CGMS

CGMS-35, WMO-WP-28
Prepared by WMO
Agenda Item: I/3.2
Discussed in WG I

AUTOMATED SHIPBOARD AEROLOGICAL PROGRAMME (ASAP)

Implementation of the ASAP programme is coordinated through the ASAP Panel of the JCOMM Ship Observations Team (SOT). High quality radiosondes are needed in particular in the oceans. Radiosonde data are particularly needed for satellite products calibration.

The main developments in the last two years have come from the EUMETNET ASAP Project (E-ASAP), mainly in the North Atlantic. Contributions are also made by Japan and South Africa. While data quality is generally good and valuable for NWP centres, there is a high percentage of loss between the number of launches from the ships and the number of timely received messages on the GTS. E-ASAP is planning to improve the satellite communication by decoupling sounding and transmission systems, direct e-mail transmission to the responsible NMHS and forwarding to GTS.

It is thought that there are currently no ASAP ship programmes still using the IDCS for data transmissions. The usual practice for the transmission of upper air soundings from the ships under E-ASAP management is the transmission via Inmarsat-C. All units are equipped with their own transceiver and do not use the ships Inmarsat system. Trials to implement Globalstar as cheaper system have not proved satisfactory so far.

CGMS Members are invited to take note of the ASAP status and particularly to take note of the latest information concerning usage of the IDCS.

AUTOMATED SHIPBOARD AEROLOGICAL PROGRAMME (ASAP)

1. INTRODUCTION

Implementation of the ASAP programme is coordinated through the ASAP Panel of the JCOMM Ship Observations Team (SOT). At the fourth SOT session, Geneva, Switzerland, 16-21 April 2007, considering the efforts required to run the ASAP, the SOT agreed that it would be more effective if it would operate as a Task Team under the SOT. The proposal that the Task Team would eventually replace the ASAP Panel will be submitted to JCOMM-III in 2009.

A full ASAP status report is provided in the following sections for information purposes although CGMS WG I Members may wish to focus on the issues of satellite data telecommunication in section 5.

2. REQUIREMENTS

High quality radiosondes are needed in particular in the oceans. Observation of the tropospheric component of the atmosphere is needed for NWP, and radiosondes generally provide better high vertical resolution information than the aircraft data (AMDAR) over the oceans. Radiosonde data are particularly needed for the validation of satellite products. The need to establish new ASAP routes would inevitably be driven by numerical modelling centre requirements and the need to target areas that are considered sensitive for NWP. Such requirements will act as the driver for investing in future upper air sounding routes at sea, whether on a global or regional basis.

3. IMPLEMENTATION

The main developments in the last two years have come from the EUMETNET ASAP Project (E-ASAP) as it progressively aims to integrate the ASAP ships contributed by its participating members into a cooperative European programme. The E-ASAP model of integrating units on a regional basis in order to obtain economies of scale, and aiming to harmonize operations under a central management team, is perhaps one that could be considered in other areas of the globe where vertical profiles of the atmospheric structure are needed for regional short to medium-range Numerical Weather Prediction. Although the E-ASAP recruited ships primarily operate in the North Atlantic and Mediterranean, the programme nevertheless aims to contribute to the wider World Weather Watch by providing up to 10% of its soundings outside its direct area of interest (e.g., in the Southern Oceans). This is being achieved by upper air ascents performed by the German research ship ***FS Meteor***. In addition, the E-ASAP programme also funds radiosonde operations from the North Sea platform ***Ekofisk***, and contributes funding for consumables used by the Norwegian Ocean Weather Ship ***MIKE***.

Reducing the gap between the number of launches from the ships and the number of timely received messages on the GTS remains a key issue of the E-ASAP programme. Basically, the received data are of good quality and important for forecast models. However, the high loss rate of >20% results both in missing data at

the Met Services and higher operational costs. Reducing the loss rate is an issue of training the operators on board and improving the data transmission to the receiving Met Service (before transmitting to the GTS). E-ASAP is planning to (i) improve satellite communication by decoupling sounding and transmission systems, through direct e-mail transmission to the responsible NMHS and subsequent forwarding to GTS, (ii) support the International Polar Year (IPY) by providing additional soundings for the Greenland Flow Distortion experiment (GFDex) campaign, and further support, if requested, (iii) support the EURORISK by providing facilities for position tracking for targeted soundings, and (iv) assess options for high resolution BUFR data (upper-level temperature, humidity and wind report from a sea station (TEMP-SHIP) reports of ca. 2 KB versus edited 5sec BUFR reports of ca. 65 KB).

While the main concentration of the ASAP operations therefore continues to be over the Northern Atlantic, an important contribution is also made by Japanese research ships operating primarily in the North Western Pacific areas and seas adjacent to Japan (although the research ship ***Mirai*** also occasionally operates in the Atlantic and Indian Oceans). The number of soundings reported from the Japanese has also increased significantly since 2005 (from 582 in 2005 to 938 launches in 2006). The percentage of Japanese reports getting onto the GTS continues to be generally high when compared to that of E-ASAP ships. Whilst a total of 4238 sounding messages from E-ASAP ships were inserted on the GTS in 2005, the loss rate (due to loss of sonde at launch, operator error or transmission problems) continued at unacceptably high levels. As a consequence, the initial objectives of the E-ASAP programme have had to be readjusted to more realistic levels.

Soundings were also started by the South African research ship ***SA Agulhas***. Although operations were temporarily interrupted by theft of the sounding equipment from this ship, it is understood that they will resume in the near future. Research ships operated by other countries may also be performing occasional soundings for particular projects outside of the ASAP scope.

The WRAP (World Re-occurring ASAP Programme – i.e. ASAP operating on round-the-world merchant vessels in the Southern Hemisphere) was officially terminated in April 2005 because of the difficulties in maintaining a viable and cost effective service. The project had provided good quality upper-air data over a period of almost four years and had required close collaboration between the National Met Services involved (i.e., the Australian Bureau of Meteorology, the United Kingdom Met Office and NOAA). If the project were to be resurrected then it would be essential to establish ongoing financial commitments from a greater number of participants at the outset.

The overall number of ASAP reports received at ECMWF showed a positive trend since 2005. However the percentage of ASAP soundings reaching 100 hPa has dropped in 2006 to figures between 85 and 90% compared to values between 90 and 95% in 2005.

4. ASAP SHIP RECRUITEMENT

Recruitment of a merchant ship to host a new ASAP unit requires significant financial and human resources. Following recruitment, the ongoing cost of ASAP consumables (helium, radiosondes and balloons) and of ASAP data transmission is

extremely high when compared to the cost of surface marine observing networks. Specialist technical skills are also needed to maintain the ASAP system when in service, and to ensure the quality of the upper air data.

There have been some major mergers between the shipping companies used for hosting ASAP systems. Although this has resulted in significant changes to the trading patterns of many of the container ships involved; it has, fortunately, not greatly affected the ships that host ASAP units.

At the fourth SOT session, the ASAP Panel agreed that it would be useful to investigate the development of the programme in the North Pacific and the Indian Ocean. However, it was noted that it was difficult to recruit ships, especially in the Indian Ocean.

5. SATELLITE DATA TELECOMMUNICATION

5.1 Use of IDCS by ASAP ships

Current information suggests that no ASAP ship programmes remain as users of the International Data Collection System (IDCS). This has recently been confirmed for transmissions via Meteosat although it does still need verification for other geostationary satellites that form part of the global system. If this is confirmed then it would imply that any remaining IDCS channel allocations for ASAP ship programmes might in the future be considered for re-allocation to other uses.

5.2 Other satellite data telecommunication issues

The usual practice for the transmission of upper air soundings from ships under E-ASAP management is transmission via Inmarsat-C. All units are equipped with their own transceiver and do not use the ships Inmarsat system. Trials to implement Globalstar as a cheaper system have not proved satisfactory because the communication procedures differ between the East and West Atlantic. Further, the coverage of Globalstar is not 100% in the relevant area. Basically, Globalstar is still an option in combination with Inmarsat-C as a backup system, but further tests have been postponed.

Inmarsat-C is a very reliable sat com system. Nonetheless, there are only two geostationary satellites, which can be used in the EUCOS area over the North Atlantic and Mediterranean. This requires an optimum position of the antenna to ensure proper communication with the satellite. Interference with ships' communication systems must be avoided. Therefore, most antennas are mounted on or near the launcher. On several ships, the antenna is relocated from starboard to portside, depending on the east- or westward crossing.

The data messages are transmitted using Special Access Code 41. In Europe only the UK Met Office and Météo France accept TEMP messages using code 41. Therefore, only the Land Earth Stations (LES) Goonhilly and Aussaguel can be used. The processing steps are different at the Met Office and at Météo France, but both rely on telex lines for the transmission from the LES to the Met Service. To avoid problems (e.g. due to different headers) Goonhilly (LES 002 AOR-W and LES 102 AOR-E) was chosen as the default station for all E-ASAP units.

The transfer of Goonhilly Inmarsat-C LES operations to Burum LES in November 2006 had a major impact on E-ASAP data transmission, resulting initially in the loss of data and subsequently to major timeliness problems. The issue was discussed between the E-ASAP management and KNMI regarding transmissions to Burum. Since E-ASAP and ASAP operating countries pay all transmissions, KNMI is open to implementing modern communication procedures to accept TEMP messages from ships and to insert them onto the GTS.

The cost of upper air TEMP code data transmission via Inmarsat is a limiting factor for the ASAP Programme, and transmission of ASAP data in BUFR might have data telecommunications cost implications.

The capital costs involved in establishing an ASAP unit, and the ongoing costs of consumables, are extremely high when compared to other marine observing networks and are difficult to justify, especially given the high radiosonde failure rates. Although ASAP data has been shown to be of comparable quality to that from land radiosonde stations, increased satellite and AMDAR data over oceans will also place a question mark over future plans to enhance the ASAP operations. Whilst more targeted observations in sensitive areas where storms are originating should be encouraged, this is always likely to be hampered by the variable nature of shipping movements.

The cost of upper air TEMP code data transmission via Inmarsat is extremely high compared to a standard SHIP code transmission from VOS (often amounting to over €450/month/ship). The National Meteorological Services (NMSs) that host the LES to which the data is transmitted traditionally pay these costs. In Europe, this data is primarily sent to Goonhilly LES; and accordingly the United Kingdom Met Office is faced with an annual cost in the order of €30,000/year. To alleviate this cost burden, an agreement was reached within the EUCOS that the Met Office should be reimbursed for cost incurred by E-ASAP operators. This system has operated well to date, but will need to be reconsidered in the light of the recent Goonhilly problems. In addition, the E-ASAP has been testing the use of Globalstar and an alternative to Inmarsat communications, as a means of reducing transmission costs.

At its fourth session, the SOT agreed that the ASAP nevertheless continue to be an important component of the World Weather Watch, and it is hoped that other countries can be persuaded to initiate, or resume, their ASAP activities.

6. DATA TRANSMISSION IN BUFR

The transition from TEMP to BUFR is an ongoing issue at the WMO. Its urpose is to have high-resolution data. TEMP files are of approximately 2-3 KByte and cost approximately 8-10 € per transmission (including confirmation) via Inmarsat-C. Therefore, high-resolution BUFR data would be extremely expensive to transmit. As long as there is no agreed template for ASAP radiosounding data of practicable file size the ASAP units should continue to transmit TEMP files. These files can be decoded to BUFR at the receiving Met Service and transmitted to the GTS in BUFR format. Further benefit of alphanumeric files is the option to transmit the data manually by e-mail, if required.

BUFR code templates to match the vertical frequency of the alphanumeric TEMP code have been developed within the WMO, and progress is being made on another template to facilitate the collection of high-resolution data in real-time within the EUCOS. However, the costs involved in transmitting BUFR data via satellite is a determining factor in deciding the level of data (and metadata) that can be sent. Furthermore, manufacturers of sounding equipment will need to ensure that their systems can accept the high-resolution BUFR template.

7. CONCLUSIONS

CGMS Members are invited to take note of the ASAP status and particularly to take note of the latest information concerning usage of the IDCS.