

# Weather observations

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The German Meteorological Service coordinates an international programme for weather balloon observations on board merchant ships. E-ASAP (Eumetnet – Automated Shipboard Aerological Programme) is a joint programme of 26 European meteorological services. Currently, 18 ships from different shipping companies participate and deliver around 5000 balloon observations per year.

In this article, Rudolf Krockauer outlines the way the programme works – and suggests *Seaways* readers and shipping companies may like to join in.

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**Y**ou don't need to tell a mariner how important weather forecasts are. So it is not surprising that a willingness to take weather observations on board is generally very high on most ships.

Every day, hundreds of weather reports are despatched from ships to different international meteorological services. From there, they are relayed to the GTS (Global Telecommunication System) and are then available worldwide for weather forecasts. These voluntary observations make a very valuable addition to the land-based meteorological observation networks. However, they can reflect only the situation on the earth's, or ocean's, surface.

Vertical profiles of the troposphere (upper air soundings) are of great importance for the quality of weather forecasts. On land, most of the meteorological services operate a network of aerological (vertical) stations. These stations launch weather balloons fitted with so-called radiosondes every day. (A radiosonde is a unit for use in weather balloons that measures various atmospheric parameters and transmits them to a fixed receiver.) Ascending to a height of over 25km, these balloons report the most important meteorological parameters (atmospheric pressure, temperature, humidity and wind velocity). This makes it possible to compute three-dimensional forecasting models.

## Objective

Apart from a few islands, the aerological stations are largely confined to the continents. Only a few meteorological services operate stations on board ships. Acting for Eumetnet since 2003 a network of 26 European meteorological services, the German Meteorological Service (DWD) has coordinated a fleet of 18 ships that participate in observations under the E-ASAP (Eumetnet – Automated Shipboard Aerological Programme) and regularly launch weather balloons in the North Atlantic and Mediterranean Sea.

E-ASAP is the only observation programme of its kind in the world, in which balloons are routinely launched from merchant ships. In total, these ships launch around 5,000 balloons per year. This is possible only thanks to the dedicated participation of the seafarers who carry out these soundings. Around 80 per cent of all ship-based soundings worldwide are performed under the E-ASAP. Other programmes rely on government ships, such as research ships.

Studies show that the E-ASAP soundings have a significant influence on the quality of weather forecasts for the North Atlantic and Europe. The European Centre for Medium-Range Weather Forecasts (ECMWF) in Reading (UK) also confirms the high quality of the soundings.

## Technology

An E-ASAP station consists of the following main components:

- The balloon launcher (pneumatic or manual) and
- The electronics to receive the data and automatically forward it to the meteorological service.

A well-chosen site on board for the launcher is important to allow unobstructed launching of balloons. In most cases, balloons fly off over the stern because the ship is moving forward at around 15-20 knots. However, occasionally balloons do get caught up in the superstructure or arials and then burst. In this case the sonde device is lost. Turbulence behind the superstructure can also cause problems, forcing balloons downwards from their launch height to the surface of the water.

In some stations, the launcher and electronic systems are integrated in a

modified standard 10ft container. With both heating and air conditioning, this offers comfortable working conditions for filling and launching balloons in any weather. Power is obtained from the ship's electrical system. However, the built-in equipment (air conditioning, compressor and pneumatics, for example) does result in increased maintenance costs.

On many ships it is difficult to find a suitable site for the container. Sometimes special frameworks have to be fixed on to the ship. For that reason, there is the alternative of installing the electronic equipment on the bridge, for example, and launching the balloons from smaller manual launchers. These are lighter, require no power supply or cable connections, and are far less prone to ship-induced vibrations.

The electronics comprise the receiver to receive the data from the radiosonde, a laptop to process the data and a transceiver for the satellite transmission. As little space is needed, it is possible to install the electronics on the bridge. Only the laying of cables for the arials (GPS, telemetry and satellite communications) requires some effort.

## Operation

Usually two to three launches a day are undertaken at sea at a distance of 75 nautical miles from the mainland. The launches are carried out by the ship's crew. About 20 minutes' effort is involved in preparing the sonde, filling the balloon with helium and launching it. Once the balloon is in the air, the rest (measuring and satellite transmission) follows, fully automatically.

For the data processing of the meteorological services, it is important that the soundings take place at fixed synoptic times. The most important synoptic times are 00, 06, 12 and 18 UTC. This ensures that soundings are carried out at the same times globally. Balloons are usually launched about 60-90 minutes before the respective synoptic deadline.

Even if the operator on board doesn't realise it, the data is urgently awaited not only at the German Meteorological Service but in many countries on both sides of the North Atlantic. Unless the soundings are available within 90 minutes after the synoptic deadline, they are worth only half



▲ Container launching: 10ft container launcher on board the *Melfi Italia II*



▲ Helium loading: preparing helium bank for weather balloon operations



▲ Deck launching a weather balloon

as much for computation of the models.

The success of E-ASAP is largely dependent on the willingness of the operators on board ship. The German Meteorological Service pays seafarers an allowance for their services, and makes regular maintenance visits on board at suitable times in the ship's voyage schedule. On this occasion, any unresolved queries are answered and new operators are familiarised with the equipment. The same applies for stations supported by the French, Danish, British, Spanish and Icelandic meteorological services, which likewise are part of the E-ASAP fleet.

## Outlook

Owing to the high cost of operating weather balloons, stations on the mainland will be reduced and replaced by measurements from starting and landing scheduled aircraft. Such possibilities do not exist at sea. Therefore, in spite of weather satellites, there will still be an ongoing need for E-ASAP soundings.

Unfortunately, time and again, dependable E-ASAP ships find they can no longer participate. This may be because the ship has been sold or relocated to another maritime area. In such instances, the station must be removed from the vessel and a suitable replacement ship found as quickly as possible.

For the European E-ASAP programme, the following prerequisites must be fulfilled:

- The ship should operate predominantly in the North Atlantic and/or Mediterranean Sea.
- There must be a suitable place on board to site the station.
- In return for an allowance, the operator must be willing to launch weather balloons regularly and at fixed times.

## Thanks for help

We would like to give special thanks to the following shipping companies who, through their cooperation with E-ASAP, make a valuable contribution to improving the weather forecasts: Atlantic Container Line, Hapag-Lloyd, CMA CGM, Royal Arctic Line, Maersk, Hornlinie, Thien & Heyenga, Eimskip and Briese.

Since there will always be changes to the E-ASAP fleet at some time in the future, we would also be pleased to hear from any shipping companies, ship managers and ships' crews who may be interested.

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