events could then continue to be sent through the QCRelay mechanism. Under this scenario, a monitoring centre would send a message through the QCRelay using either a real or unique masked call sign. JCOMMOPS, as it does now, would match the real or masked call sign to a ship and VOS National Focal Point (NFP) and send the message to this NFP.

6.6 In case of ship reports inserted on the GTS using SHIP masking, the monitoring centres would resolve ship's identification through access to the quasi real time data-set of original reports and make sure that duplicates are not assimilated twice in the models. They would report on systematic errors via JCOMMOPS QCRelay using the real call sign.

6.7 The SHIP masking solution implies software developments to be made by operational data assimilating centres in order to access a separate data distribution system and filter duplicates out. Delays in the implementation of such procedures can be expected.

6.8 For security reasons, the unique ship's identification database should exist separately from the WMO Publication number 47 although the two databases will have to be consistent. Access to this new database must also be secured. There is no need to secure access to WMO Publication 47 if it contains only REAL call signs and does not cross references MASK call signs with REAL ones. JCOMMOPS would provide for that cross-reference in a secured way. When using MASK, it should be noted that the name of the country of the ship's registration should not be part of the masked identification number; the name of the NMHS recruiting country may be part of it; however, if more confidentiality is required regarding country's identification, then the latter could also be hidden in the identification scheme.

6.9 For countries implementing MASK, schemes must be carefully developed to avoid potential clashes between (i) masked call signs and (ii) existing real call signs of other countries. Masked call signs must be unique.

6.10 RSMC, Exeter, VOSClim RTMC, overseas monitoring centres, and JCOMMOPS need to address the cost issue for the required software developments. They will have to set up development projects and indicate possible implementation dates.

6.11. The ENCODE solution could provide for a viable longer-term solution once VOS observations start to be distributed in table driven code form. A proposal would have to be submitted to the CBS and a proper coordination mechanism proposed to make sure that all legitimate users would have decoding capability.

6.12 The flow diagram in annex IV provides for a detailed description of the flow of information between the different actors in the context of this proposal.

_____

**ANNEX I**
**BACKGROUND**

***Third SOT meeting, Brest, 7-12 March 2005***

Excerpt from the SOT-III final report is reproduced below:

> ***III-A/4.1 Security issues arising from availability of SHIP data on the web***
>
> *III-A/4.1.1 Ms Julie Fletcher (New Zealand) and Mr Graeme Ball (Australia) raised security issues arising from availability of SHIP data on the web. Ships participating in the VOS scheme do so on the understanding that their data are only being exchanged between NMS for real-time meteorological forecasting activities and for climatological research. SHIP data are now however also displayed in many public web sites. This has led to questions about how these data were obtained, but of greater concern is the identification of ships' names, call signs and positions and the security risk this exposes them to. Some Shipping Companies have threatened to withdraw their ships from the VOS programme if the leak of this data to the web continues. The meeting was informed that the IMO had recognized the issue of marine security and was organizing an international meeting on the subject later in 2005.*
>
> *III-A/4.1.2 The meeting noted that replacing call signs with "SHIP" could mitigate the problem and be an interim solution, but would not completely solve the problem as those who chase ships with malicious intent could still follow the ship routes. With regard to the possibility of using encrypted call signs, the meeting noted that it was unrealistic to encrypt ship reports as had been done with AMDAR messages from aircraft.*
>
> *III-A/4.1.3 The meeting requested VOSP members to take any possible actions to prevent making the ship positions available on the web site, such as contacting the relevant organization/companies and informing them of the security risk by making ship data available (**Action**: VOS operators, SOT chairperson). It also requested the WMO Secretariat to inform NMS about this issue so that NMS could monitor the situation and take appropriate actions. (**Action**: WMO Secretariat). The meeting also noted that the problem would continue to exist whilst FM-13 SHIP is included as "essential data" in the Resolution 40 (Cg-XII). It therefore requested the WMO Secretariat to advise the WMO Executive Council (EC) about this issue and to take the necessary actions. The meeting requested that the WMO Secretariat ensure that this issue is discussed at the coming WMO EC (EC-LVII) (June 2005). (**Action**: WMO Secretariat)*
>
> *III-A/4.1.4 The meeting noted that some weather charts issued by NMS were also made available on their web sites and included Ship Data and callsigns. The meeting agreed that although mariners liked to see observations on the charts, displaying of callsigns exposed them to a security risk. (**Action**: NMS)*

***Fifty-seventh WMO Executive Council, Geneva, June 2005***

Excerpt from the WMO EC-VLVII final report is reproduced below:

> ***3.4.4.3*** *….. It was also noted that there were potentially serious security risks associated with allowing VOS call signs and position data to be made freely available on external Websites not maintained by the National Meteorological Services. Because ship observations are regarded as 'essential data' in Resolution 40 (Cg-XII) the problem was likely to persist. It was therefore agreed at the last JCOMM Ship Observations Team meeting (SOT-III, March 2005), that a report on the issue should be made at EC-LVIII.*

Third International Workshop of Port Meteorological Officers, Hamburg, 23-24 March 2006,

Excerpt from the PMO-III recommendations are reproduced below:

> *Ship security remains a concern for shipping companies and Member Countries; mainly because of the high number of ship piracy acts (more than 300 attacks every year, 30 crew members killed in 2004). The publication of a ship's identification and more importantly its position via web sites, is regarded with great concern by shipping companies and can lead to some companies requesting that their ships be de-recruited from the VOS. This has already happened in several instances, e.g. since mid-2003, Australia lost more than 5000 ship reports per year because of such concerns from a fishing company, and Japan lost more than 300 VOS between March 2005 and December 2005.*

*A short term solution is to use a generic callsign, e.g."SHIP", although this (i) impacts on the integrity and usefulness of WMO publication no. 47, (ii) prohibits the relay of quality information from monitoring centres back to ship operators because identification of the relevant ship operator becomes practically impossible, and (iii) does not address ship security concerns for those ships sailing in regions where the traffic is low.*

A longer term solution arising from discussions with SOT-3, JCOMM-2, and PMO-INT-III was now being proposed for adoption by WMO Executive Council, that: "WMO recommends that NMHS reclassify ship data transmitted in FM-13 SHIP format from essential data to additional data". This would limit distribution of the data beyond NMHS and would require special agreement with third parties regarding the specific use of the data. For this proposal to succeed it will require the support of all NMHSs due to the question of who owns the original data

*The PMO-INT-III also recommended "WMO recommend that NMHS remove ships' call signs from charts distributed to ships via the radio-facsimile or other means.*

*Other possible options that could be implemented nationally or regionally were as follows:*

> *Japan proposed a solution where ship's call sign transmitted via Inmarsat code 41 could optionally pass through a filter at LES Yamaguchi, whereby letters "SHIP" before GTS insertion would replace the real call sign. Decisions whether or not to replace the ship's call sign by "SHIP" would be the responsibility of the ship or the NMHS of the recruiting country. Countries adopting such a solution were urged to maintain a private database to help resolve monitoring problems.*

The E-SURFMAR Programme Manager proposed a scheme of generic call signs to identify particular ship categories ( Minos, Batos, TurboWin etc). This would have the benefit of hiding the true identity of a ship but would not solve the problem in low traffic areas. This would also assist with the compensation scheme established under E-SURFMAR. For example, ship's call signs could be coded Qttccnn where Q is letter "Q" (not used by any country at present), tt represents the ship category, cc the country operating the ship, and nn a sequential number (from 00 to ZZ).

Fifty-eighth WMO Executive Council, Geneva, June 2006.

As required by EC-LVII, a report on the issue was presented by JCOMM to the Executive Council. Excerpt from the WMO EC-LVIII final report is reproduced below:

> ***3.4.4.3*** *As regards to the requests from EC-LVII, the Council:*
>
> *….*
>
> *(b) Noted that the security issues arising from availability of ship positions and identification data on the Internet had been discussed again at the Third International Port Meteorological Officers Workshop (PMO-III), in Hamburg, Germany, 23-24 March 2006. The Council also noted the following PMO-III proposals that could be implemented nationally and regionally:*
>
> *(i) Ship call signs transmitted via Inmarsat code 41 could optionally pass through a filter at LES whereby the real call sign would be replaced by letters "SHIP" before GTS insertion. Decisions on whether or not to replace ship call signs by "SHIP" would be made by the ship or NMHS of the recruiting country. Countries adopting such a solution are urged to maintain a private database to help resolve monitoring problems;*
>
> *(ii) A scheme of generic call signs could be used to identify particular ship categories (Minos, Batos, TurboWin etc). This would have the benefit of hiding the true identity of a ship but would not solve the problem in low traffic areas. This would also assist with the compensation scheme established under E-SURFMAR. For example, ship call signs could be coded Qttccnn where Q is letter "Q" (not used by any country at present), tt represents type of AWS, cc the country operating the ship, and nn a sequential number (from 00 to ZZ);*
>
> *(iii) SHIP observations on the GTS (BBXX) could be reclassified from essential data to additional data with respect to Resolution 40 (Cg-XII), on the understanding that*

*NMHS wanting to use the data for operational purposes will not be adversely impacted, but third parties wanting the data must sign agreements with the NMHS explicitly detailing how they will use the data, which under no circumstance should then be made available on public websites. Ships' call signs could be omitted from all SHIP observations (BBXX) plotted on charts which are subsequently transmitted from the NMHS to ships, either by radiofacsimile broadcast or by other means.*

*The Council recognized the seriousness of the situation, which if not addressed could ultimately lead to the disappearance of the majority of VOS reports available on the GTS and agreed that there were many implications and associated issues to address at the international and national levels. It urged Members to carefully review the proposals presented by the JCOMM Co-presidents to address the problem, and adopted Resolution 7 (EC-LVIII).*

Resolution 7 (EC-LVIII) is reproduced in annex II.

## ANNEX II

### Regional analysis of reports on acts of piracy and armed robbery against ships which were reported to have been allegedly committed or attempted during 2005

(source IMO, MSC.4/Circ.81)

| | | FAR EAST | | | AFRICA | | SOUTH AMERICA | | |
|---|---|---|---|---|---|---|---|---|---|
| ACTS REPORTED TO HAVE BEEN ALLEGEDLY COMMITTED | | Malacca Strait | South China Sea | Indian Ocean | East Africa | West Africa | Atlantic | Caribbean | Pacific |
| **Location of incident** | | | | | | | | | |
| | In international waters | 8 | 5 | 2 | 9 | 1 | | | |
| | In territorial waters | 2 | 20 | 11 | 8 | 4 | 1 | 1 | 1 |
| | In port areas | | 56 | 26 | 5 | 16 | 2 | 11 | 8 |
| **Status of ship when attacked** | | | | | | | | | |
| | Steaming | 8 | 20 | 7 | 13 | 1 | 2 | 1 | |
| | At anchor or on berth | 2 | 61 | 32 | 6 | 20 | 1 | 11 | 9 |
| | Not stated | | | | 3 | | | | |
| **Number of persons involved in the attack** | | | | | | | | | |
| | 1-4 persons | 3 | 34 | 16 | 6 | 12 | | 7 | 6 |
| | 5-10 persons | 3 | 19 | 13 | 4 | 3 | 1 | 3 | 2 |
| | More than 10 persons | 2 | | 1 | | | | | |
| | Not stated | 2 | 28 | 9 | 12 | 6 | 2 | 2 | 1 |
| **Consequences to the crew** | | | | | | | | | |
| | Actual violence used against crew | 6 | 16 | 11 | 3 | 12 | 1 | 4 | 2 |
| | Threat of violence (including crew being tied up but not physically attacked) | 2 | 22 | 7 | 1 | 5 | 1 | 5 | 3 |
| | Ship missing | | | | | | | | |
| | Ship hijacked | | 4 | | 14 | | | | |
| | None/not stated | 2 | 39 | 21 | 4 | 4 | 1 | 3 | 4 |
| **Weapons used by attackers** | | | | | | | | | |
| | Guns | 7 | 12 | 11 | 6 | 3 | 2 | 1 | 1 |
| | Knives | 2 | 29 | 7 | 2 | 13 | | 9 | 4 |
| | Other | | 4 | 1 | | 1 | | 1 | |
| | None/Not stated | 3 | 36 | 18 | 14 | 4 | 1 | 1 | 4 |
| **Parts of the ship raided** | | | | | | | | | |
| | Master and crew accommodation | 7 | 6 | 8 | 13 | 2 | | | |
| | Cargo area | | 36 | 10 | 6 | 14 | | 9 | 7 |
| | Store rooms | 3 | 31 | 19 | 2 | 3 | 3 | 3 | 2 |
| | Engine room | | 2 | | | | | | |
| | Not stated | | 6 | 2 | 1 | 2 | | | |
| **Total number of incidents reported per areas** | | **10** | **81** | **39** | **22** | **21** | **3** | **12** | **9** |
| **Total number of incidents reported** | | **197** | | | | | | | |

**ANNEX III, RESOLUTION 7 (EC-LVIII)**

**RESOLUTION**

**Resolution 7 (EC-LVIII) – SHIP OWNERS AND MASTERS' CONCERNS WITH REGARD TO VOS DATA EXCHANGE**

**THE EXECUTIVE COUNCIL,**

**Recalling** the request made by the Executive Council at its fifty-seventh session for the JCOMM Ship Observations Team (SOT) to assess the risks associated with allowing Voluntary Observing Ships (VOS) call signs and position data being made freely available on external websites not maintained by the National Meteorological or Hydrometeorological Services, and to provide options to address the problem, as appropriate,

**Noting** the proposals prepared by PMO-III and endorsed and submitted to the Executive Council by the JCOMM Co-presidents,

**Acknowledging;**

(1) The seriousness of the problem, which, if not adequately addressed, could ultimately lead to the disappearance of the majority of VOS reports available on the Global Telecommunication System (GTS),
(2) The concerns on the issue expressed by ship owners and masters,

**Recommends:**

(1) Members that, 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;

(2) All Members implementing such a process to provide for the secure exchange of ship call signs and reports affected by the masking process, so as to assist in resolving real-time monitoring and climate analysis problems;

**Requests** the Secretary-General, as a high priority issue, to establish a high level dialogue, involving Members affected, the International Maritime Organization, the International Chamber of Shipping, shipping companies, and relevant organizations and technical commissions, for example the Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology or the Commission for Basic Systems, in order to determine if there is a link between VOS data availability on external websites and piracy and other ship security issues; to review the implementation and impact of masking; and to propose a general and universally acceptable solution to the issue that would address the concerns of ship owners and masters, as well as the data monitoring and quality information feedback requirements, for consideration by the Executive Council at its fifty-ninth session in 2007.

_____

**ANNEX IV**
**PROPOSED FLOW DIAGRAM**