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|  | **VOS Report for 2016** | **Country =** | **United Kingdom** |
|  |
|  | **a.** | **Programme description:** |
| **Category** | **No. of ships at** **31 Dec 2016** | **Recruitments in 2016** | **De-recruitments****In 2016** | **Comments** |
| *Selected* | 33 | 2 | 15 | * The UK Selected fleet was further reduced in 2016 with new VOS being recruited in preference to the VOSClim fleet
* Inactive and underperforming UK selected ships are gradually being withdrawn from the fleet
* UK selected ships operate in all regions
 |
| *Selected AWS* | 0 | 0 | 0 |  |
| *VOSClim* | 214 | 23 | 22 | * The UK VOSClim fleet has grown in 2016, with new recruits added to this VOS class in preference to Selected
* Recruits also includes those ships that were upgraded from Selected class during the year
* UK VOSClim ships operate in all ocean regions
 |
| *VOSClim AWS* | 0 | 0 | 0 | * Last remaining AWS- a BATOS system was removed and replaced with an AMOS in December 2015
 |
| *Supplementary* | 0 | 0 | 0 |  |
| *Supplementary AWS* | 59 | 11 | 1 | * AMOS systems are primarily aimed at ships operating in UK or near continental waters
* All remaining legacy systems (MINOS, BATOS) have now been withdrawn and replaced with AMOS systems
* No expansion of the network planned for 2017
* All units to be upgraded to 2nd generation model (AMOS-2) from 2018 onwards
 |
| *Auxiliary* | 0 | 0 | 0 |  |
| *Auxiliary AWS* | 0 | 0 | 0 |  |
| *Other* | 0 | 0 | 0 | The 3 remaining manually reporting mobile rigs supplied with Met Office equipment are now included within our Selected fleet. [Third party systems on rigs and platforms are not included] |
| **National VOS Total** | 306 |   |  |  |
|  |  |  |  |  |  |
|  | **National VOS Target** | ~300 |  |  |  |  |
|  | **National VOSClim Target**  | 200 |  |  |  |  |
|  |  |  |  |  |  |  |
|  | **b.** | **Data management:** |
|  | *Total number of ship observations (BBXX) distributed on the GTS in 2016* | 85608 – real time observations from manually reporting UK VOS and VOSClim ships (78109 obs within HH+120 minutes)402570- real time observations from shipborne AWS installed on UK VOS (388249 obs within HH+20 minutes)(Note- excludes moored buoy and light vessel ship coded observations and observations from third party offshore rigs and platforms) |
|  | *Dates when VOS data submitted to the GCCs in 2016* | Delayed mode IMMT data from UK VOS are submitted to the GCC in Edinburgh as soon as they are recieved |

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|  | c. | **Shipboard Automatic Weather System** |
| **Type** | **No. of ships at 31 Dec 2016** | **Manual Input****Yes / No** | **Method of Comms** | **Year1 Plans** |
| AMOS | 59 | No | Iridium (SBD) | No further AMOS installations planned for 2017. Planning to upgrade all units to 2nd generation model (AMOS-2) from 2018 onwards. |
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|  | **d.** | **Electronic logbooks: (TurboWin, SEAS, OBSJMA)** |
| **Software & version** | **No. of ships at**  **31 Dec 2016** | Implementation plans |
| TurboWin Version 5.0/5.01 | 180 | Will gradually be replaced by Version 5.5 when available (or Turboweb on suitable ships) during 2017 |
| TurboWin Version 4.0-4.6 | 41 31 | Will gradually be replaced by Version 5.5 when available (or Turboweb on suitable ships) during 2017 |
| TurboWin Version 3.6 or earlier | 1 | Ships and mobile rigs that have been difficult to contact/upgrade to newer versions |
| TurboWeb Version 5.0/5.01 | 21 | Plan to roll out TurboWeb to further suitable ships in 2017 (depending on company agreement). Note- most TurboWeb ships also use TurboWin via Sat-C as a back up when internet is unavailable |
| TurboWeb Version 4.5 | 2 | Plan to roll out TurboWeb to further suitable ships in 2017 (depending on company agreement). Note- most TurboWeb ships also use TurboWin via Sat-C as a back up when internet is unavailable |

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| **e.** | **Standard Meteorological Equipment: (Types and Settings)** |
| **Equipment Type / Element** | **Manual Instrumentation** | **AWS Instrumentation** |
| Barometer | MK2 Precision Aneroid Barometer (N&Z) | Vaisala PTB330 Digital Barometer (single cell) |
| Vaisala PTB330 Digital Barometer (single cell) | Druck digital barometer |
| Vaisala PTB220 Barometer (triple cell) | Vaisala PTB110 barometer |
| *Default national setting* | *Station Level*  | *Station Level*  |
| Barograph | N&Z MK2 Barograph (open scale/7 day) | N/A (tendency derived from hourly barometer output) |
| Fischer MK3 Marine Barograph |  |
|  | Vaisala PTB330 Digital Barometer |  |
| *Default national setting* | *Mean Sea Level* | *Station Level (as read pressure transmitted)* |
| Thermometers | 2/C Mercury Thermometers (BS 692 Spec -30C to +45C) fitted in both port and starboard marine screens | Rotronic Hygroclip 2 temp/humidity sensor Vaisala HMP110 humidity sensor (as of Nov.2016 this will replace the Rotronic Hygroclip across the network) |
|  | Rotronic hand held Hygropalm HP220-A temp/humidity sensor (18 ships only) |  |
| Sea Surface Temperature | Engine room hull sea water intake temperatures now used for most UK VOS | Sensing Devices Limited (IEC:EN:60751:2008 Class ‘B’ housed in potting compound with copper conductors) |
|  | MK2 Mercury Sea Thermometer (-5C to +35C) with MK3 sea bucket (only supplied to low freeboard ships) |  |
| Wind Speed | Anemometer not provided to UK VOS fleet (wind speed estimated from sea state) | Gil windsonic (if wind system used)  |
|  |  |  |
| Wind Direction | Anemometers not provided to UK VOS fleet (wind direction inferred from sea state) | Gill windsonic (if wind system used) |
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| **f.**  | **PMO ship visit activities: (if a visit is for dual purposes, include all purposes)** |
| **Activity** | **Manual Ship**  | **AWS****Ship** | **Comment** |
| Routine VOS inspections | 93 | 48\*\* | \*\*includes 17 inspections undertaken by Met Office technicians |
| VOS recruitment visits | 9\* |  | \*includes one replacement of a BATOS with an AMOS |
| VOS de-recruitment visits | 3 |  |  |
| VOS courtesy or foreign visits | 3 | 0 |  |
| *Total visits to VOS* | 156 |  |
| Routine ASAP inspections | 0 |  | UK involvement in ASAP activities is now integrated into E-ASAP. Inspections are only undertaken if so requested by the E-ASAP Programme Manager |
| ASAP recruitment visits | 0 |  |  |
| ASAP de-recruitment visits | 0 |  |  |
| ASAP courtesy visits | 0 |  |  |
| *Total visits to ASAP* | 0 |  |  |
| Routine SOOP visits | 0 |  |  |
| SOOP recruitment visits | 0 |  |  |
| SOOP de-recruitment visits | 0 |  |  |
| SOOP courtesy visits | 0 |  |  |
| *Total visits to SOOP* | 0 |  |  |
| Visits in support of DBCP (drifting buoys) | 5 |  | Arranged ships for deployment of 8 E-SURFMAR drifters in North Atlantic, 15 Met Office drifters in Atlantic tropical regions and the Southern Ocean and 4 barometer upgrade drifters for the GDP |
| Visits in support of Argo (profiling floats) |  |  | ARGO floats are usually shipped direct to research ships for subsequent deployment (PMO visits rarely required).ARGO floats rarely deployed from other VOS ships |
| *Total visits to other programs* |  |  |  |
| **Total visits by national PMOs** | 161\*\* | *Sum of all ship visits (VOS + ASAP + SOOP) + visits to other program (DBCP + Argo)* |
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| **g.** | **Major challenges and difficulties:** |
| * A continued lack of PMO resource has had a significant impact on the number of VOS inspections and consequently the availability/quantity of observations in 2016 (currently only one full time UK PMO). Failure to routinely visit recruited ships also has implications for the ongoing training of observing officers and for establishing links with key ship owners.
* Whilst the increased use of ships own email to send observations has many benefits, including cost savings, routine monitoring is required to ensure that emailed observations are not stored up on board prior to transmission, thereby preventing them from being received in time for our forecast models. Careful monitoring of our message switching systems is therefore needed to ensure that corrupt or incorrectly formatted observations are not rejected. Some ships are also changing their email settings on TurboWin, which can prevent the observations from automatically passing through our message switching systems. [Note- 170 UK VOS are now using ships own email systems to send their TurboWin observations]
* A large percentage of the UK VOS fleet is trading on a worldwide basis and as a consequence, is often difficult to ensure routine inspection of these ships without the assistance of overseas PMO’s. Each year there can be up to 100 ships in the UK fleet that we are unable to inspect for this reason. Muster check lists are emailed to these ships to determine the condition of their instruments and to request the download of TurboWin log files. Quality monitoring and performance feedback is also provided by PMO’s on a regular quarterly basis, whenever possible.
* At the end of 2016 a total of 50 manually reporting VOS were sending their observations using masked call signs (for a variety of commercial, legal and security reasons). Use of masked call signs complicates database access and data quality monitoring procedures.
* Coding/transmission problems arising from the use of Code 41 to send observations via Goonhilly Inmarsat Land Earth Station are monitored on an ongoing basis (for both UK and overseas VOS). The number of such problems has however decreased significantly due, in part, to the increasing use of email to send observations from manned VOS [Details of such problems are promulgated internationally via the JCOMMOPS mailing lists for non UK VOS focal points to take action as necessary].
* Met Office requirements for the security of data held on laptop computers has an impact on our ability to loan such computers to ships. Dedicated laptops computers continue to be gradually withdrawn from use, and we now only recruit ships that are willing to load the TurboWin software onto their own bridge computers.
* Whilst we have installed AMOS systems on 6 military ships (5 as of November 16) for security reasons we are unable to share their data on the GTS. This has necessitated the use of new bulletin headers to ensure that the data is not available to third parties. Whilst this has worked well, and ensures that we can receive their data in real time for our models, it makes it difficult to monitor the data quality. Furthermore due to security concerns these AMOS systems can sometimes be deactivated when the ships are engaged in sensitive operations
* Tracking down non active observing ships and recovering their equipment can be a time consuming task and some equipment has had to be written off when ships have gone to scrap without giving prior notice. Use of AIS movement information has helped with tracking some of these ships. However concentrating on a smaller number of major shipping companies and establishing closer links with these companies has helped with the recovery of equipment
* More than half the AMOS AWS systems fitted to UK VOS are solar powered (36/59). Consequently a large number of systems operating in northern waters are prone to failure in the winter months. As a consequence we are increasingly focussing our efforts on the installation of 24v systems using the ships power supply
* As the pressures of the Minamata Convention are upon us, we have begun putting protocols in place for the recovery and replacement of mercury. Suitable alternatives to mercury in glass, such as alcohol filled thermometers are in the process of being sourced. For most manned ships digital hand held devices might be the simplest alternative, although such systems are likely to be unsuitable for tankers and gas carriers that carry explosive cargoes where intrinsically safe equipment will be needed. Although final decisions have yet to be taken it is anticipated that a mixture of systems may be needed. For example a wifi system may be needed for cruise ships that don’t have bridge wings and where the screens are located remotely from the bridge. In addition intrinsically safe equipment may be needed for tankers and gas carriers. Consideration is also being given to the use of digital tiny tag temperature data loggers. A tender for the official replacement contract is due to go out in February 2017, hopefully being made available from July onwards.
* Manual transcription of observations from TurboWin to the Sat -C transmitters can often result in coding errors. Sometimes it is necessary to provide external floppy disk drives to allow data to be transferred. However GMDSS Sat-C equipment fitted to some new ships may not accommodate floppy disk drives, while others are now fitted with SD card ports. The increasing use of TurboWeb software will help overcome this problem on suitable ships
* Migration to use of BUFR templates for the UK VOS has presented a significant operational challenge during 2016. Although WMO ship coded data is being converted to BUFR format at the Met Office (from TAC), for international data exchange on the GTS we are not yet in a position to circulate the higher resolution BUFR data using the validated VOS BUFR templates yet.
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| **h.** | **Research / development / testing:** |
| * Developments of the new AMOS-2 shipborne AWS systems developed by the Met Office are continuing with trials beginning in early 2017. Use of the smaller Vaisala PTB 110 barometers will allow smaller enclosures to be used thereby simplifying the installation process. The software has been written directly by Campbell Scientific, which should reduce the number of bugs and coding errors experienced. A new simpler data format was introduced in 2013 and has now been rolled out across the entire AMOS network. Consideration is also being given to linking the AMOS data to a visual display on the bridge, via cable or wifi.
* The new WOW engine for the Met Office Weather Observations Website (WOW) <http://wow.metoffice.gov.uk/> is in place and it is planned that the next release will allow ships at sea to upload observations for display on the WOW website. This will allow amateur sailors such as yachtsmen to contribute to the crowd-sourcing of marine observations. Work is currently ongoing to develop requirements.
* Our AMOS system was granted a Provisional Production Licence at the end of 2015 and is now considered a Licensed Met Office Service/system. A Production Readiness Review will be initiated where the AMOS will be considered for a full licence. The system is now also being used on remote island systems and for use on certain open ocean moored buoys and wave gliders.
* At the request of the Hong Kong Observatory a trail AMOS system was placed on a Hong Kong VOS ship in 2013, for collaboration and evaluation purposes. Further systems are now being considered.
* Work on a new Met Office marine data gateway project is in hand to more efficiently handle and process the various incoming marine format messages from our buoys, ships, offshore rigs and AWS systems, and to deliver data to the GTS in higher resolution BUFR format. Other business priorities have put substantial delays on this work but it is hoped that significant developments will be made in 2017. It is anticipated that this work will, in due course, lead to a system for blocking poor quality data from manually reporting VOS.
* The Met Office continues to assist KNMI/E-SURFMAR with its ongoing efforts to enhance the TurboWin+ and TurboWin V5.5 logbook software. We will be rolling our V5.5 out to UK VOS as soon as our data systems can successfully handle the E-SURFMAR 101 data format generated by the software.
* Following a comprehensive tendering exercise we are now gradually rolling out higher quality Vaisala PTB 330 barometers to our manned VOS, to replace the ageing Precision Aneroid Barometers (PABs) that have been in for more than 60 years. So far 149 Vaisala PTB 330 barometers are in use on our manned VOS. In addition we are now rolling out Vaisala PTB110 barometers to all new AMOS AWS systems (23 so far).
* Each UK PMO now takes responsibility for routinely vetting the performance of a set number of shipping companies and ships. Monitoring and other feedback is emailed to each individual ship on a quarterly basis, and the activity of ships has increased as a consequence. We have also drawn on resource from other teams to carry out monitoring on behalf of the PMO’s.
* Visits to UK based shipping companies are now arranged on an annual basis. Comprehensive fleet performance reports are issued to each company to encourage increased shipowner/manager participation and involvement.
* All manually reporting UK VOS are requested to endeavour to return not less than 350 observations per year. Ships which fail to achieve this level are likely to be withdrawn from the fleet (or transferred to the new VOS support class).
* Investigations are being made into the use of alternative systems to replace mercury in glass thermometers. Although final decisions have yet to be taken it is anticipated that a mixture of systems may be needed. For example a wifi system may be needed for cruise ships that don’t have bridge wings and where the screens are located remotely from the bridge. In addition intrinsically safe equipment may be needed for tankers and gas carriers. Consideration is also being given to the use of digital tiny tag temperature data loggers. The official tender is due to be released in February 2017.
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| **i.** | **Other comments** |
| The goals and objectives for the UK voluntary fleet are also considered within the wider context of the EUMETNET Surface Marine Programme (E-SURFMAR) which aims to optimise the surface-marine observations from VOS, moored and drifting buoys. Closer cooperation and integration with other European VOS networks helps to reduce unnecessary duplication of effort, and permit objectives to be delivered in the most cost-efficient manner.* Drifting buoys are routinely deployed from UK observing ships on behalf of the E-SURFMAR Programme, and also for the UK DBCP contribution in the Southern Oceans. Ten barometer upgrade buoys have recently been purchased to contribute to the Global Drifter Programme.
* Research ships recruited to the UK VOS are also used for ARGO Float deployments and also for deep Argo float deployments
* In addition to the ship based systems listed in this report we also maintain automatic systems on 5 light vessels and 9 moored buoys (two operated jointly with Meteo France, two with the National Oceanography Centre, and one with the Plymouth Marine Laboratory).
* In addition to the VOS observation numbers in this report, the Met Office also had access to third party data from a further ~110 offshore platforms on the UK Continental shelf that host automatic weather stations – which amounted to more than 800000 hourly SHIP coded observations on the GTS in 2016. Because these automatic stations are not owned or operated by the Met Office, they have not been counted in the above observation figures. The volume of such data has increased significantly in recent years due to civil aviation authority guidelines for the availability of meteorological data for offshore helicopter operations.
 |