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The Marine Observer

A quarterly journal of Maritime Meteorology

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A Quarterly Journal of Maritime Meteorology
prepared by the Marine Division of the
Meteorological Office

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VOL. XLVII **No. 255** **JANUARY 1977**

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Editorial

As another year passes and the time comes round to sit down and summon one's thoughts regarding the writing of this Editorial the events of the past twelve months are called to mind. It is often said of the past that only the more-pleasant events are retained in the mind—'no ship like the last ship, no voyage like the last voyage'—but perhaps the events of 1976 are too close and have not had time to settle into perspective and the impact of a modern news media, too heavily canted towards disasters and strife, is still too fresh. Since, however, the New Year is a time of festivity, let us put aside thoughts of strikes, disasters, inflation and other similar bad news and recall only that which has been of benefit to mankind.

For those of us fortunate enough to have been in England during the long, hot summer this perhaps has been the outstanding event of the year, but this has been overshadowed by the resultant drought and all that implies. Those of us with a sporting inclination will remember the Olympic Games in Montreal—happily free of the horrors which occurred at Munich—but would wish to erase memories of the England cricketers' disastrous Test series against the West Indians. In terms of achievement the first commercial flights of Concorde will perhaps be outstanding to some, but even Concorde has its adversaries who look upon it with disfavour. Indeed it seems difficult to find any event which has been to the benefit of all mankind with no detriment to some.

Perhaps it is necessary to look beyond our own planet, out into space to find that for which we are searching. Here an incident occurred which was almost lost in the shadow of the bright limelight cast over the Olympics, the American Bi-centenary, the Test Matches and Concorde. This was of course the landing of the American Viking spacecraft on Mars in July.

Many people, whilst agreeing that this is an outstanding achievement of modern technology, would question what possible benefit to mankind could accrue from this space exploration. Some go further and with possibly some justification, in questioning whether the spending of vast sums of money required for such is morally acceptable when so many of the world's population are ill-housed and undernourished. No doubt the same was said about the momentous voyages of discovery of the 15th and 16th centuries. Such people may be somewhat surprised to learn that compared to the gross national product of Spain, England or France in the 16th century, the relative costs of such explorations as the Viking project are now much cheaper.

Other parallels between the momentous voyages of Magellan, Columbus and Cabot and the Viking project can be drawn. The exploratory space vehicles of the present day are unmanned, infinitely-complex machines but the lengths of the voyages are similar. The explorations of the Renaissance occurred after a long period of relative stagnation. Europe had become insular and introspective. The great voyages of discovery to the New World and the Pacific opened up new vistas, broadened possibilities and increased enlightenment. Similar circumstances to those which prevailed in Europe in the 16th century apply today. The world has been almost completely explored and is rapidly becoming uniform in thought and technology. We now have the chance to expand our knowledge by the exploration of our neighbouring planets and the opportunity to study the meteorology of other worlds. In doing so, we shall gain further understanding of our own. Meteorology is a global science; in our future study of it we may consider experiments which, on Earth, may be neither safe nor prudent. Mars has many similarities to Earth for both are planets where wind and water have exercised their influence on the topography. Should Mars prove to be lifeless, it may be a safe place in which to conduct meteorological experiments. The Viking voyage of exploration to Mars may prove of equal importance to the voyage of Christopher Columbus in 1492.

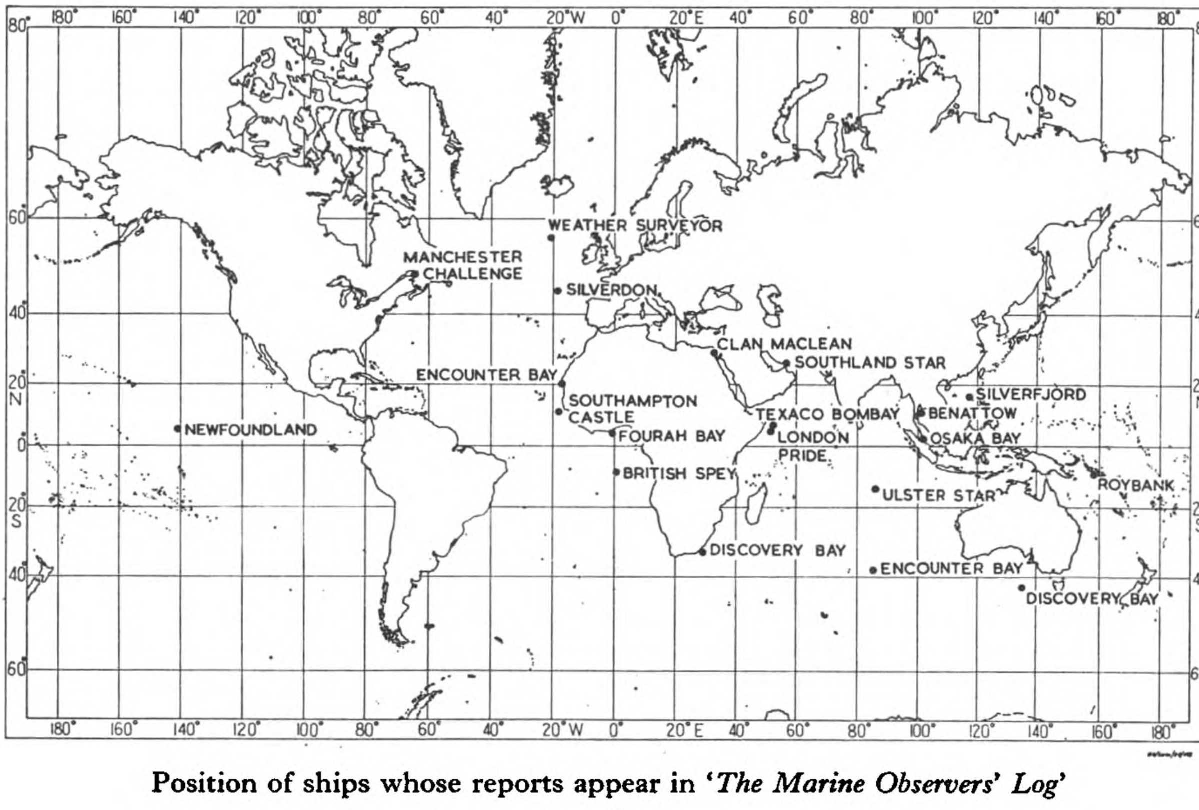
Coming back to earth, both literally and metaphorically, at the time of writing the staff of the Marine Division of the Meteorological Office are preparing for the seventh session of the Commission for Marine Meteorology (CMM) to be held in Geneva just before Christmas. International co-operation is essential for the collection and exchange of observations and the issue of meteorological information not only for shipping but for all other purposes. This is fostered by the World Meteorological Organization (WMO) which is responsible for establishing international standards and procedures and also for preparing the codes and specifications which are the international language of meteorology. The World Meteorological Organization is sub-divided into Regional Associations which study the problems of particular areas, and into Technical Commissions which are concerned with particular aspects of meteorology. The Commission for Marine Meteorology is one of the latter divisions and delegates from maritime states all over the world will be gathering at Geneva to develop further the Marine Meteorological Services System which provides marine meteorological and other related geophysical information for all shipping routes, fishing areas and other aspects of marine activity. Early in 1976 the Marine Division sent out questionnaires to the various shipping and fishing organizations throughout the UK requesting views and suggestions regarding the marine services rendered not only by the British Meteorological Office but also by foreign meteorological authorities. In conjunction with this the Port Meteorological Officers have been handing out similar questionnaires to ships they have boarded in the course of their duties. A large number of completed questionnaires have now been received by the Meteorological Office and the Marine Division would like to take this opportunity to express its gratitude to all those who have contributed their views and comments. These are now being correlated and it may well be that some of the points raised by the organizations and individual ships which are of international concern will be raised at the CMM conference. Other comments of direct concern to the British Meteorological Office will be studied, evaluated and the necessary action taken.

Among the items placed upon the agenda for the conference at Geneva will be that of ship routeing. The opinion is often expressed that as technological progress is made, the degree of dependence of the population and of marine activities on meteorological conditions decreases. A consideration of the economic losses and damage still incurred due to meteorological phenomena disprove this point of view. It has been estimated that loss of time incurred by merchant ships due to gales and rough seas, and by other ships due to various meteorological and oceanographic causes at seaports and their approaches, exceeds 15 per cent of the total budget of the operational time of the fleet. However, there is a considerable potential for greatly reducing damage and losses of money and time which are caused by unfavourable weather conditions. This potential can be realized by improving meteorological services and by the users making proper use of the available material. Elsewhere in this journal will be found an article on the Ship Routeing Service provided by the Meteorological Office at Bracknell.

The agenda will also include a review of the present state of the art of observational techniques and the further development of uniform observational methods and instruments, new requirements for marine data reporting codes and future requirements for marine telecommunications. Regarding the latter, telecommunications from ship to shore have always been a rather weak link in the rapid acquisition of marine meteorological data by the meteorological services throughout the world. This in no sense negates the valuable voluntary work done by the radio officers on board observing ships. The problems arise over the fact that more and more ships carry only one radio officer, and have been further aggravated by the new watch-keeping hours imposed on them in January 1976. Even though observations can be transmitted up to four hours late in most parts of the world and up to twelve hours late in the eastern North Atlantic, the Arctic and Southern Oceans, and such observations are of value to the forecasters, they can never be as good as the observation which is received by a meteorological service immediately after being made.

The New Year sees the return to service of the Ocean Weather Ships *Weather Adviser* and *Weather Monitor* after spending some six months undergoing refit at Manchester. These ships were built in 1944 as 'Castle'-class frigates for the Royal Navy. During 1958–60 they were converted to weather ships and until about eighteen months ago provided a very satisfactory service. In July 1975 the UK ceased to operate weather ships on stations 'India' and 'Juliett' and commenced operating on station 'Lima', this reduced the UK requirement for weather ships from four to two vessels and thus afforded the opportunity to refurbish *Weather Adviser* and *Weather Monitor*. It is customary in this Editorial to extend seasonal greetings to our readers; in addition to the *Weather Adviser* and *Weather Monitor* we wish all at sea fair-weather sailing in 1977 and our best wishes to all, whether afloat or ashore.

C. R. D.



Position of ships whose reports appear in '*The Marine Observers' Log*'

January, February, March

The Marine Observers' Log is a quarterly selection of observations of interest and value. The observations are derived from the logbooks of marine observers and from individual manuscripts. Responsibility for each observation rests with the contributor.

Observing officers are reminded that preserved samples of discoloured water, luminescent water, etc. considerably enhance the value of such an observation. Port Meteorological Officers in the U.K. will supply bottles, preservative and instructions on request.

SEVERE DEPRESSION

North Atlantic Ocean

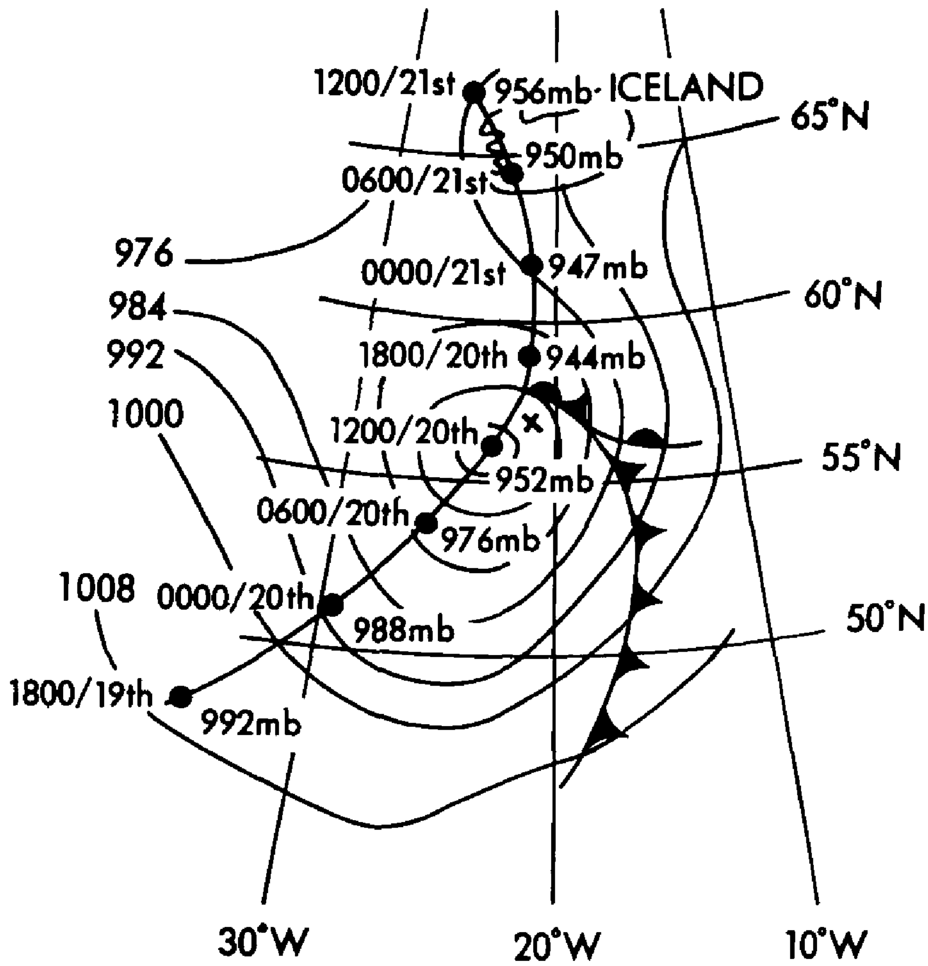
O.W.S. *Weather Surveyor*. Captain P. E. Robertson. Observers, Mr H. J. Freckleton and Mr M. Hatch, Meteorologists.

20 March 1976. At 0600 GMT the weather chart had shown a small deepening depression centred to SW of station, it was expected to move NE and turn N later.

The *Weather Surveyor* was keeping station in position 56° 58′N, 20° 58′W. During the afternoon of the 20th the vessel was lying stopped in a strong to gale SE'ly wind with a heavy swell from E and SE. From 1510 onwards, rapid moderation of the wind occurred and small breaks in the cloud cover appeared.

At the time of the 1600 observation, visibility was 8 n. mile and there were 7 oktas of strong convective cloud in all sectors, with a small clear area above the vessel. At 1630 the atmosphere appeared somewhat heavy, there was no wind and the vessel was rolling heavily in 'mixed' seas with a heavy southerly swell with a heavy easterly interposed. The pressure reached its lowest level—949·6 mb—at this time.

By 1640 the wind had become light NW'ly but then increased rapidly to severe gale force 9 by the time of the 1715 pilot balloon ascent. Within the next hour the visibility was reduced to 45 metres in hail and blowing spray. During the next three violent hours, mean winds in excess of 70 knots were measured with gusts exceeding the limit of the wind-indicator scale (90 knots), one gust was estimated to be 95 knots. From 2100 onwards a moderation set in with a decrease in wind speed to gale force 8 to severe gale 9 with occasional gusts to storm force 10.



Synoptic situation at
1200, 20 March 1976
●—● Track of depression
× OWS 'Lima'
All times GMT.

The following are extracts from the Meteorological Log:

GMT
1200: Wind 170°T at 38 knots, pressure 965·6 mb.
1400: Wind 120°T at 34 knots, pressure 958·4 mb.
1530: Wind 130°T at 12 knots.
1630: Wind calm.
1640: Wind 310°T at 5 knots.
1700: Wind 260°T at 15 knots, pressure 950·9 mb.
1710: Wind 280°T at 40 knots.
1730: Gust 81 knots.
1800: Wind 260°T at 66 knots, pressure 956·6 mb.
1822: Gust 90 knots.
1900: Wind 290°T at 70 knots, pressure 965·3 mb.
1928: Gust 95 knots (estimated).
2000: Wind 290°T at 72 knots, pressure 973·3 mb.
2100: Wind 280°T at 48 knots, pressure 978·2 mb.
2300: Wind 270°T at 38 knots, pressure 984·7 mb.

'Lima', new as an Ocean Weather Station, had been sited almost dead centre in the path of the first depression of what was the first vernal equinox on which it had been manned.

Position of ship: 56° 58′N, 20° 58′W.

Note. O.W.S. *Weather Surveyor* was affected by a severe depression which originated on the 19th March as a shallow wave depression over mid-Atlantic. Its rapid development is shown in the accompanying synoptic situation at 1200 on the 20th, by which time its central pressure had fallen to 952 mb. As is evident from the log extracts, the still-deepening depression crossed station 'Lima' during that afternoon and reached its maximum intensity in the early evening.

SEA-TEMPERATURE FLUCTUATIONS

South African Waters

S.S. *Discovery Bay*. Captain L. E. Howell. Fremantle to Fos-Sur-Mer. Observers, the Master, Mr N. H. Lampe, 1st Officer and Mr Bouch, 2nd Officer.

31 January 1976. As the vessel approached the coast at an oblique angle, the sea-temperature rose slowly to 24°C and the vessel experienced the strong WSW set approaching the 100 fathom line. This line was crossed at 1440 GMT and the following observations were made:

GMT
1440: Sea temp. 24°C, air temp. 26·0, wet bulb 23·5.
1500: In position 15 n. mile south of Great Fish Point and about 5 n. mile landward of the 100 fathom line, sea temp. 16·0 (fall of 8 deg C in 20 minutes).
1515: Sea temp. 15·0.
1530: Sea temp. 14·0. Air temp. 22, wet bulb 19·5.
1545: Sea temp. 13·2.
1600: Sea temp. 14·0.
1630: Sea temp. 15·0.
1700: Sea temp. 17·0.
1800: Sea temp. 17·0 Vessel now off Port Elizabeth.

Position of ship at 1200: 33° 30′S, 28° 30′E.

Note. A wind of force 5 or 6 from ENE had been blowing for some time and would be expected to induce a surface drift to SW from the coast towards the Aghulas current. Upwelling resulting from this divergence from the coast seems the most probable explanation for such low sea-temperatures and for the remarkable steepness of the temperature gradient.

COLLISION WITH WHALE

North Atlantic Ocean

S.S. *Encounter Bay*. Captain K. E. Howard. Tilbury to Fremantle. Observers, the Master, Mr B. V. Chipperfield, 1st Officer and Mr P. J. Sizer, 3rd Officer.

15 February 1976. At 2014 GMT the vessel collided with a whale. The vibration increased to a very high level and the ship's wake doubled in size.

The whale became impaled on the stem with about six metres of its length on either bow and at a depth of about three metres. After stopping and going astern on the engines, the carcase floated clear, breaking into two parts as it floated off.

In the darkness it was not possible to identify the whale type or to photograph the carcase, but in the light of an Aldis lamp, the following details were observed by the 1st Officer:

The overall length was approximately 12 metres.
The back was speckled brown and white becoming grey all over towards the tail.
There appeared to be a hump about the middle of the back.
The underside was all white.
It had a very large fluked tail.

The ship was carrying 40 dogs of various breeds in the forecastle and at a distance of 8 metres diagonally from the point of impact with the whale.

At the time of impact, Mr and Mrs West, the ship's dog-handlers, were in the process of bedding down the dogs for the night. They stated that the impact with the whale was felt as a jolt which momentarily staggered them and their charges who were, at the time, standing up. They added that within seconds of the jolt being felt the dogs reacted in one of three ways:

1. They barked loudly, excitedly and agitatedly.
2. They whined loudly or whimpered.
3. They just stood in silent apprehension.

This behaviour lasted for only a very short time. It seemed that the older and more-intelligent breeds of dog were the more excited, in particular two highly-intelligent sheep dogs, while the younger dogs and those of lesser intelligence whined, whimpered or just stood there in silent apprehension.

The Master wonders if the behaviour of the dogs was mere reaction to the sudden jolt or reaction to the admitted temporary show of fear by the dog-handlers. Was it possible that the 'explosion' of odour, which must have occurred when the whale was rammed, could within seconds have been sensed by the dogs, or did the dogs instinctively sense or hear the anguished cries of the dying mammal only a very short distance away from them, cries which were inaudible to the human ear, but not to that of canines?

Meanwhile, the 3rd Officer, who has experienced whale-ramming twice now within the last two years (*Botany Bay*, 1974), wonders if the whales are being confused by the underwater noises of high-speed engines coupled with echo-sounder noises and surface radar pulses to the extent that they fail to take avoiding action. It would seem unlikely that these huge mammals could sleep undisturbedly through the underwater noises of an approaching high-velocity ship.

Finally the Master also wonders if we aren't all wondering too much in our efforts to earn a barograph!

Position of ship: 19° 02′N, 17° 52′W.

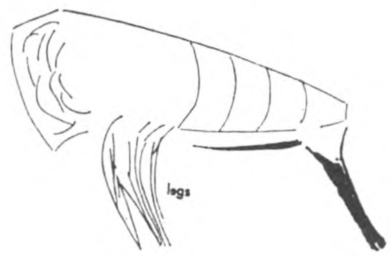
MARINE LIFE

Southern North Atlantic

m.v. *Southampton Castle*. Captain C. D. Hedges. Southampton to Ascension Island. Observer, Mr D. J. Mercer, 2nd Officer.

11 February 1976. On obtaining a bucket of sea water in order to determine the temperature, it was noted that the water contained a number of insects varying in type and size, and in colour from a light brown to a translucent blue. They swam about in the water in short, sharp spiral or circular movements. The largest of the insects was approximately 2½ mm in length and possessed an irritating sting.

The bucket contained 30 of the insects, some were so small, however, that it was not possible to ascertain whether they were all similar to the sample in the sketch. The sketch is lacking somewhat in detail but the insect's approximate shape can be seen.



Position of ship: 11° 20′N, 17° 50′W.

Note. Dr Roger J. Lincoln, Department of Zoology, British Museum (Natural History), comments:

'Unfortunately I cannot give you a precise determination of the small planktonic "insects", but will narrow the field of possibility. The organisms were not insects, but were most likely small planktonic crustaceans, either amphipods, isopods or copepods, and did not possess a sting but may have caused irritation by biting, unless the irritation was caused by some other organism in the water sample. Beyond this it is difficult to say. The small sketch suggests a copepod which also fits with the very small size of the animals, but they do not bite. On the other hand some small isopods and amphipods do bite but are not much like the sketch and are usually much larger than 2½ mm. This is as near as I can get to a solution.'

BIRDS

North Atlantic Ocean

m.v. *Silverdon.* Captain A. Walker. Rotterdam to Key West (USA). Observers, Mr A. Tester, Chief Officer, Mr P. Collings, 2nd Officer, Mr B. Roberts, 3rd Officer and Mr T. O'Keefe, Cadet.

28 March 1976. At 1200 GMT when the vessel was about 350 n. mile WNW of Cape Finisterre, two land-birds were observed flying around the vessel and eventually they landed on deck. One bird was an owl, see sketch, and the other was a type of hawk.

The hawk stayed on board for two days and was not seen to leave.

The owl was estimated to be 25 cm from head to tip of tail, its back was a beautiful light and dark brown with fawn patches. The frontal plumage was fawn-coloured and it had short dark-brown ears and a long tail. The hawk was smaller in size, it was dark brown in colour and its wing-span was estimated to be 45 cm.

The owl was observed to circle the ship four or five times each morning, it would then spend the rest of the day perched on the deck cranes. It stayed with us for five days, leaving when the ship was 480 n. mile ENE of Bermuda. At no time during its stay did it display nocturnal habits.

Position of ship at 1200 on 28th: 45° 24′N, 18° 30′W.

Note. Captain G. S. Tuck, Chairman of the Royal Naval Birdwatching Society, comments: 'This is the short-eared owl, it has quite frequently been reported far out to sea.'

Malacca Strait

s.s. *Osaka Bay.* Captain R. Moore. Kobe to Singapore. Observers, the Master and ship's company.

30 March 1976. Shortly after dawn a large bird, white with orange bill and black legs and feet, and approximately 45 cm in length, landed on deck. It stayed there for 15 minutes then circled the vessel for nearly an hour.

A variety of birds were seen about the ship with no obvious reason for their being away from land.

One gaudy little fellow—all the colours of the rainbow—committed suicide by flying into a bulkhead, a bird of ill-omen for the engine had to be stopped shortly afterwards.

Position of ship at 2330 GMT: 3° 05′N, 101° 40′E.

Note. Captain Tuck comments:
'The large bird was a Plumed Egret, *Egretta intermedia*, a migrant to Malaysia.'

South China Sea

m.v. *Silverfjord.* Captain R. Sidney. Nagoya (Japan) to Jeddah (Saudi Arabia). Observers, the Master and Mr S. L. Bishop, 3rd Officer.

28 March 1976. At 0200 GMT four small birds were seen to land on the vessel. They closely resembled house sparrows in shape, size and habits, only their markings and colourings were different.

Each bird had a reddish-brown 'cap', and face and throat were black with two small white patches on either side of the neck. The underside was a uniform grey and the tail and centre of the back were fawn in colour. The wings and back of the birds' heads were the same colour as the tail with dark-brown and cream lines running irregularly through them.

It was not possible to get close to the birds as they moved away when approached.

They spent most of their time on the deck apparently feeding, although it was over a year since the vessel last carried an edible cargo.

At the time the birds landed on the vessel the nearest land was San Fernando, Luzon, 150 n. mile to the east.

The birds remained on board for several days and their 'singing', which again was similar to that of a house sparrow, was regularly heard.

Position of ship: 16° 53′N, 117° 38′E.

Note. Captain Tuck comments:
'Land-bird identifications in remote parts of the world are much more difficult to assess. These birds are probably Java sparrows, *Padda oryzivora*.'

Gulf of Suez

m.v. *Clan Maclean.* Captain A. G. Cruickshank. At anchor, Suez Bay. Observers, the Master and ship's company.

29 March 1976. For the last day and night a very distinctive and colourful bird has been seen around the vessel, and has been identified as a Hoopoe.

It measures approximately 25 cm in length and has a wing-span of approximately 30 cm. It appears to be well fed and is not afraid of humans as it has been around inspecting members of the crew who were painting the decks. While we were 'taking noon sights' it flew to within 120 cm of the bridge wing to have a look at us.

Position of ship during period: 29° 58′N, 32° 31′E.

Note. Captain Tuck comments:

'This is the Hoopoe, *Upupa epops.* In this area Hoopoes frequently come aboard on migration.'

Indian Ocean

m.v. *Ulster Star.* Captain J. R. Howorth. Port Taufiq (Egypt) to Melbourne. Observers, the Master, Mrs J. R. Howorth and Mr S. G. Willis, 2nd Officer.

9 February 1976. Between 0930 and 0940 GMT a flock of approximately 70 large sea-birds were seen to be fishing about 185 metres from the vessel. They were too far off for positive identification, but in plumage, shape and size, they closely resembled the Pale-footed Shearwater, *Puffinus carneipes*, as described in our book on birds.

At the time of the observation the vessel was about 900 n. mile SE of the Chagos Archipelago and about 670 n. mile WSW of Cocos Is.

Weather conditions at the time: wind SE'E, force 2, air temp. 27·0°C, sea temp. 27·6.

Position of ship: 14° 08′S, 86° 10′E.

Note. Captain Tuck comments:

'This species breeds off the west coast of South Australia and migrates to and from the Arabian Sea outside the breeding season.'

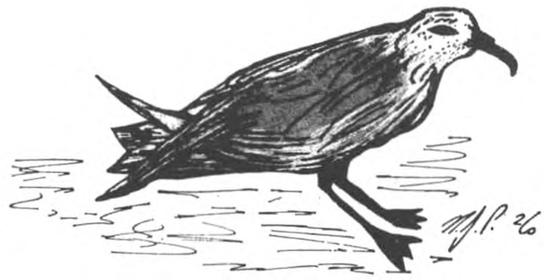
South Atlantic Ocean

m.v. *British Spey.* Captain K. V. Meacock. Little Aden (Saudi Arabia) to Lagos (Nigeria). Observers, the Master and ship's company.

4 January 1976. At 0930 GMT it was reported to the bridge that a small sea-bird was hiding in one of the store rooms and on investigation a rather dirty and pathetic-looking mess was pulled from beneath a storage rack and placed in a box on the bridge. There was some controversy over the identification of the bird, but we finally settled on a Petrel, see sketch.

The bird was in a very distressed state and was very weak. Attempts were made to force-feed it with strips of raw haddock but without success. We did, however, finally succeed in feeding it by using a hypodermic syringe with the needle removed and the plastic cover for the needle left in place with the end cut off. This could easily be put down the bird's gullet and fish mixed in water was injected down the throat.

Within an hour the bird was showing signs of improvement and was removed to a temporary home in the Second Mate's cabin—until the smell of fish became too severe—then it was placed in a cupboard.



The bird stayed on board for three days until it had recovered, and during this time it was taken to the bridge during the afternoons where its antics proved to be very amusing.

As it gathered strength it began to take flights around the wheelhouse, although these often ended in disaster in the waste-paper bin. It swam quite well in a bucket of water although it seemed very tired afterwards. When it became tired it would usually find a dark corner to take a rest. It showed little fear of being handled and rarely attacked the hand that was feeding it.

It finally flew away when the vessel was in position 2° 23′N, 8° 22′W, and was last seen heading east and flying well.

The bird had a wing span of 42 cm and measured 17 cm from beak to tail.

On the day it flew away a second bird of the same species was found in another store room.

This bird also was in a pitiful state. There was a lot of paint over its body and it had obviously swallowed some in attempts to clean itself. The paint was removed as gently as possible with a mild soap solution and the bird was fed in the same way as our other visitor. It seemed to rally for a time but unfortunately died the next day, presumably of paint poisoning.

Position of ship at 0930 on 4th: 8° 23′S, 00° 06′E.

Note 1. Captain Tuck comments:

'Both birds were Leach's Storm Petrels, *Oceanodroma leucorhoa*. An often-reported custom of these birds is to burrow up the sleeve of a jacket or any suitable shelter when alarmed or caught. The crew are to be commended for the care and attention given to these birds in their efforts to revive them.'

Note 2. Captain Tuck, expressing his appreciation to all those who supply details of birds observed in their Meteorological Logbooks, remarks on the efforts and great interest shown by observers. This bird observation and the five preceding it are among those listed by Captain Tuck as being good examples of observing and reporting.

North Atlantic Ocean

s.s. *Encounter Bay*. Captain K. E. Howard. Tilbury to Fremantle. Observers, the Master and Mr P. J. Sizer, 3rd Officer.

15 February 1976. Shortly after 0900 GMT a pigeon was seen to alight on the port bridge wing. For a while it just sat there obviously extremely exhausted, its head was sunk right down and for a time it seemed quite unable to move. After about 45 minutes it began to move around the bridge wing with short steps. However, as soon as any attempt was made to approach it, it rushed away.

It was noted that the pigeon had a light-blue plastic ring around its right ankle, and throughout the morning attempts were made to capture it with offers of water, milk, bread and dried cereals, but to no avail; we were therefore unable to determine the number on the ring.

The pigeon's markings were considered interesting. The body was white with grey feathers, around the front of the neck there were three separate distinct black

V-shaped 'collars' pointing downwards, and there was an emerald-green patch on the top of the head.

During the morning several attempts were made by the Master and the 3rd Officer to photograph the bird. A good close-up was not obtained, but a photograph was taken at a distance of about three metres.

An expert's opinion is requested on the types of food most likely to attract such a bird in a similar state.

Position of ship: 22° 13'N, 17° 35'W.

Note 1. Major L. Lewis, M.B.E., General Manager, The Royal Pigeon Racing Association, comments:

'I have seen the photograph taken of the bird so kindly tended by Captain K. E. Howard and his crew and it is a racing pigeon, possibly from the Canary Isles, where pigeon racing is a popular sport.'

Note 2. The following is an extract from an article by Major Lewis on racing pigeons in *The Marine Observer*, April 1975 edition:

'The racing pigeon is an eater of hard grain with maples, maize, wheat and barley being its chief diet. However, when very tired due to overtaxing its strength, a lighter diet of groats, lentils, split peas or even rice is beneficial as is the addition of glucose to the drinking water. The average healthy racing pigeon should be fed about 1½ ounces of grain each day, though when distressed three feeds of approximately half an ounce per feed per day suits the bird better.'

INSECTS

Gulf of Guinea

m.v. *Fourah Bay*. Captain R. M. Munro. Observer, Mr S. J. Pang, 4th Officer.

23 March 1976. At 1900 GMT while observing the sunset from the boat deck, an insect, see sketch, was observed. It was moving in an unusual but set pattern over the deck, spinning several times in a small circle then moving off at a tangent.

During the course of its motion the observer put his forefinger across its track and it crawled up the finger as if it were tame. Half-way up the finger it stopped and flapped its wings and unwound its proboscis at the same time; however, it made no attempt to fly off.

The most striking part of the insect was its colourful abdomen. The first segment was silvery-orange in colour, below that was a blue segment which changed under the reflection of light to green. The next one down was silvery, this was followed by a chocolate segment, then another silvery and slightly broader segment, another blue segment and finally three which were completely black. A thin black band formed a kind of boundary at either end of each segment.

The underside of the abdomen was not so attractive; it was generally black with a band of silver midway across it.

The wings were dark brown with patches of orange and a small patch of blue on each of the orange patches; they remained spread out all the time. The second set of wings were totally hidden underneath the upper wings, even when they were flapped. They were only about one-third of the size of the main wings and were similar in colouring to them—this gave the impression that the insect had only one set of wings.

The two black antennae on the head were blade-shaped and were pointed at the tips.

The thorax was only slightly hairy, mainly black with tints of silver and blue.

The insect was left to wander freely on the study table throughout its period of captivity. On the following morning it was still moving around in circles on the same table when it was observed to begin to lay tiny yellow eggs each about 0·5 mm in diameter.

Position of ship: 04° 49′N, 00° 15′W.

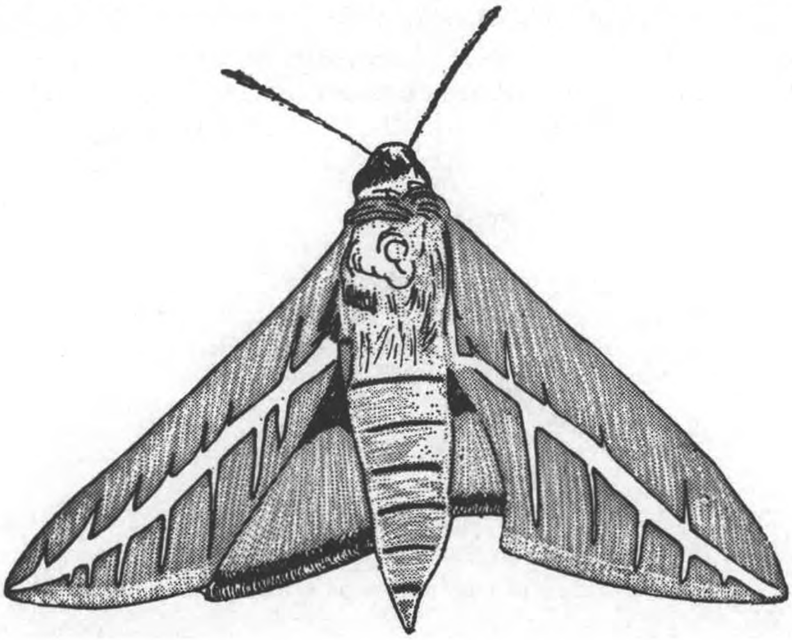
Note. Mr Allan Watson, Department of Entomology, British Museum (Natural History), comments:

'The specimen captured by m.v. *Fourah Bay* is of the species *Euchromia lethe* Fabricius (family: Ctenuchidae). This moth is a native of tropical West Africa, but is sometimes found in England associated with bananas on the foliage of which the caterpillar possibly feeds.'

Persian Gulf

m.v. *Southland Star*. Captain E. C. Smith. At anchor Bandar Abbas. Observers, Mr A. Middleton, 3rd Officer and Mr R. Lough, Cadet.

3 February 1976. A large insect, see sketch, was seen to be flying menacingly in the vicinity of the chart room. After being engaged in battle and defeated, it was found to be about 35 mm in length and to have a wing span of some 50 mm.



The body was dark brown in colour with white stripes, the wings were also dark brown with yellow stripes. Several small white feathers were growing in an area behind the creature's head.

Position of ship: 27° 07′N, 56° 11′E.

Note. Mr Allan Watson comments:

'This is the hawk-moth, sometimes known as the striped hawk-moth or white-lined sphinx, it bears the scientific name *Hyles lineata* Fabricius. This species is probably the most widespread hawk-moth and is found in North and Central America, Africa, Europe (rarely in Britain) and Asia.'

BIOLUMINESCENCE

Southern North Pacific

m.v. *Newfoundland.* Captain C. Rowntree. Papeete (French Polynesian Islands) to Richmond (San Francisco). Observer, Mr T. Conway, 2nd Officer.

3 January 1976. At 1130 GMT large circles of bioluminescence within an approximate radius of 3 n. mile around the vessel were observed, and about as much light was radiated as would be experienced at twilight; the phenomenon lasted for 4–5 minutes.

The rotating circles seemed to be moving from one place in the sea to another, it was as though they disappeared beneath the surface of the sea to reappear elsewhere.

Weather conditions at the time of the observation were as follows: wind SE, force 2–3, air temp. 24·4°C, sea temp. 26·1, sea slight, long low swell.

Position of ship: 05° 05′N, 140° 25′W.

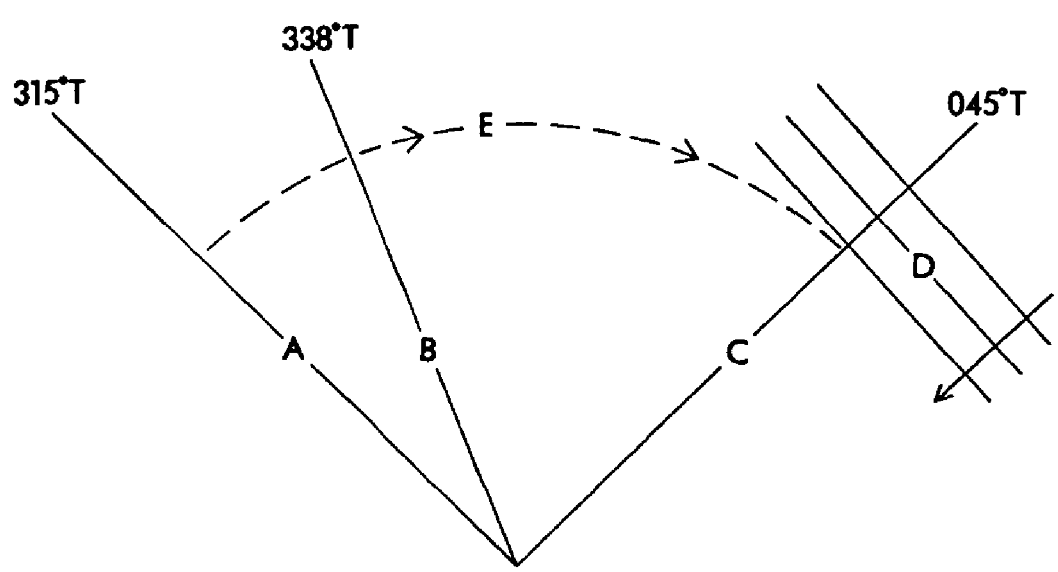
Note. Dr P. J. Herring, of the Institute of Oceanographic Sciences, comments:

'These are the mystifying "phosphorescent wheels" which are generally confined to shelf areas bordering the Indian Ocean, particularly the Moluccan region. Kalle has shown how these may result from the interference patterns of radially spreading seismic shock waves (see article by Turner in *The Marine Observer*, Volume 36, 1966, page 24), and the "wheels" may travel across the sea surface as described in this observation.'

Gulf of Siam

s.s. *Benattow.* Captain R. E. Cowie, Singapore to Bangkok. Observer, Mr C. J. A. Cladingbowl, 2nd Officer.

27 March 1976. At 1917 GMT pulsating bands of parallel light were observed in the sea moving towards the vessel from 045°T. After two to three minutes the bands took on a definite spoke formation, the centre of which was not seen but lay in the



A Locus of centre of spoke formations at beginning
B Ship's coarse
C Locus of centre of spoke formations at end
D Advancing bands of parallel light
E Direction of movement of spoke formations

direction of 315°T. The spokes passed the vessel at an ever-increasing rate, two spokes per second at the fastest. At this time they were about 22 metres in width and there was about 22 metres between each spoke. The light given off from the spokes was white to light green in colour, it increased in intensity with the speed of rotation. The direction of rotation was clockwise. By 1925 the centre of the spokes had shifted from 315° to 360°T and gradually reverted back to advancing bands of parallel light.

Shortly after this the parallel bands gave way to a counter-clockwise spoke rotation. This was observed in a direction centred along 315°T from the vessel, the spokes moved across the bow to 045°T, at which point they became parallel bands which diminished in intensity. By 1934 they had completely disappeared.

About an hour before this phenomenon was observed, pulsating bioluminescence in the form of upwelling or small underwater explosions about 1½ metres across was observed. This phenomenon continued throughout the whole time of the observation.

The Aldis lamp was switched on but the light produced no after-glow effect and only made watching more difficult. The radar was not switched on.

No attempt was made to obtain a sample of the water as there was no way to preserve it.

Position of ship: 10° 52′N, 101° 28′E.

Indian Ocean

s.s. *Texaco Bombay*. Captain D. Saunders. Bandar-e Ma'shur to Durban. Observer, the Master.

6 January 1976. The vessel entered an area of 'milky sea' in approximate position 06° 48′N, 52° 20′E.

At first a marked contrast between the blackness of the ship and the surrounding sea was observed. It was a very weird experience something like passing over an ice rink or, perhaps, floating on a cloud. If it were not for the vibration of the vessel it would have been like a ghostly passage. The horizon was clear-cut and the whiteness of the sea was in sharp contrast to the darkness of the sky.

On passing clear of this phenomenon in approximate position 06° 20′N, 52° 07′E, the sky and sea merged to form a solid black wall, this seemed to bring out even more the ice-like sea previously experienced.

'Milky sea', as the *Marine Observer's Handbook* describes it, is exactly what it was like—a never-to-be-forgotten experience.

Weather conditions at the time were as follows: sky cloudless, barometer reading 1017·3 mb, air temp. 24·5°C, sea temp. 26·0.

Position of ship: 06° 48′N, 52° 20′E.

Note 1. The Master of *Texaco Bombay* reports entering a further extensive area of bioluminescence on 25 January 1976 in position 4° 13′N, 51° 27′E, this time he reports that the phenomenon was more prominent than that observed on 6 January. On each occasion a sample of the sea-water was collected.

Captain Saunders concludes his second report by adding that he hopes the reports will be of value and that he looks forward to hearing of progress being made in the pursuit of understanding this phenomenon.

Note 2. Dr P. J. Herring comments:

'The curious phenomenon known as "milky sea" can be very dramatic as these vivid descriptions demonstrate. The exact cause or causes remain a mystery, but two organisms may be implicated. The uniformity of the light has led to the suggestion that luminous marine bacteria are responsible, but luminous bacteria are rarely present in oceanic regions in sufficiently high numbers to produce so startling an effect. An alternative possibility is that small crustaceans, particularly ostracods (2–3 mm long), may be responsible. These animals may occur in vast numbers at the surface at night, they can pour out a very bright luminous fluid into the sea, and are known to swarm in the Arabian Sea area. The simultaneous luminescence of multitudes of these animals might produce the observed effect, and the luminescence might persist for a time even after the animals have returned to deeper water. I would urge any observer fortunate enough to encounter this phenomenon to try firstly to obtain a bucket of the surface water and see whether it is visibly luminescent or contains any small animals, and secondly, to see whether illumination of the sea surface with an Aldis lamp has any effect (ostracods will often luminesce in response to a light stimulus).'

Solomon Sea

m.v. *Roybank*. Captain P. H. Thomas. Tarawa (Gilbert Islands) to Gizo (New Georgia group). Observer, Mr C. Burtenshaw, 2nd Officer.

1 February 1976. At 1645 GMT in the general area where an active volcano had been reported in 1970, an area of the surface of the sea appeared to be reflecting from below a pulsating glow, increasing and decreasing in intensity at a regular rate. This was first observed when the area, apparently circular, was close to the vessel on the starboard bow. The vessel's distance from the phenomenon was such that it was impossible to avoid passing through it, and in crossing, it was indeed observed to be circular in shape having a diameter of approximately 30–45 metres.

Weather details were as follows: light airs, sea calm, visibility excellent, barometer reading 1008·4 mb, air temp. 28·3°C, sea temp. 31·1.

Position of ship: 08° 53′S, 158° 01′E.

Note. Dr P. J. Herring comments:

'This observation of a slow pulsating luminescence, apparently below the surface, suggests seismic stimulation of a patch of luminous organisms. The known volcanic activity of this area indicates the likelihood of submarine disturbances. Shock waves, and their multiple reflections from the surface and bottom, might produce an apparent pulsating luminous response. More-generally accepted forms of seismically-induced luminescence are the very rapid movements of "fireballs" up from deep water which "explode" at the surface (e.g. see observation from s.s. *Yoma, The Marine Observer*, Volume 32, 1962, page 59) and the production of "phosphorescent wheels" in shallower water (see observation from m.v. *Newfoundland* in this issue).'

Indian Ocean

s.s. *London Pride*. Ra's at Tannurah (Saudi Arabia) to Rotterdam. Observer, Mr K. J. Halpin, 3rd Officer.

23 January 1976 between 1700 and 2100 GMT. The marine bioluminescence phenomenon 'white water' was observed.

The sea all round the ship as far as the horizon was illuminated by a light greenish-white light. This 'blanket' of light appeared to be a metre or so above the actual sea surface, and seemed to have a calming effect on the surface of the water, although the wind speed and direction did not alter significantly.

The blanket of light was unbroken and nowhere were any individual patches of bright green bioluminescence normally associated with the phenomenon observed. The effect of the phenomenon was totally negated by the rising of the moon shortly after 2100.

Weather conditions at the time were as follows: barometer reading 1013·3 mb, air temp. 25·0°C, wet bulb 24·0, sea temp. 27·0, wind 080°T, 9 knots, sky half-covered with cumulus (base about 300 metres) and alto-cumulus, frequent rain showers, sea slight, no definable swell.

Position of ship: 05° 10′N, 51° 00′E.

Note 1. The s.s. *London Pride* is a Canadian Selected Ship.
Note 2. Dr P. J. Herring comments:

'This is an example of the infrequent phenomenon in which luminescence appears to be aerial rather than marine. It can only be presumed that luminous marine micro-organisms (probably dinoflagellates) were responsible and had in some way been uplifted from the sea surface into mist layers above the surface.

'Reports of this type are very puzzling, particularly in situations such as this where the wind is very light and seems hardly adequate to account for the suspension of the luminescence with the permanence indicated by the observations.'

ABNORMAL REFRACTION

Indian Ocean

s.s. *Encounter Bay*. Captain K. E. Howard. Tilbury to Fremantle. Observers, Mr R. D. Lorraine, 2nd Officer, Mr P. J. Sizer, 3rd Officer and Mr S. Johnson, Seaman.

29 February 1976. The previous day a Navigational Warning had been received informing all ships that a meteorological rocket was to be launched between 1500 and 2200 GMT the following day. Since no one on board had previously observed one, all watch-keepers kept celestial as well as terrestrial look-outs.

At 1725 a flashing object was noticed in the sky at an altitude of 4 degrees, a point on the port bow. As soon as a regular pattern of flashes (green, white and red) was seen, the object was assumed to be the rocket. However, a second one appeared soon afterwards, followed by three more objects, all spaced evenly around the ship at low altitudes, and all flashing the same colour pattern at regular intervals.

It was at this point that we realized that the flashing objects were stars being affected by super and abnormal refraction.

Subsequent investigations proved them to be Arcturus, Antares, Betelgeuse, Sirius and Procyon, all at altitudes below 15 degrees.

The phenomenon continued until 2000 when it faded and disappeared.

Weather conditions at the time were as follows: wind WNW force 2, fine and clear, slight following sea and swell, barometer reading 1022·3 mb, air temp. 17·5°C, wet bulb 17·0, sea temp. 14·0.

Position of ship at 1725: 38° 04′S, 85° 14·5′E.

COMET WEST

Gulf of St Lawrence

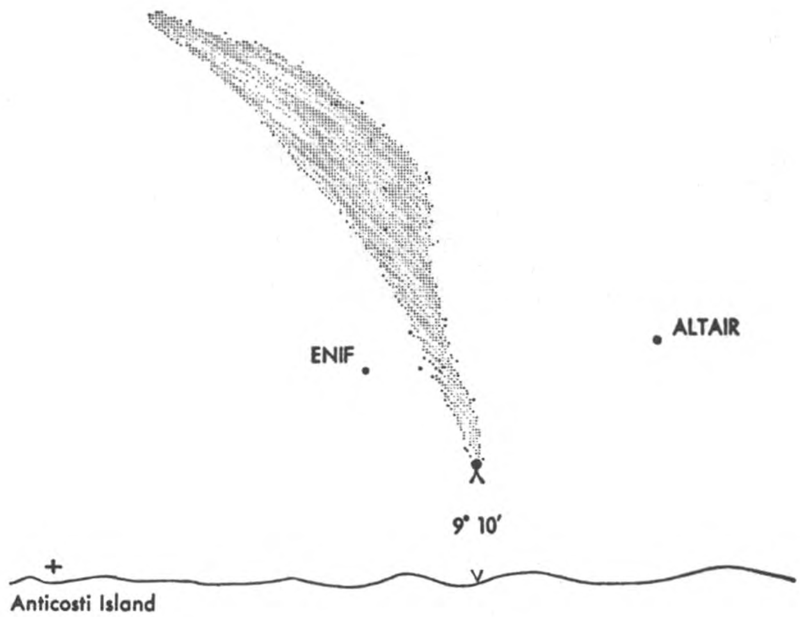
m.v. *Manchester Challenge*. Captain J. Illingworth. Manchester to Montreal. Observers, Mr W. A. Lowe, Chief Officer, Mr R. Waterton, 2nd Officer and Mr D. Addison, Cadet.

7 March 1976. At 0910 GMT a comet head, see sketch, was observed bearing 083°T with the extremity of the tail bearing approximately 077°T. The sextant altitude of the head was 9° 10′ and the magnitude of the head in comparison with other stars was −1·4 to −1·6.

The night was crisp and clear so giving a very sharp view of the comet. It was later identified as Comet West. It was observed again on 12 March but very much fainter, and accurate observations could not be made.

Weather conditions at the time of the observation were as follows: air temp. −10°C, wet bulb −10, sea temp. −2, wind NW, force 4, visibility more than 15 n. mile, sky almost clear, traces of altocumulus lenticularis, patches of pancake ice, refraction present.

Position of ship: 49° 49′N, 64° 36′W.



Note 1. We have received reports of this Comet from a large number of the VOF including: m.v. *Antilochus*, s.s. *Benavon*, m.v. *British Beech*, m.v. *British Holly*, m.v. *Clan Magillivray*, s.s. *Discovery Bay*, s.s. *Jervis Bay*, s.s. *Kowloon Bay*, m.v. *Laurentian Forest*, s.s. *Liverpool Bay*, m.v. *Peisander*, m.v. *Port Alberni City*, m.v. *Port Nicholson*, m.v. *Post Runner*, m.v. *Sara Lupe* and m.v. *Taupo*.

Note 2. This comet was named Comet West after the astronomer, Richard West, who first discovered it in the latter part of 1975 from the European Southern Observatory in Chile. It brightened much more than expected and it is only the fourth time this century that a comet could be seen with the naked eye during daylight. It appeared to be about as bright as Mercury and possessed a fan-shaped tail about ½° wide.

It was obviously well worth looking at. It appeared low down in the eastern sky below the constellation of Delphinus but by mid-February 1976, it seemed to be weakening as it neared the sun. As it passed Mercury towards the end of the month, it brightened again. It reached perihelion, its closest approach to the sun, on 25 February when it could be clearly seen about 8½° from the sun. Its brightness was estimated to be about magnitude −3, some five times brighter than anticipated.

AURORA AUSTRALIS

Indian Ocean

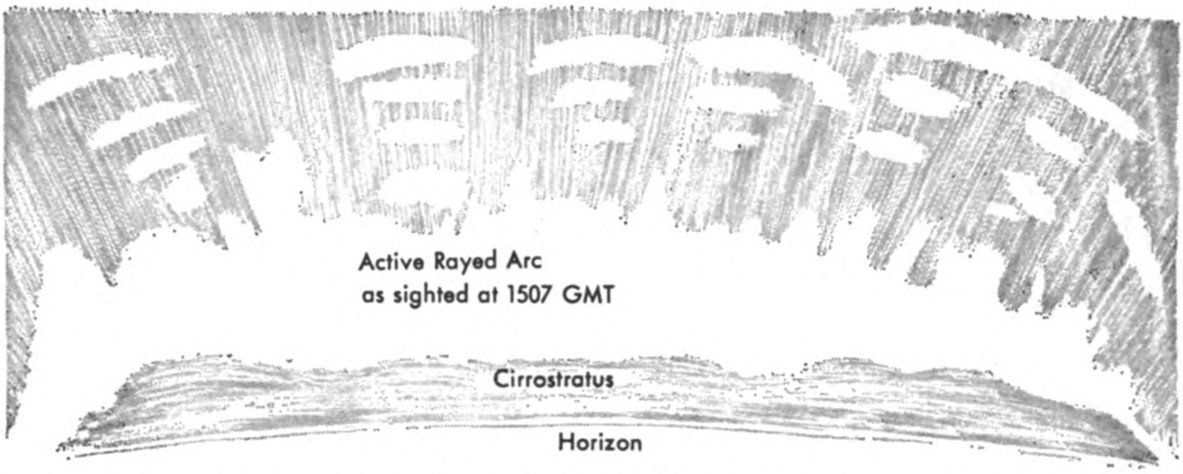
s.s. *Discovery Bay*. Captain P. J. Clark. Rotterdam to Sydney. Observer, Mr C. C. Young, 3rd Officer.

26 March 1976. At 1500 GMT the first signs of an auroral display appeared at an angle of about 10° above the poleward horizon. It appeared as a pulsating glow similar to cirrus cloud in the moonlight. It became a rayed arc which gave the appearance of a folded curtain produced by bundles of upward-stretching rays. It was fully formed at 1507. The line of the rays seemed to be along the direction of the magnetic force of the earth, they stood at about 15° from the vertical.

At 1516 the rays, which seemed to be pulsating, converged overhead to the magnetic zenith to become coronal, changes in luminosity were rapid. By 1522 the activity was 'flaming'—definitely a most impressive sight, although the colour was a dull white, or, as the *Marine Observer's Handbook* describes it, moderate.

By 1545 the aurora had faded and the coronal effect had disappeared. However, at 1556 the aurora reappeared in rayed-arc form for about 15 minutes.

During the course of the following 1½ hours the aurora was visible in active-patch



form at intervals of 12–17 minutes. By 1620 it had almost completely disappeared and clouds were forming on the horizon, however a quiet form of aurora was visible in glow form, similar in appearance to moonrise except that it was centred due SSE.

At 1730 a ray form was observed in addition to the already predominant glow form, the glow had by this time intensified in brilliance. At 1745 it was obscured by stratocumulus cloud, but two separate ray forms were visible above the cloud.

At 1804 a non-active rayed arc was forming, the centre of which was bearing 155°T. At 1816 the moon rose and its light intensity obscured the aurora to some extent.

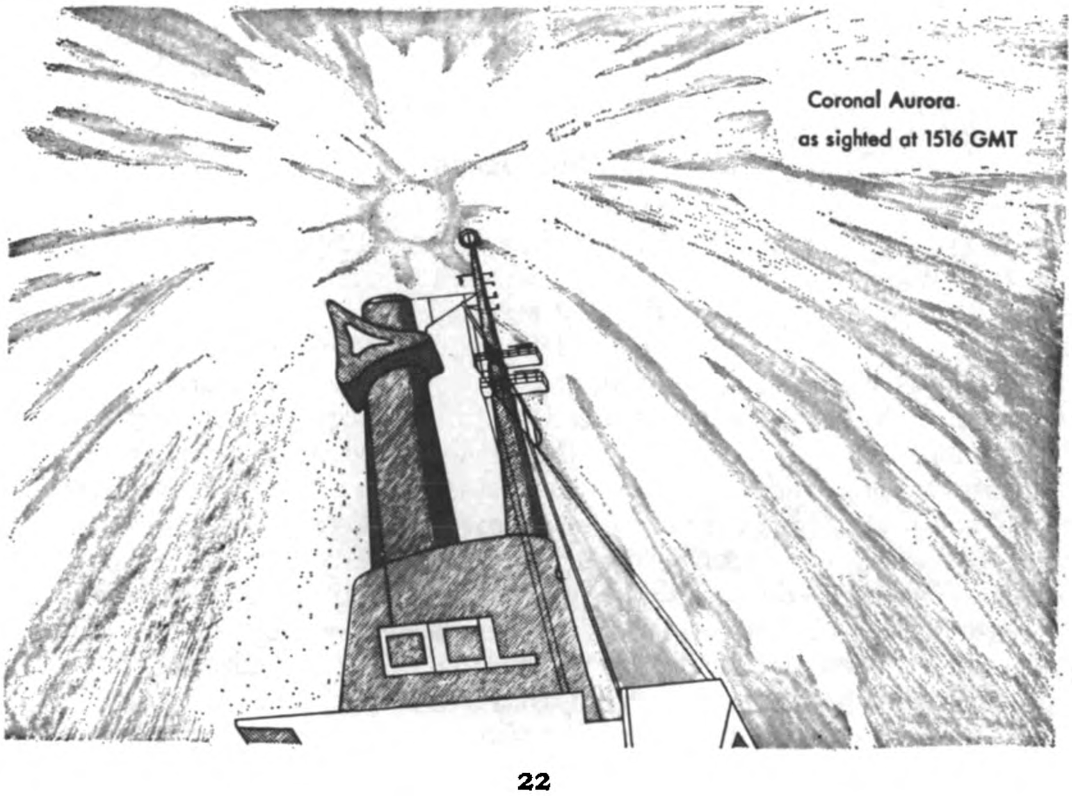
At 1820 a pulsating rayed arc extending from the glow form was observed, it was not possible to determine its elevation owing to the presence of low clouds on the horizon. At 1830 the aurora began to dissipate and by 1848, it was no longer visible.

These observations were made more spectacular by the sight of a meteorite passing through the glow form at 1645 and burning up.

Throughout the period of observation the sea was calm and this reflected the auroral forms. A watch was kept on the magnetic compass but no change in its heading occurred.

Weather conditions at the time were: dry bulb 15·0°C, wet bulb 12·7, sea temp. 14·0, barometer reading 1012·4 mb and wind N'E, force 3.

Position of ship at 1500: 41° 39'S, 135° 00'E.



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The Development of Ship Routeing and its Modern Application at the Meteorological Office, Bracknell

By the Staff of the Marine Division, Meteorological Office

The feasibility of routeing vessels to avoid the worst weather conditions became apparent when technological advances in the post World War II era introduced high-speed computers for the collection of meteorological data and, in turn, the mathematical prediction of development and movement of weather systems. The routeing of ships by shore establishments began in the USA in the 1950s and the practice was adopted by various European Government Meteorological Services during the 1960s. Hitherto, the practice had been to make use of well-known and well-established principles to select routes when crossing the oceans. Perhaps the oldest of these was that practised by Arab dhows plying between India and the east coast of the African continent in that they utilized the NE monsoon on west-bound passages and the SW monsoon on east-bound passages. Much later, in the latter part of the 18th century, there was concern in the new colonies on the eastern seaboard of North America over the delays incurred by west-bound vessels on passage from Europe. The astute Yankee whalers had already discovered the massive current which flows from America eastwards towards Europe, but the English mail-packets strangely lacked this knowledge and often were delayed for upwards of two weeks by sailing against it. The then Postmaster General of the Colonies, Benjamin Franklyn, was appointed by the Lords of Treasury in London to look into the matter; as a result of his consultations with a Nantucket whaler captain, Franklyn published a chart of the North Atlantic in 1787 showing the currents, and the ships that used this chart improved their performance significantly.

In 1852 an American naval lieutenant, Matthew Fontaine Maury, whilst serving as Superintendent of Charts and Instruments, enlarged upon Franklyn's work by painstakingly collecting wind and current observations from ships' deck logbooks and collating these to construct his famous *Sailing Directions*. These had a profound influence on shipping for although the main purpose of the routes he advised was to prevent collision, they also enabled ships the world over to take full advantage of the currents and prevailing winds of the ocean's surface. His work is perpetuated today in the well-known 'Pilot Charts' issued by the US Hydrographic Office each month and which still bear the legend 'Founded upon the researches made in the early part of the nineteenth century by Matthew Fontaine Maury, whilst serving as a lieutenant in the US Navy'. As well as showing surface currents and monthly wind distribution, these Pilot Charts also recommend routes between the principal ports. The British Admiralty also publish a series of charts recommending routes based on climatological patterns, and their well-known publication *Ocean Passages for the World* recommends routes in great detail.

Although the older term 'Weather Routeing' is still sometimes used, a more-correct phrase is perhaps 'Ship Routeing' since, although weather is the main factor, the principles of navigation, seamanship, naval architecture, oceanography and marine engineering must also be considered before a route can be selected.

The Master of a ship is the best person to choose the route that his ship will follow but even in the modern powerful ships of today he is still obliged to take careful note of the weather likely to be experienced on passage, particularly if he has to operate economically. A few years ago much attention was given to the time ships spent in port and thus not earning their keep; the container-ship era has revolutionized this situation and it could now perhaps be said that a great deal of time is wasted at sea by navigation which, today, might be described as other than the best possible. A vessel that is hove to in heavy weather is unlikely to be earning maximum profit; of course there will always be the occasion when even the most careful and experienced navigator must heave to, but such cases can be appreciably reduced if careful consideration is given to weather and sea conditions likely to be encountered and to avoiding the worst of both. The question is therefore often asked—why route a ship from a shore establishment if the Master has at his disposal climatological data, radio weather bulletins and facsimile weather and wave charts which should enable him to do his own? There are three answers. Firstly, due to facsimile schedules, broadcast timings and volume of traffic, the information which the ship receives by radio can be out of date meteorologically speaking. Secondly, no matter how good the Master may be at interpreting forecast charts he cannot be as competent as the professional meteorologist who has specialized in this work for many years—unlike the Master who, of necessity, has to divide his skills amongst the varied aspects of his profession. Finally, the Master does not have at his immediate disposal the vast resources of a modern meteorological centre such as at Bracknell. Here the task of selecting routes is entrusted to a team of master mariners with long sea-going experience, who devote their whole time to selecting the most advantageous routes for ships which use the service. They are provided with a continuous flow of analysis and forecast charts, ice information, warnings, bulletins and satellite pictures and are briefed on the meteorological situation by experienced forecasters.

Method

The ship's response to various wave fields is determined by extracting sufficient data from the deck logbooks to construct a performance curve (Figure 1). The wind and wave fields must be predicted for as far ahead as possible—at Bracknell at present this is about 72 hours. This is done by feeding into the Meteorological Office main computer (one of the fastest in the world, capable of processing 8 million instructions per second) a vast amount of meteorological data obtained from land stations, merchant ships and balloon-borne radiosondes.

All the data are subjected to rigorous quality control by the computer, and are then used to produce a computer analysis of fields of temperature, humidity, winds and contour heights of pressure levels over most of the Northern Hemisphere down to about 15°N for each of 10 separate levels in the atmosphere. A forecast for the next 72 hours is then computed by using the Meteorological Office 10-level forecast model.

A relationship between surface wind speed and wave height was derived by Pierson and Moskowitz to give the formula

$$H = 0{\cdot}0214\, V_0^2$$

where H = wave height in metres

V_0 = surface wind in metres/sec.

Strictly, surface wind speeds are not produced by the Bracknell forecast model so the empirical relationship as deduced by Findlater and others between the surface and 900-mb wind are used. The surface wind direction is also deduced from the 900-mb wind by using these relationships. The computer utilizes this formula to convert wind field into wave field and produces a series of charts depicting conditions up to 48 hours ahead. Subjective modifications are made for actual reports of sea conditions, fetch and generated and residual swell.

The forecast wave or swell heights and directions are then applied to the ship performance curve to determine how far the vessel will travel in the next 12 hours over a number of possible courses. These points are then joined to form a 'time front' i.e. the locus of possible ship positions at that time. From selected points on this time-front the process is then repeated in successive 12-hour steps and results in a least-time track for that part of the route (Figure 2) which would be the course that the vessel would be advised to follow if meteorologically-induced conditions

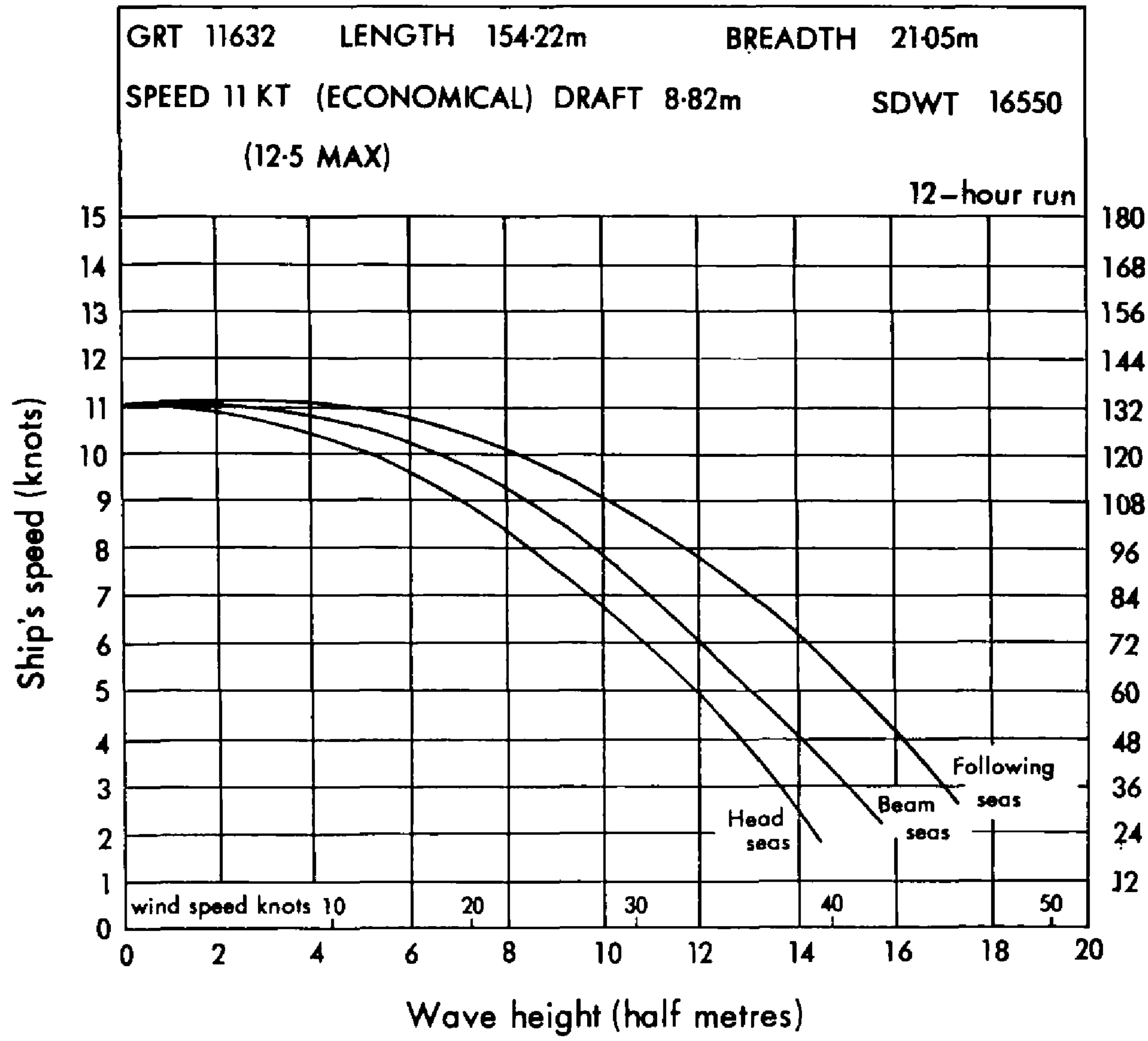

Figure 1. Performance curve prepared from logbook

were the only consideration. At this stage, however, subjective consideration must be given to other parameters. The router has to consider if the course is navigationally feasible, if the state of loading makes the heading inadvisable, if the time thus gained would be lost through adverse currents and if the course would take the vessel into an area of fog or ice. A message is then sent by radio to the Master advising him to follow the selected route. This message also includes a forecast of wind and sea along the selected route if required. This procedure is continued daily throughout the passage and surveillance of the ship's progress is achieved by plotting her position on successive 6-hourly weather charts. The ship plays her part by informing the routeing centre of her position at regular intervals. If the ship is part of the WMO Selected Ship scheme she transmits coded weather reports at 6-hourly intervals to the nearest coast radio station, these reports are then relayed over the Meteorological Telecommunications Network to Bracknell, otherwise a routed ship is requested to send a plain-language message direct. The selected reports can reach Bracknell very quickly. For instance, in the case of some vessels crossing the Pacific, the 0600 GMT observation—having been transmitted to a local coast radio station, relayed to Washington, passed on to Bracknell via communication satellite and automatically recorded on tape and read into the computer data bank—can be regularly extracted by Ship Routeing Section at 0715 GMT that same day.

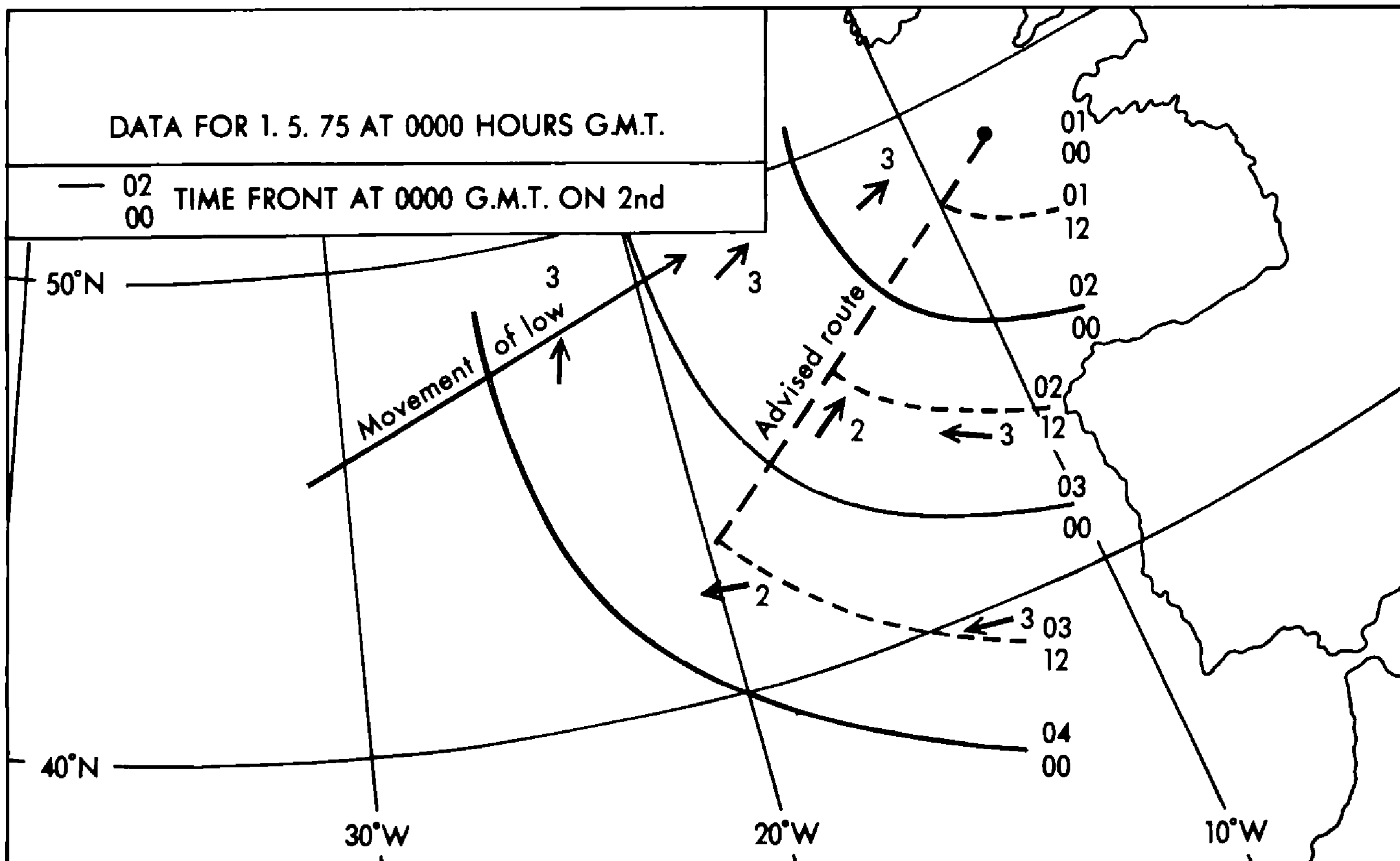

Figure 2. Calculation of least time track

The first part of the routeing procedure is often modified when the vessel has to pass through restricted waters such as the North Sea, the Caribbean or the estuary of the St Lawrence River. In these cases the initial advice is whether the ship proceeds via the Pentlands or the English Channel, the Mona or Sombrero passages, or via Belle Isle or Cape Race. In some cases this part of the routeing is critical. In one particular case a bulk carrier was due to leave Middlesbrough on the NE coast of England bound for St John, New Brunswick, Canada. Being loaded with steel products consisting mostly of steel plates, she had a very low centre of gravity and was therefore prone to heavy rolling. The Master was concerned that she should avoid heavy weather, particularly on the beam. The wave forecasts (Figure 3) indicated the possibility of north-westerly seas of 7 metres off northwest Scotland and the vessel was consequently advised to sail south-about from Middlesbrough and down the English Channel where the conditions were more favourable.

The object of ship routeing varies according to the type of ship and the requirements of the operating company. It can be:

(*a*) Least time. When ship routeing began the main objective was to reduce time on passage regardless of other considerations, but least-time routeings are now mostly confined to oil tankers which do not suffer cargo damage and are less susceptible to hull damage than other ships. On the basis of time saved, one tanker company has calculated that during one winter of ship routeing in the North Pacific Ocean, an average of 36 hours and 100 tons of bunkers per vessel per crossing was achieved.

(*b*) Least time with least damage to hull and cargo. A small fleet of ships carrying paper products from Newfoundland to the UK and liable to hull damage from pounding, particularly during the UK to Canada 'no cargo passage', used the routeing service and found that damage bills of £30 000 per ship per year fell to negligible amounts. The routeing charge per ship per year was approximately £300. This type of routeing is undertaken at Bracknell more frequently than any other.

(*c*) Least damage. This is requested when the vessel is carrying a particularly sensitive cargo such as livestock on deck, uncrated cars, etc.

(*d*) Constant speed. Some ship charters stipulate the maintenance of a certain speed over a certain time with a financial penalty for failure. Routeing advice is adjusted to achieve this.

(*e*) Fuel saving. In recent years, with increased oil costs, the most significant advantage of ship routeing has been in fuel saving, although this has always been a direct spin-off from least-time/least-damage routes. The present charge for this routeing is equivalent to two tons of bunkers for an Atlantic crossing and three tons on the Pacific so that significant savings can be made on fuel bills, even in those cases where service speed has been reduced as part of the fuel economy programme. In a recent pamphlet *Marine Fuel Energy Conservations Program for Steam Turbine Ships* the Chevron Oil Company published the result of an Energy Conservation Program initiated in 1973. Two of their findings significantly favoured the use of ship routeing. They found that there was a marked reduction in fuel consumption when a constant power was maintained instead of frequent throttle steam valve adjustments. The figure quoted was 8 per cent reduction in fuel consumption. The diagram of voyage speed economics (Figure 4) graphically illustrates profit reduction in bad weather. Although these principles applied to a tanker fleet, they are equally applicable to other types of vessel.

An example of ship routeing is shown at Figure 5.

The routeing service at Bracknell has also been adapted for advice on the movement of tows, both in and out of harbour and on passage. Sometimes the advice is limited only to the most favourable time to leave harbour. More frequently, the

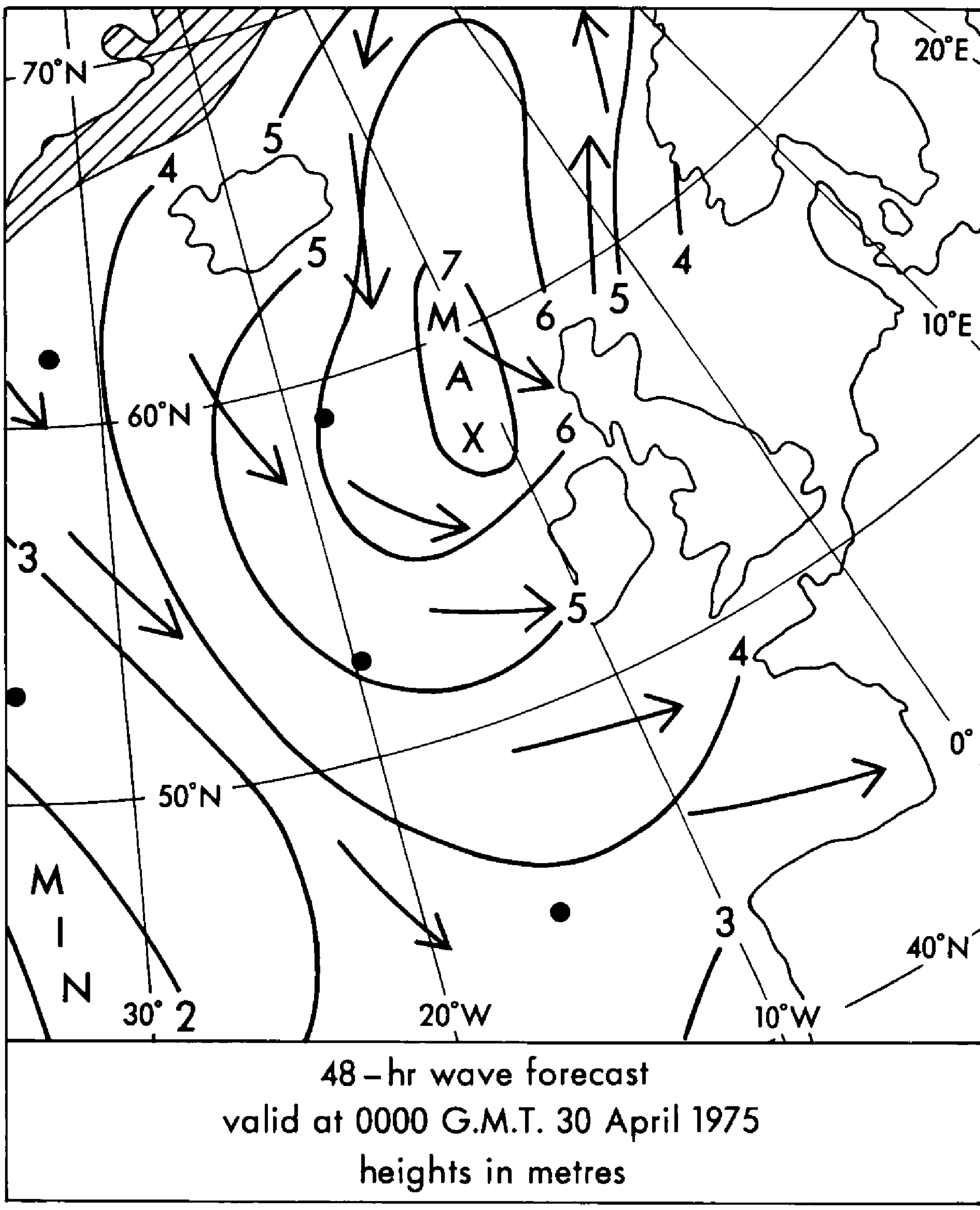

Figure 3. Wave forecast chart prepared at Bracknell

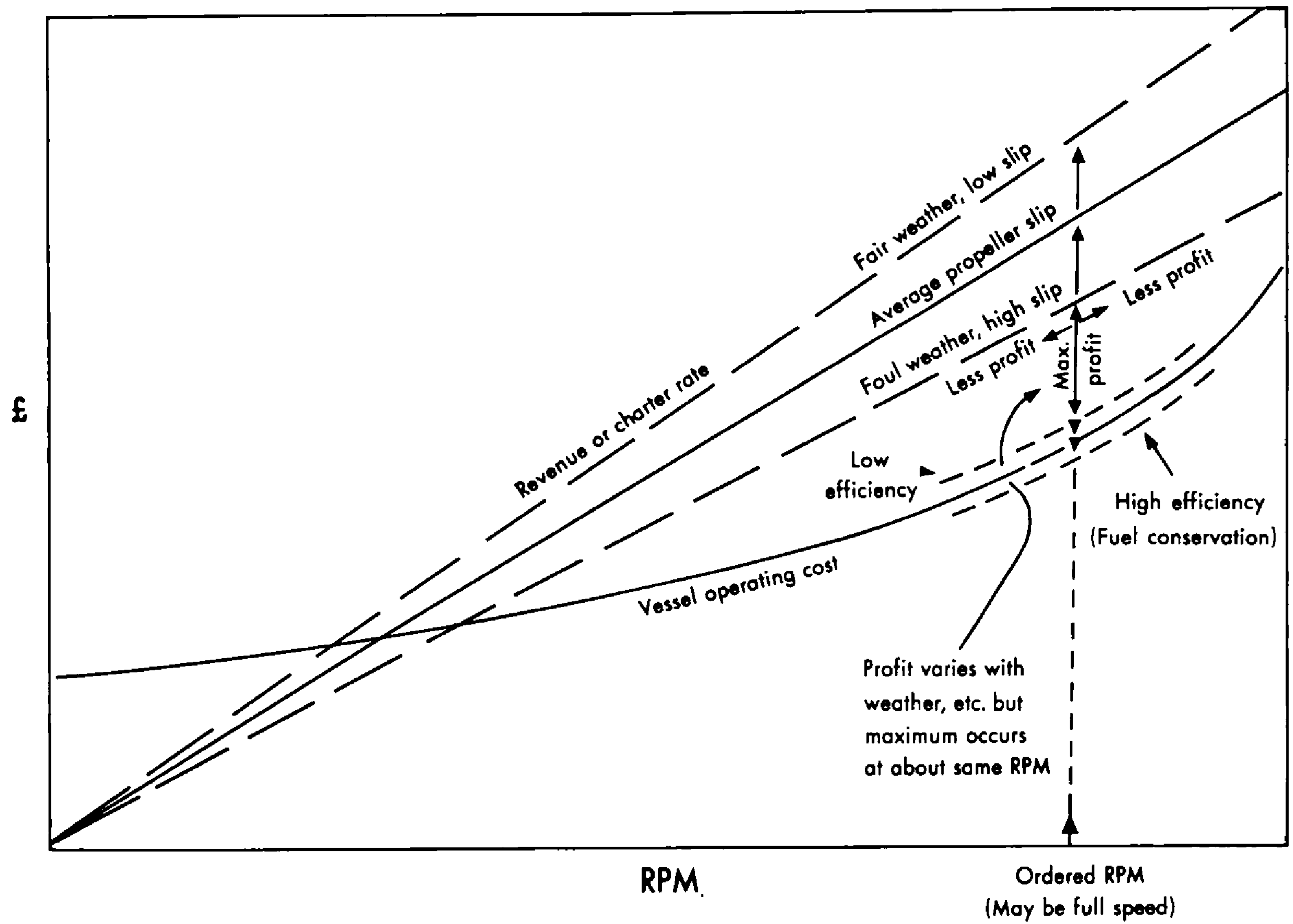

Figure 4. Voyage speed economics diagram

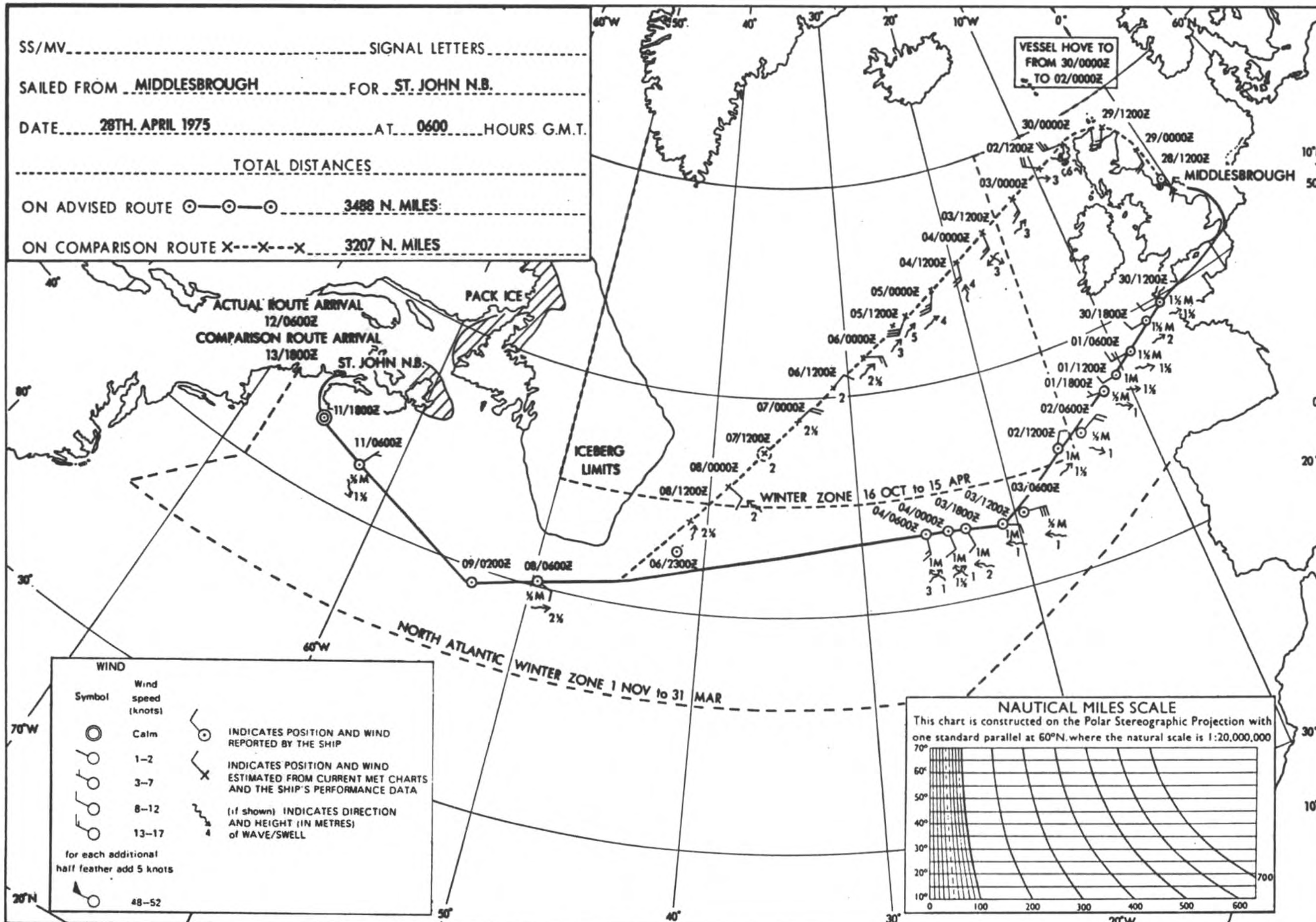

Figure 5. Example of ship-routeing chart

progress of the tow is monitored in the same way as conventional vessels and the tow is advised when and where to shelter should the need arise. In these cases the router utilizes his knowledge of pilotage problems in restricted waters in conjunction with up-to-date meteorological information. Tows may be of the usual tug barge type or may be oil rigs, concrete platforms, floating cranes, floating docks and other craft.

One of the most vital aspects of ship routeing by a meteorological service is the liaison between the particular router and the Master concerned. Wherever possible the opportunity is taken to visit the ship or tow before departure and discuss any cargo characteristics, handling problems or preferences. Opportunity is taken to answer any questions that the Master may ask about the service and agree the radio stations for passing advisory messages.

Many shipmasters prefer to carry out their own routeing, and they are best able to do this, albeit on a limited basis, when in command of vessels equipped with facsimile recorders, and in areas where they can receive charts showing medium-range forecasts of pressure systems and the short-range prognostic wind and wave charts. Ice charts, issued by some meteorological centres, are also of value to the on-board router.

The 24-hour weather forecasts for sea areas which are regularly broadcast do not of themselves enable shipmasters to do their own routeing over long distances, nor is it advisable to attempt route planning on data gleaned from the International Analysis Code FLEET as changes in the weather pattern are often too rapid to allow the (IAC FLEET) code to be of much value in this context.

Evaluation

It has been stated earlier that a routed ship contributes to the service by providing the routeing officer with information, either in ships' code form or in plain language as to her position, the weather she is experiencing and an indication of her progress. This information is plotted along the ship's route, and a knowledge of the weather which prevailed over the entire ocean enables an objective evaluation to be made as to whether other feasible routes would have been more or less advantageous in regard to heavy weather avoidance, and whether the vessel could theoretically have arrived earlier at her destination. It is customary to indicate on the evaluation charts the sea and swell conditions which the ship would have encountered on alternative routes. This information can be of value not only to the shipmaster but also to the owner or charterer should questions arise regarding the overall weather conditions during the passage. The Marine Division of the UK Meteorological Office is often consulted for this type of information, especially after periods of extreme weather or unusual ship behaviour.

In conclusion, it can be said that ship routeing from a shore-based establishment is a success—because the shipmaster, the weather-router and the main meteorological centre co-operate, each in their particular area of special competence.

551.466.3

Special Reports of Freak Waves

By J. E. Atkins
Meteorological Office

In *The Marine Observer* and other journals over the last ten years or so a number of accounts and discussions have appeared concerning a type of wave that is especially damaging to ships. The destructive nature of such 'freak' waves is due not merely to the height of crest above trough but to the exceptional steepness of the face between crest and trough.

Mallory (1974) has given an account that is fairly typical of the recorded encounters with such waves:

> 'It was reported that this vessel received gale force south-westerly winds from the early hours of September 25, the waves being 30–40 ft (9–12 m) high. Then at 1647 on September 25 there appeared ahead of the ship a long deep trough into which her bows plunged. Before the forepart could lift, the advancing mountain of water crashed down on to the two forward hatches setting them bodily down by 2 feet and breaking them open.'

Reports have often mentioned a change in the rhythm of the waves leading to an especially deep trough followed immediately by the impact of the damaging wave. Examples are given in these two accounts:

> 'The Captain reported that waves were coming in sequences of seven on the bow. In one sequence the seventh wave did not hit them; instead there was no sea in front of the bow, only a hole. The bow fell into the hole and then the seventh wave, higher than the bow, crashed onto the ship. The Willstar lost her bulbous bow. Steel hull plates almost an inch thick were torn away. Beams thicker than railway tracks were snapped.'
> (Washington, NOAA, 1974.)
> 'The distance from one wave top to the next was about 150 feet and the ship was pitching and scending about 10–15 degrees to the horizontal. And then it happened. Suddenly having scended normally the wavelength appeared to be double the normal, about 300 feet, so that when she pitched she charged, as it were, into a hole in the ocean at an angle of 30° or more, shovelling the next wave on board to a height of 15 or 20 feet before she could recover, as she was "out of step".'
> (Meteorological Office, London, 1965.)

The sources of these and other accounts may be found in the list of references at the end of this article.

Because of concern at the hazard caused by freak waves the International Chamber of Shipping has asked the World Meteorological Organization (WMO) to collect information on such waves. As the United Kingdom is participating in the scheme, Officers of Voluntary Observing Ships are requested to make special reports of any freak waves encountered. Forms for reports are available from Port Meteorological Officers who will also forward the completed reports to the Meteorological Office at Bracknell. In fact the UK is to act for WMO as the international centre for the scheme so that reports from other countries will in due course be sent to Bracknell and the Meteorological Office will be responsible for collation, analysis and publication of the results.

The reporting form has headings for data specifically required for statistical analysis but also has space for more general notes of other conditions which seem important to the observer at the time—such immediate impressions will be much appreciated as likely to give valuable insight into the underlying mechanisms. The reports required are not of large waves in general—the characteristics of these waves can be analysed from wave or swell data routinely recorded as part of the weather observation—but of the freak waves that are not only high but have a geometry that causes them to be especially damaging. The guidance from WMO (and reproduced on the reporting form) is:

> 'A freak wave may be defined as a wave of very considerable height ahead of which there is a deep trough. Thus it is the unusual steepness of the wave which is its outstanding feature and makes it dangerous to shipping. Reports so far suggest that such waves have usually occurred where a strong current flows in the opposite direction to a heavy sea.'

Most of the freak waves reported to date have occurred off the coast of south-east Africa in the sector lying between Cape St Lucia and Port Elizabeth. A summary of these reports has been made by Sanderson (1974). In these waters the criterion of a strong current flowing in the opposite direction to a heavy sea is quite often realized: the Agulhas current flows south-west, its axis lying near the hundred fathom line, and in places has an average rate as high as 4 knots; winter gales from the south-west are fairly common and at times have a prolonged fetch so that pronounced swells may run from this direction as well as the locally-raised wind waves. The prevailing currents and wind frequencies off south-east Africa are shown in Figure 1a. However, this is not the only area where high waves can be expected to meet a strong opposing current. For example Figure 1b shows that the southern part of the Kuro Shio, off eastern Taiwan, is consistently opposed during winter months by the north-east monsoon winds and that these winds often reach gale force. No reports are known, though, of freak waves in this area. Perhaps incidents have not received publicity or perhaps some additional contributing factors are missing off Taiwan.

Some of the additional factors that have been suggested as conducive to freak waves off south-east Africa are:

1. That often one or more trains of swell run in addition to the wind waves. Each train of waves has its characteristic wavelength and speed but an exceptionally large wave may be produced when the trains are briefly in phase.
2. That deformation of the flow of water over submarine canyons may initiate the freak waves.
3. That the south-westerly gales associated with the freak waves are sometimes preceded by strong north-easterly winds. (The orography of South Africa accentuates the shift of wind at the front that introduce the gale.) Thus the current may be temporarily enhanced just before it encounters high seas from the south-west.

Though enough is now known to give warning of the broad conditions conducive to the incidence of freak waves over this particular area off south-east Africa the general phenomenon is by no means well understood. More reports are needed to extend knowledge and, in particular, to assess the risk in other seas. It is most important that freak waves occurring in all areas be reported. Reports from different areas are likely to bring out new aspects of significance.

One such aspect has been revealed in an analysis by James (1974) of a freak wave in the Gulf-stream when the fast-moving current was opposed by strong north-easterly winds: the sharp increase in temperature to which the lowest layers of air were subjected on passing across the 'north wall' of the Gulf-stream led to convectional overturning of the air with stronger winds from aloft being brought down to the surface and augmenting the build-up of waves.

One would wish that freak waves were not encountered at all but on the infrequent occasions they are experienced it is most desirable that details are recorded as fully as possible in the difficult circumstances. Only by such reports will adequate knowledge be accumulated and sound advice formulated for avoiding the hazard.

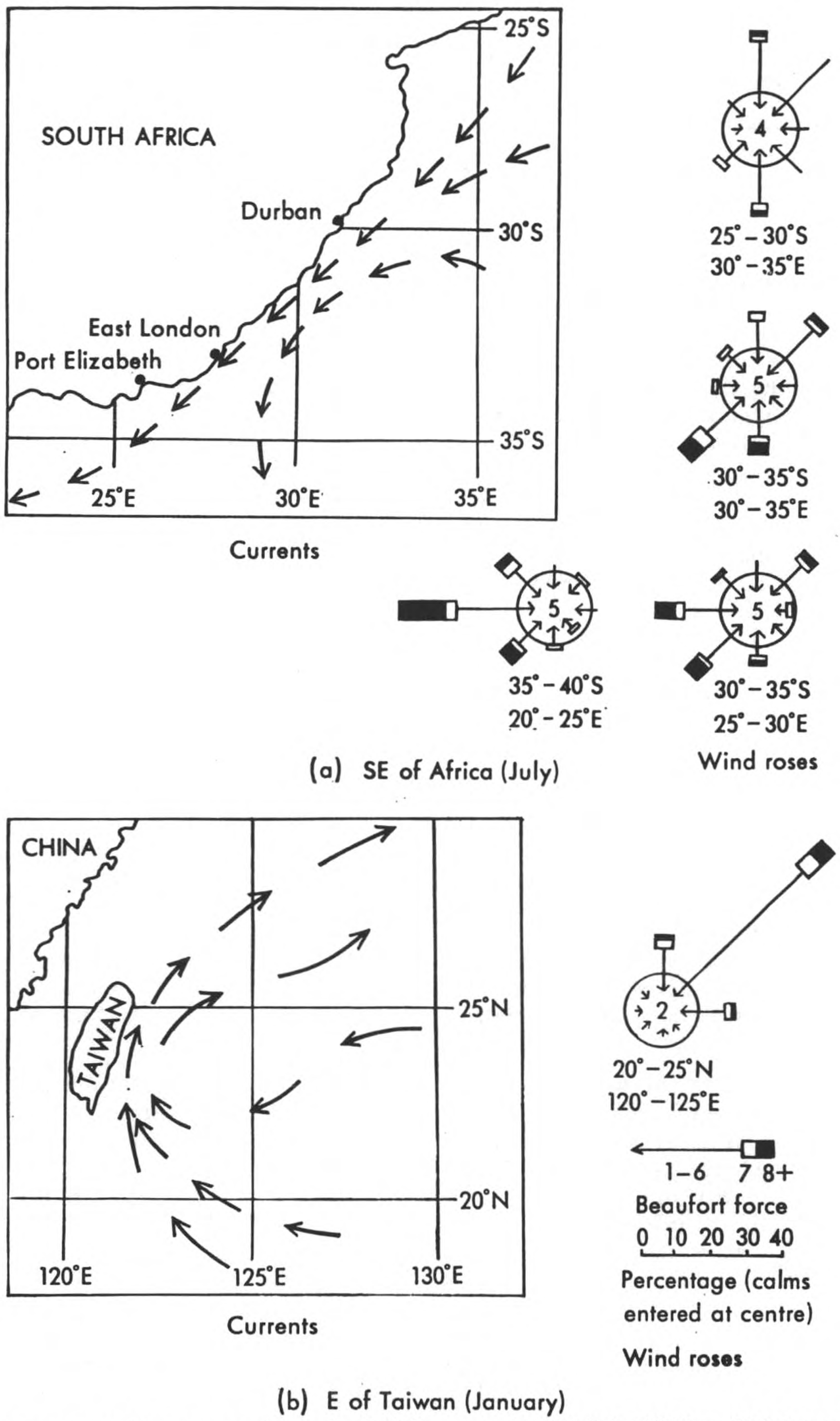

Figure 1. Prevailing currents and wind frequencies (a) SE of Africa (July), and (b) E of Taiwan (January)

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ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM JULY TO SEPTEMBER 1976

The charts on pages 37 to 39 display the actual and normal ice edges (4/10 cover), sea-surface and air temperatures and surface-pressure anomalies (departures from the mean) so that the abnormality of any month may be readily observed. (The wind anomaly bears the same relationship to lines of equal pressure anomaly as wind does to isobars. Buys Ballot's law can therefore be applied to determine the direction of the wind anomaly.) Southern and eastern iceberg limits will be displayed during the iceberg season (roughly February to July). In any month when sightings have been abnormally frequent (or infrequent) this will be discussed briefly in the text.

The periods used for the normals are as follows. Ice: 1966–73 (Meteorological Office). Surface pressure: 1951–70 (Meteorological Office). Air temperature: 1951–60 (U.S. Department of Commerce, 1965). Sea-surface temperature: area north of 68°N, 1854–1914 and 1920–50 (Meteorological Office, 1966), area south of 68°N, 1854–1958 (U.S. Navy, 1967).

July

The weak pressure anomalies of June continued throughout July with near-normal air temperatures. The long-standing excess of ice around southern Greenland was slow to clear although previous excesses off Labrador and in Hudson Bay gave way to near-normal conditions. Clearance in Baffin Bay was ahead of normal and although small areas of excess and deficit developed elsewhere, ice limits were generally near normal.

August

High pressure soon became established near Scotland with low pressure over the North Pole giving a pattern of anomalous north-westerly winds (with below-average temperatures) to the west of Greenland and south-westerly winds to the east. More ice persisted than is usual in Foxe Basin and the sounds leading to Baffin Bay. The ice south of Greenland finally dispersed, but off the east coast ice persisted a good deal farther south than is usual by the end of August. The tendency for south-westerly and westerly winds over the Barents and Kara Seas resulted in a recession of ice in these areas beyond that normally expected during August.

September

To the west of Greenland the winds and temperatures reverted to near the normal for this time of year. The formation of new ice consolidated the previous excesses in Foxe Basin and north-west of Baffin Bay. To the east of Greenland there was considerable clearance of ice so that by the end of September the excesses of August had largely disappeared. An anomaly for cold northerly winds east of Spitsbergen brought the ice edge southwards, in places past the normal position for the end of September despite previous considerable deficits of ice in this area.

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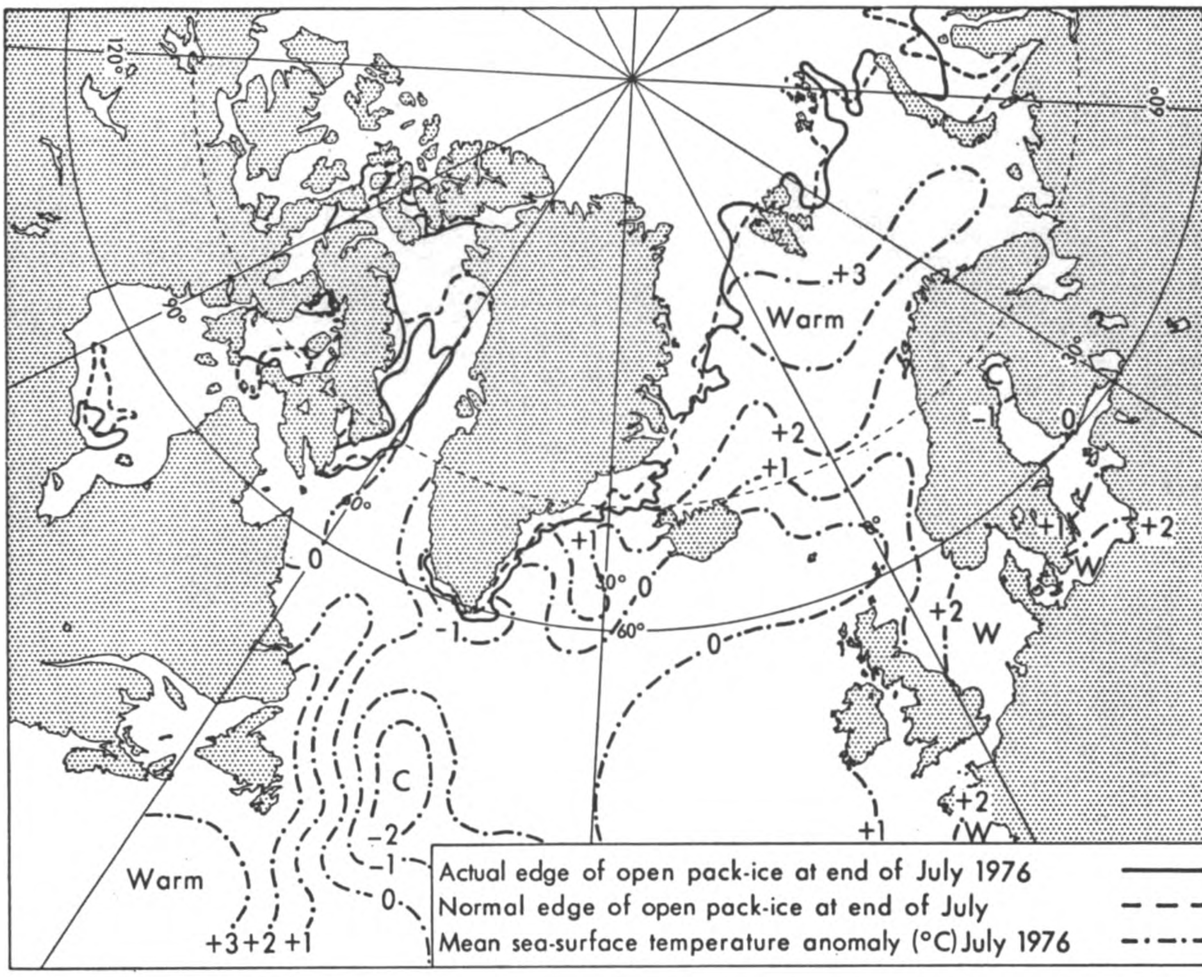
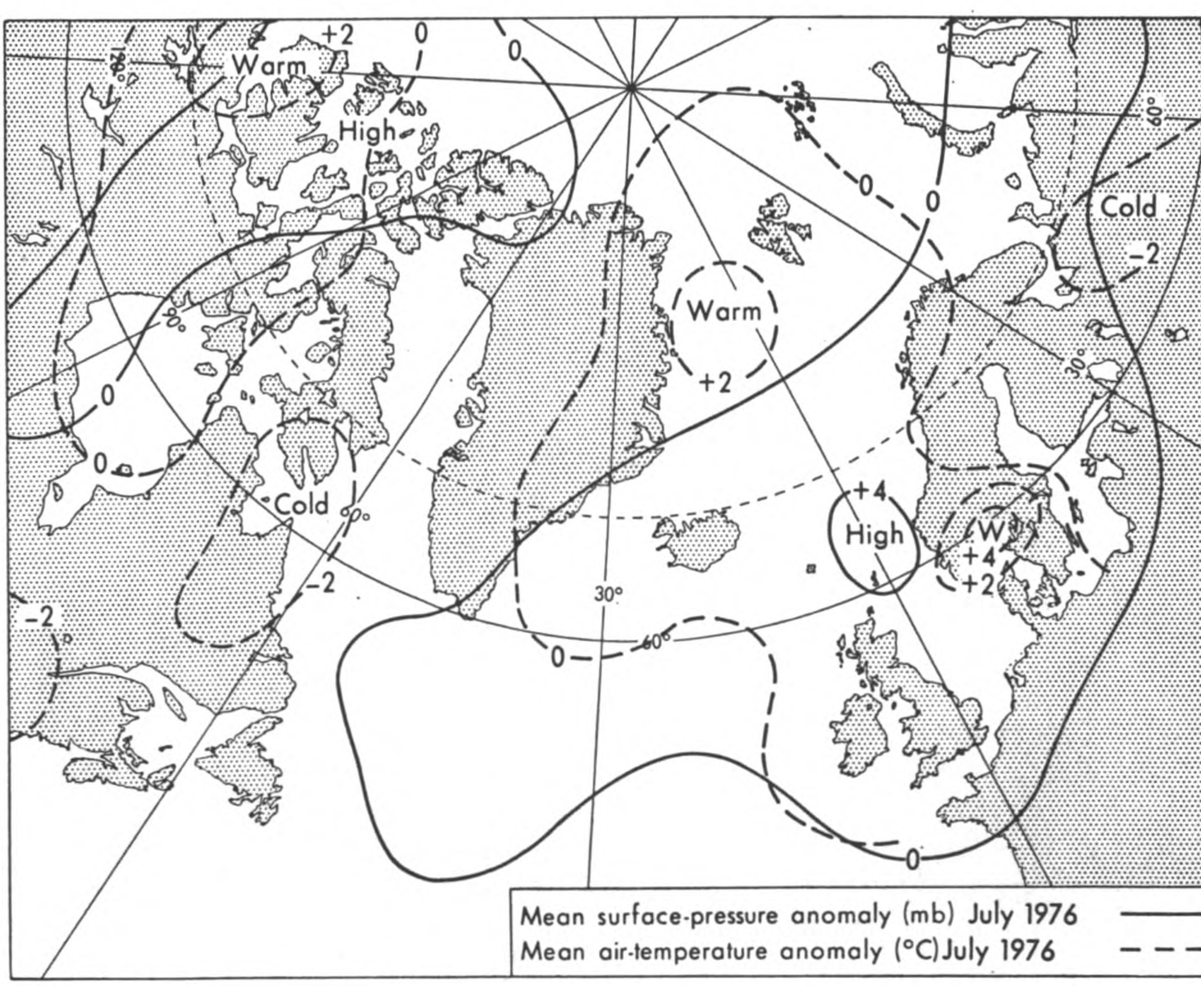
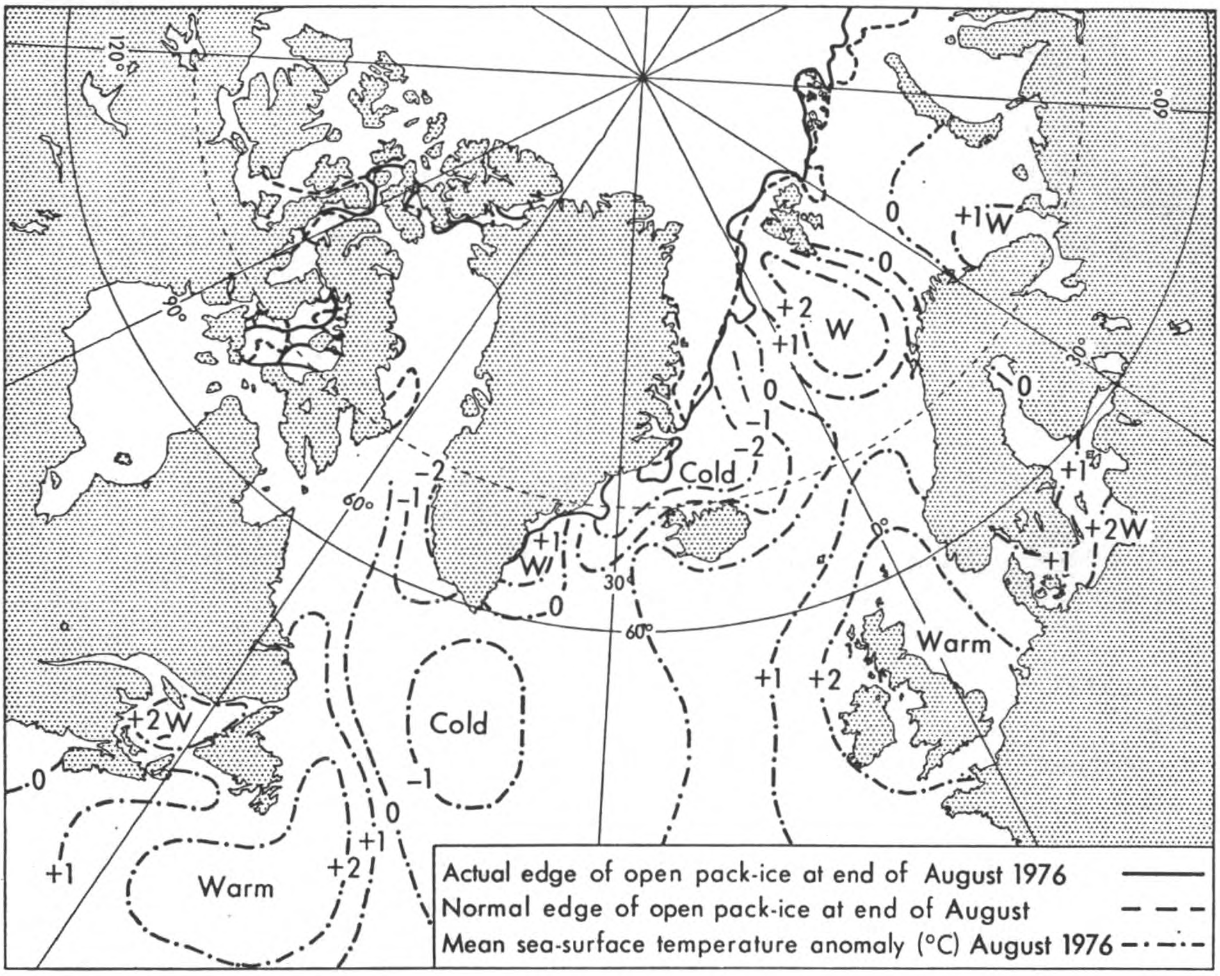
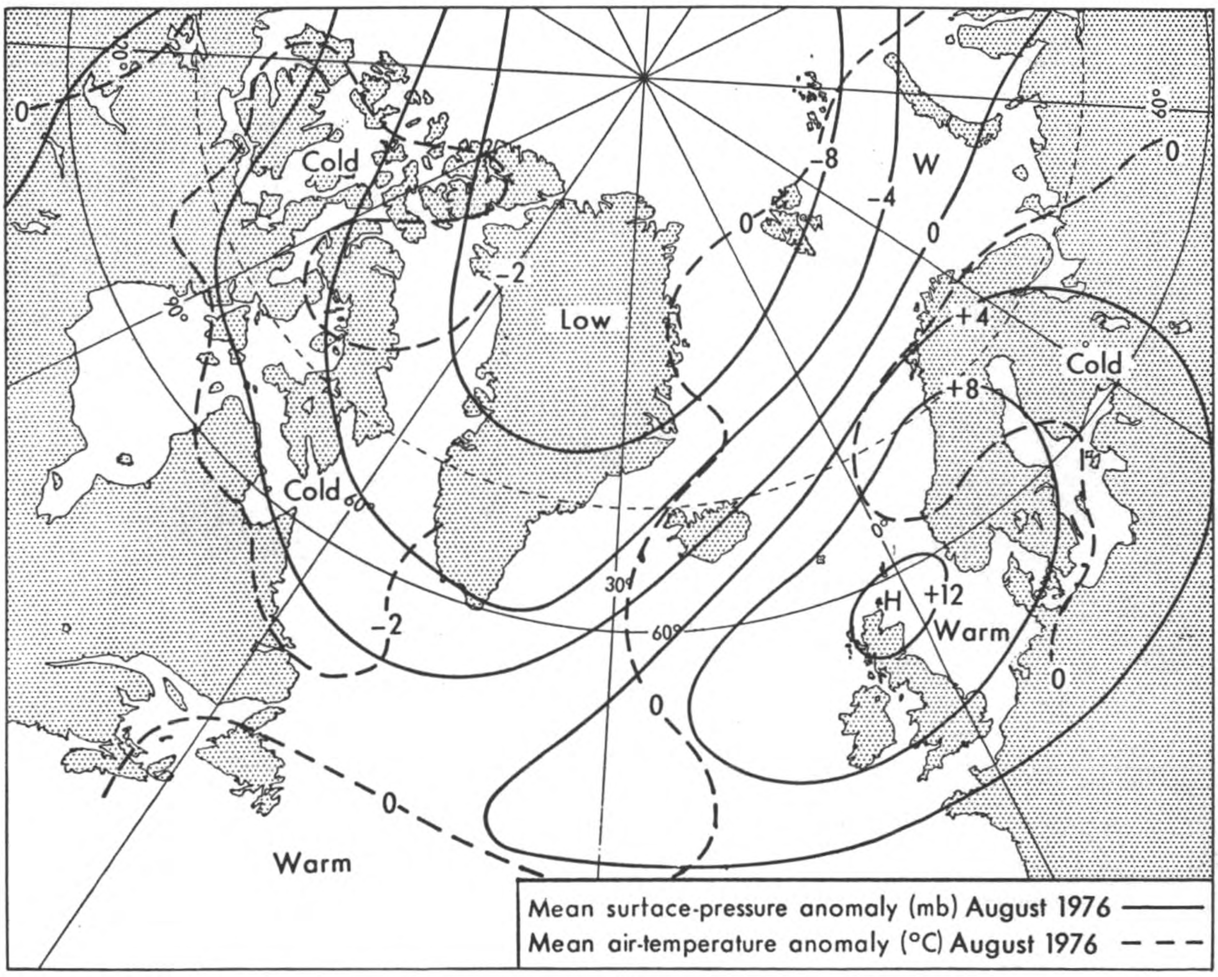

Warm
+3
+2
+1
0
-1
C
W
-2
Warm
+3+2+1
Actual edge of open pack-ice at end of July 1976
Normal edge of open pack-ice at end of July
Mean sea-surface temperature anomaly (°C) July 1976

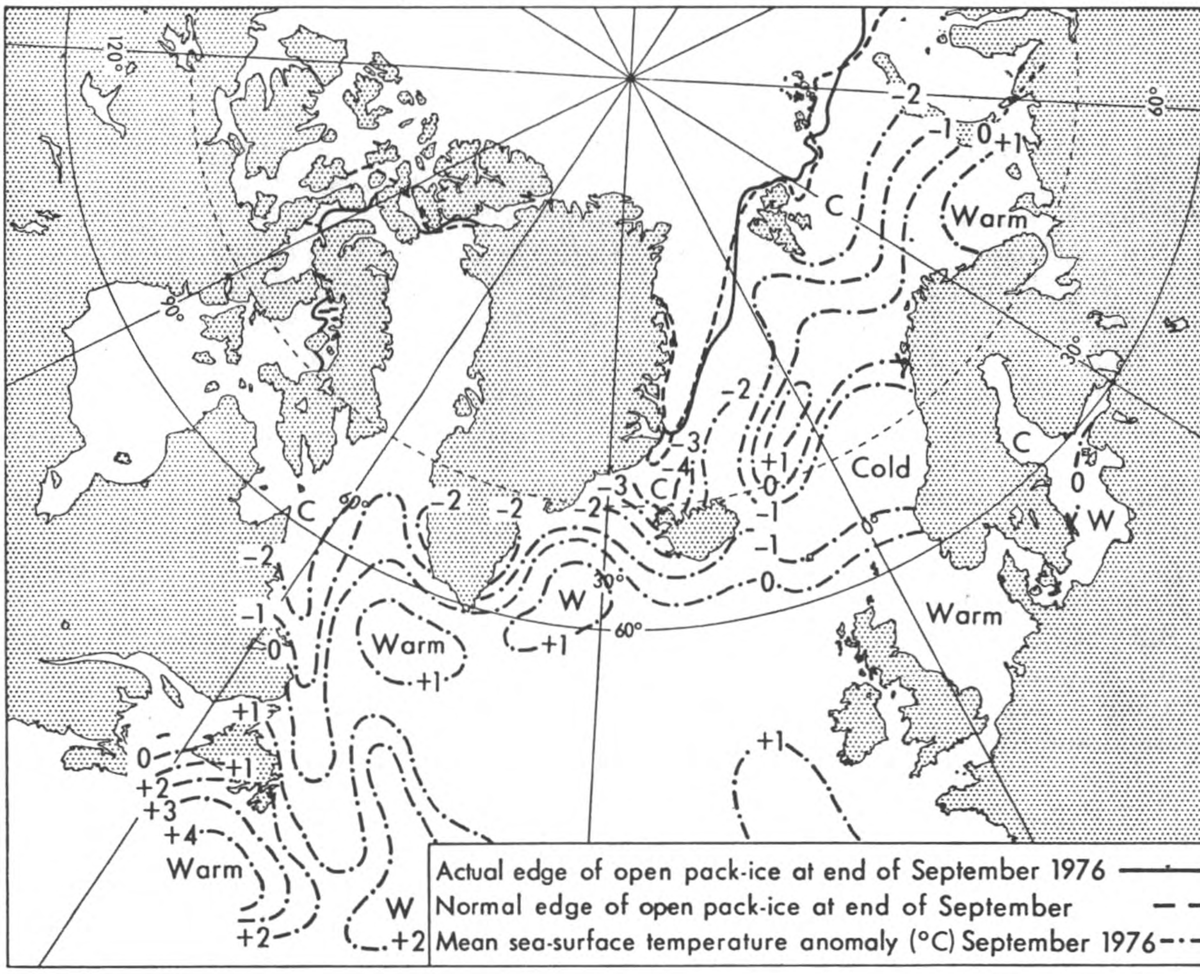

Warm
+2
0
High
Cold
-2
Warm
+4
High
W
+4
+2
Mean surface-pressure anomaly (mb) July 1976
Mean air-temperature anomaly (°C) July 1976

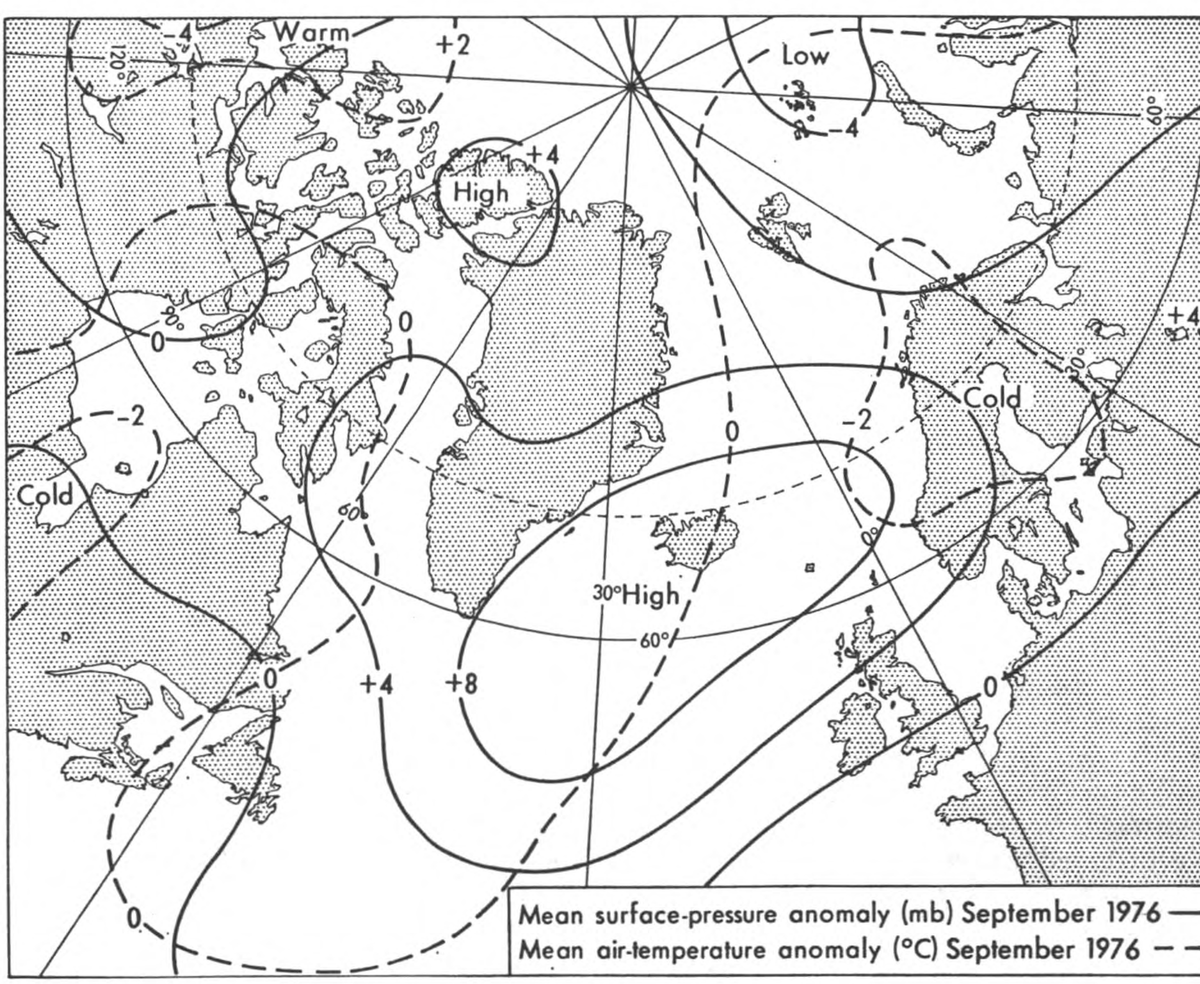


Cold
Warm
Cold
Warm
Actual edge of open pack-ice at end of August 1976
Normal edge of open pack-ice at end of August
Mean sea-surface temperature anomaly (°C) August 1976



Cold
Low
Cold
Cold
Warm
Warm
Mean surface-pressure anomaly (mb) August 1976
Mean air-temperature anomaly (°C) August 1976


Actual edge of open pack-ice at end of September 1976
Normal edge of open pack-ice at end of September
Mean sea-surface temperature anomaly (°C) September 1976
Warm
Cold
W
C
60°
30°
90°
120°


Mean surface-pressure anomaly (mb) September 1976
Mean air-temperature anomaly (°C) September 1976
High
Low
Warm
Cold
+8
+4
+2
0
-2
-4
60°
30°
90°
120°

Personalities

OBITUARY.—It is with great regret that we have to record the sudden and tragic death of MR H. E. ATKINSON, Assistant Scientific Officer in the Port Meteorological Office at Cardiff, during the course of a routine visit to the Selected Ship m.v. *Hazelmoor* in Cardiff Docks on 21 September 1976.

'Bill' Atkinson was born in Harrow, Middlesex on 2 July 1924 and was educated at Harrow County School. On the appointment of his father to the Headmastership of St Julians High School, his family moved to Newport, Monmouthshire, in 1936, and Bill completed his formal education at his father's school. After leaving St Julians he was indentured to the Bank Line as an apprentice. During his apprenticeship he was appointed Midshipman RNR and served in landing craft attached to the Mediterranean Fleet.

On completion of his apprenticeship he obtained his Second Mate's Certificate and became a contract officer on the Shipping Federation Pool. He served in a great variety of ships, mainly out of the Bristol Channel ports and, at one time or another, in ships belonging to all of the Bristol Channel ship-owners.

Bill passed for Master in 1959 and obtained Part A of the Extra Master's Certificate in 1962. He was invalided out of the Merchant Navy in 1965 following a severe accident at sea.

He joined the Meteorological Office in March 1966 and was appointed to Cardiff where he remained until his untimely death.

He was a member of the Institute of Navigation and the Nautical Institute and a fellow of the Royal Meteorological Society.

Bill's great passions were the sea, ships and the men who sailed in them. He held the 'Red Duster' in the highest esteem and had a deep regard and respect for his fellow seamen, whom he actively served through participation in the work of his local branches of both the Royal National Lifeboat Institute and the Missions to Seamen; his familiar figure will be sadly missed around the Bristol Channel ports.

We extend our deepest sympathy to his family.

D. J. F. S.

RETIREMENT.—CAPTAIN J. W. BORROWDALE retired recently after 36 years at sea.

Captain Borrowdale commenced his apprenticeship with Medomsley Steamship Company of Newcastle in 1940. On obtaining his 2nd Mate's Certificate in 1944 he transferred to Anglo-American Oil Company, later to be known as Esso Petroleum Company. Apart from a short period in 1946 he remained with this Company until his recent retirement. He was appointed to his first command in 1955 and he latterly was Master of the *Esso Cambria.*

We received Captain Borrowdale's first meteorological logbook from the *Esso Cambridge* in 1955. Since then he has sent us a further 18 logbooks.

We wish him health and happiness in his retirement.

RETIREMENT.—MR D. MURRAY, Radio Officer, retired on 3 June 1976 from Marconi International Marine Company after 42 years' service at sea.

David Murray joined Marconi on 29 May 1934 as Radio Officer and sailed in various foreign-going vessels until April 1953 when he joined s.s. *Laurentia* in which he remained until February 1965. Thereafter, until his retirement, he served in Scottish Coast vessels.

We received the first meteorological logbook bearing Mr Murray's name from the *Laurentia* in 1953 and since then he has been associated with a further 25 logbooks. He received Excellent Awards in 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1963, 1964 and 1965—an outstanding record of voluntary work for the Meteorological Office.

We wish him a long, healthy and happy retirement.

RETIREMENT.—COMMODORE D. H. STEWART, C.B.E., R.D., R.N.R., retired recently from the service of Ocean Fleets Ltd after serving 38 years at sea.

Desmond Hamilton Stewart first went to sea in 1938 as a midshipman with Blue Funnel Line.

During 1942 he had the misfortune to be torpedoed twice. The first occasion was in January of that year whilst serving in the *Cyclops* off Halifax, Nova Scotia and as a result of his meritorious service he was awarded Lloyd's Medal and mentioned in the *London Gazette*. In August that year he was again torpedoed, this time whilst on Malta Convoy duties and, as a result of that incident, was interned in Tunisia for four months.

Commodore Stewart joined the Royal Naval Reserve in January 1943 and for the rest of the war served in frigates in the Western Approaches and the Far East.

On demobilization in 1945 he returned to Blue Funnel Line. He was promoted to Master in 1961 and appointed to command of the *Myrmidon*. He latterly commanded the 'Bay' class container ships of the Ocean Transport and Trading Company on the Far East run.

Commodore Stewart remained with the Royal Naval Reserve after the war and was promoted to Commodore in 1971. On his retirement from the Reserve last year he was awarded the C.B.E., in the Birthday Honours List.

We received the first meteorological logbook bearing Commodore Stewart's name from the *Machaon* in 1948. Since then he has sent us a further 33 logbooks of which 24 have been classed as Excellent. He received Excellent Awards in 1966, 1969, 1971, 1972, 1973 and 1975.

We wish him a long, healthy and happy retirement.

Notice to Marine Observers

APPOINTMENT OF NEW PORT METEOROLOGICAL OFFICER

Captain John Holland Jones has been appointed Port Meteorological Officer in Cardiff to succeed Mr D. J. F. Southon who has been transferred to the new Port Meteorological Office in Newcastle.

Captain Jones was indentured as apprentice with British Petroleum Tanker Company (BPTC) in 1937 and remained with that Company for the whole of his sea-going career. He obtained his Master's Certificate in 1948 and was appointed to his first command, the *British Diligence*, in 1956. He retired from BPTC in 1975, his last command being the *British Confidence*.

In 1973 Captain Jones had the honour of laying the wreath on behalf of the Merchant Navy and Fishing Fleet at the Cenotaph in Whitehall on Remembrance Day. He is Warden of the Swansea and South Wales Company of Mariners.

Fleet Lists

Corrections to the list published in the July 1976 number of *The Marine Observer.*

Information regarding these corrections is requested by 30 September each year. Information for the July lists is required by 31 March each year.

GREAT BRITAIN (Information dated 1.10.76)

The following coasting vessels ('Marid' ships) have been recruited:

NAME OF VESSEL	MASTER	OWNER/MANAGER
Arco Thames	C. M. Hart	A.R.C. (Marine) Ltd.
Arco Tyne	C. Locke	A.R.C. (Marine) Ltd.
Bass Shore	S. Sage	Offshore Marine Co. Ltd.
British Security	G. K. Waite	B.P. Tanker Co. Ltd.
Corchester	J. Knox	Ocean Transport & Trading Ltd.
Cymbeline	H. Jackson	Houlder Bros. Ltd.
Earl Godwin	M. Handfield	British Rail
Hudson Light	M. R. Uminski	Hudson S.S. Co. Ltd.
L. M. Odin	D. Thompson	Land & Marine Engineering Ltd.
Mairi Everard	A. MacKinnon	F. T. Everard & Sons Ltd.
Oswestry Grange	M. Kirkley	Houlder Bros. Ltd.
Suavity	-. Anderson	F. T. Everard & Sons Ltd.
Wendy Weston	R. Biggs	G. Weston Shipping Ltd.
Whitegate	M. Parker	Turnbull Scott Management Ltd.

The following vessels have been deleted:

Bardic Ferry, British Osprey, Cerdic Ferry, Claymore, Dorset Coast, Frendo Star, Malling.

The following skippers and radio operators have been added to the Trawler Fleet List:

SKIPPER	RADIO OPERATOR	TRAWLER OWNER/MANAGER
F. Drewery	A. Preece	British United Trawlers Ltd.
P. Garner	A. Spence	Boyd Line Ltd.
J. R. Nelson	M. E. Morrow	T. Hamling & Co. Ltd.
R. Pepper	F. Thompson	Willemace Ltd.
W. Waddingham	A. S. Warman	Willemace Ltd.

GREAT BRITAIN *(contd.)*

The following ships have been recruited as Selected Ships:

Name of Vessel	Date of Recruitment	Master	Observing Officers	Senior Radio Officer	Owner/Manager
Al Rumaithian	22.7.76	B. Hird	R. J. Yelland, B. R. Denley, I. H. Clarke	C. R. Orpen	Kuwait Shipping Co. (SAK)
Al Shamiah	4.6.76	M. A. Wedgery	P. G. Moore, W. Vanes, R. Valvona	M. D. Tottoh	Kuwait Shipping Co. (SAK)
Almeda Star	14.4.76	F. P. McGuckin	G. S. Hart, R. A. Orford, J. C. Harris	J. H. McFarland	Blue Star Line Ltd.
Banbury	8.3.76	A. W. Cameron	P. Goodman, D. J. Magin, I. M. Wright	I. H. Snowden	Houlder Bros. & Co. Ltd.
Baron Belhaven	5.7.76	G. Towers	W. G. Finnie, R. W. N. Dodd, C. Groundwater	F. T. Howard	Scottish Ship Management Ltd.
Baron Napier	25.6.76	D. Sinclair	D. Cursiter, D. White	M. Thomas	Scottish Ship Management Ltd.
Beaverbank	2.8.76	W. A. Langworthy	F. G. Mealyer, R. F. Morton, J. N. Kenyon	G. R. Gadd	Bank Line Ltd.
Border Chieftain	20.8.76	J. Bruce	G. J. Pearson, T. Bailey, H. J. Stribblehill	R. J. Bryne	B. P. Tanker Co. Ltd.
Border Shepherd	13.7.76	T. Y. Watkins	C. J. Coxhead, R. Mills	D. MacPherson	B. P. Tanker Co. Ltd.
British Poplar	4.4.76	W. A. M. Hare	R. Raeburn, M. Hustwith, R. R. Frankis	D. Owen	B. P. Tanker Co. Ltd.
British Unity	28.7.76	F. Dawson	R. Massingham, J. Ronald, N. Baker	P. Williams	B. P. Tanker Co. Ltd.
Cape Rodney	19.3.76	A. M. Fraser	N. Smith, T. R. Walker, D. Johnson	J. McNeill	Lyle Shipping Co. Ltd.
Cedarbank	26.6.76	D. McPhail	S. J. Rabett, M. Bos-Walker, B. Stirling		Bank Line Ltd.
Choctaw II	7.5.76	H. Francis	C. Bird	C. Bird	Santa FE (U.K.) Ltd.
City of Winchester	5.7.76	N. B. Airey	D. Ayre	H. Hugget	Ellerman Lines Ltd.
City of York	18.8.76	E. D. Turner	C. P. Wake, C. Hainsworth, N. Ellison	J. Ward	Ellerman Lines Ltd.
Clytoneus	14.8.76	I. I. Laing	F. D. Baker, A. Searle, I. Fraser-Mitchell, A. C. Temple	D. Mackay	Ocean Transport & Trading Ltd.
Derwentfield	30.6.76	I. A. M. Haddow	J. Rayn, J. Jarwick, D. Sim	E. Chlechowicz	Hunting & Son Ltd.
Farnella	22.4.76	H. Powdrell	G. Christmas	G. Christmas	J. Marr & Son Ltd.
Fleetbank	19.5.76	P. Simpson	C. M. Notman, J. K. Ward, J. Steel	W. Davies	Bank Line Ltd.
Gardline Locator	4.5.76	H. Morrell	–. Hill, –. Withers		Gardline Ltd.
Hindustan	21.9.76	B. Ward	W. Taylor, W. Fraser, P. Jameson	–. Thurston	Common Bros. Ltd.
Ibn Abdour	20.5.76	J. S. Smith	J. R. Murray, P. A. Laurie, R. V. Ridges	D. W. Manning	Kuwait Shipping Co. (SAK)
Industria	14.5.76	C. P. White	G. F. Smith, R. Marshall, W. Rankin	M. P. Clarkson	J. &. J. Denholm Ltd.
King Egbert	1.7.76	T. A. Ireland	C. V. D'Costa, G. Roberts, J. Wilson	R. Buxton	Whitco Marine Services Ltd.
Linguist	24.8.76	J. Wilson	M. K. Austin, C. J. Wren, R. Pennock	G. J. Quirke	T. &. J. Harrison Ltd.
Loch Lomond	1.7.76	R. W. Cotter	A. N. MacLeod, S. Pottinger, T. Wake	P. J. Binnie	J. & J. Denholm Ltd.
Lynton Grange	26.8.76	J. Gilzean	P. Burrow, T. Banton, P. Healey		Houlder Bros. & Co. Ltd.
Matco Avon	3.6.76	D. Anderson	A. C. Brooking, G. C. Kelly, S. Jose	G. McDanielson	Mobil Shipping Co. Ltd.
Post Challenger	25.8.76	P. Bennison	A. Stobbs, M. Mitchel, A. Good, W. Fernis	M. Jackson	Panocean Shipping & Terminals Ltd
Shirrabank	28.6.76	P. H. Thomas	J. Nippers, N. E. Maxwell, R. J. Nibb		Bank Line Ltd.
Strathdirk	2.8.76	H. E. Wrightson	R. D. M. Hamilton, B. S. Dean, D. J. Perry	D. A. Hunt	P. & O. S.N. Co.
Taybank	14.7.76	R. J. Bridger	A. Stevenson, D. G. Houghton, S. G. Wride	J. J. C. Coman	Bank Line Ltd.

GREAT BRITAIN (*contd.*)

The following ships have been recruited as Supplementary Ships:

Name of Vessel	Date of Recruitment	Master	Observing Officers	Senior Radio Officer	Owner/Manager
Gowanbank	20.9.76	P. J. Elder	M. J. Perkins, J. Faulkner, A. M. Weale	S. Murphy	Bank Line Ltd.
Lord Mound Stephen	13.5.76	M. B. Shuker	R. A. Williams, B. N. Owen, G. Walterston	T. Smith	Canadian Pacific Steamships Ltd.
Lord St Vincent	26.6.76	R. Jobling	M. Allison	M. Allison	British United Trawlers Ltd.
Princess Anne	15.3.76	P. Craven	C. Sheen	C. Sheen	Boston Deep Sea Fisheries Ltd.
Rocknes	18.3.76	J. G. Sleight	P. Leale, J. Black, D. Cape	M. Emmett	Jebsen (U.K.) Ltd.
Sir Winston Churchill	26.4.76	C. P. R. Collis			Sail Training Association
Susan Miller	11.8.76	R. Ryce-Hughes	T. C. Sherlock, J. Griffiths, F. J. Wigley	W. G. Armstrong	St Vincent Shipping Co. Ltd.

The following Selected and Supplementary Ships have been deleted:

Avonfield, Bamburgh Castle, Benreoch, British Cygnet, British Swift, Cape Wrath, Chrysantema, City of Delhi, Clan Maclaren, Clan Maclean, Clan Macleod, Collin, Cumberland, Derbyshire, Edinburgh Castle, El Lobo, Gladiola, Glenmoor, Gothland, Hemifusus, Joseph Conrad, Mobil Endurance, Orchidea, Otaio, Pendennis Castle, Port Aukland, Primella, Raphael, St. Giles, Silver Pit, Sir William Hardy, Strathinver, Sugar Exporter, Sugar Importer, Sussex, Temple Bar, Venassa, Viking Vigilant, Welsh Herald, Worcestershire.

BRITISH COMMONWEALTH

INDIA (Information dated 1.4.76)

(This complete list was not available for the July 1976 number)

Name of Vessel	Owner
Selected Ships:	
Akbar	Mogul Line Ltd.
Andamans	Shipping Company of India
Dumra	Damodar Bulk Carriers
Dwarka	MacKinnon MacKenzie & Co. Ltd.
Indian Reliance	India Steamship Co.
Indian Renown	India Steamship Co.
Indian Security	India Steamship Co.
Indian Success	India Steamship Co.
Jag Kisan	Great Eastern Shipping Co.
Jalazad	Scindia Steam Navigation Co.
Jaladharma	Scindia Steam Navigation Co.
Jaladhanya	Scindia Steam Navigation Co.
Jaladuhita	Scindia Steam Navigation Co.
Jaladhruv	Scindia Steam Navigation Co.
Jalaganga	Scindia Steam Navigation Co.
Jalagirija	Scindia Steam Navigation Co.
Jalagouri	Scindia Steam Navigation Co.
Jalajyoti	Scindia Steam Navigation Co.
Jalakanta	Scindia Steam Navigation Co.
Jalakrishna	Scindia Steam Navigation Co.
Jalapalaka	Scindia Steam Navigation Co.
Jalavikram	Scindia Steam Navigation Co.
Jalavishnu	Scindia Steam Navigation Co.
Jaljawahar	Scindia Steam Navigation Co.
Karanja	MacKinnon MacKenzie & Co. Ltd.
Lok Sevak	Mogul Line Ltd.
Maharaja	South East Asia Shipping Co.
Mohammedi	Mogul Line Ltd.
Mozaffari	Mogul Line Ltd.
State of Assam	Shipping Corporation of India
State of Bihar	Shipping Corporation of India
State of Gujarat	Shipping Corporation of India
State of Haryana	Shipping Corporation of India
State of Kutch	Shipping Corporation of India
State of Maharashtra	Shipping Corporation of India
State of Orissa	Shipping Corporation of India
State of Punjab	Shipping Corporation of India
State of Tamil Nadu	Shipping Corporation of India
State of Travancore-Cochin	Shipping Corporation of India
State of Uttar Pradesh	Shipping Corporation of India
Vishva Maya	Shipping Corporation of India
Vishva Prabha	Shipping Corporation of India
Vishva Sudha	Shipping Corporation of India
Vishva Vir	Shipping Corporation of India
Supplementary Ships:	
Annapoorna	Shipping Corporation of India
Apj Anjali	Surendra Overseas Ltd.
Apj Ambika	Surendra Overseas Ltd.
Apj Sushma	Surendra Overseas Ltd.
Aradhana	Shipping Corporation of India
Bailadila	Shipping Corporation of India
Barauni	Shipping Corporation of India
Bellary	Shipping Corporation of India
Bhagat Singh	Shipping Corporation of India
Bhaskar	Shipping Corporation of India
B.R. Ambedkar	Shipping Corporation of India
Cahankya	Shipping Corporation of India
Chatrapati Shivaji	Shipping Corporation of India
Chennai Jayam	South India Shipping Corporation
Chennai Perumai	South India Shipping Corporation
Chennai Selvam	South India Shipping Corporation
Chidambaram	Shipping Corporation of India
Desh Bandu	Shipping Corporation of India
Devaraya	Shipping Corporation of India
Gauri Shankar	Himalaya Shipping Co. Ltd.
Harsha Vardhana	Shipping Corporation of India
Indian Endurance	India Steamship Co.
Indian Industry	India Steamship Co.
Indian Prestige	India Steamship Co.
Indian Progress	India Steamship Co.
Indian Prosperity	India Steamship Co.
Indian Resolve	India Steamship Co.
Indian Resource	India Steamship Co.
Indian Splendour	India Steamship Co.
Indian Strength	India Steamship Co.
Indian Tradition	India Steamship Co.
Indian Triumph	India Steamship Co.
Indian Tribune	India Steamship Co.

Name of Vessel	Owner
Indian Trust	India Steamship Co.
Indian Valour	India Steamship Co.
Indian Venture	India Steamship Co.
Jag Anjali	Great Eastern Shipping Co.
Jag Anand	Great Eastern Shipping Co.
Jag Asha	Great Eastern Shipping Co.
Jag Dev	Great Eastern Shipping Co.
Jag Doot	Great Eastern Shipping Co.
Jag Jawan	Great Eastern Shipping Co.
Jag Jiwan	Great Eastern Shipping Co.
Jag Jyoti	Great Eastern Shipping Co.
Jag Laxmi	Great Eastern Shipping Co.
Jag Manek	Great Eastern Shipping Co.
Jag Prakash	Great Eastern Shipping Co.
Jag Ravi	Great Eastern Shipping Co.
Jag Rekha	Great Eastern Shipping Co.
Jag Shakti	Great Eastern Shipping Co.
Jagat Neta	Dempo Steamship Co.
Jagat Swamini	Dempo Steamship Co.
Jagat Vijeta	Dempo Steamship Co.
Jaladharati	Scindia Steam Navigation Co.
Jaladhir	Scindia Steam Navigation Co.
Jaladurga	Scindia Steam Navigation Co.
Jaladuta	Scindia Steam Navigation Co.
Jalagomati	Scindia Steam Navigation Co.
Jalagopal	Scindia Steam Navigation Co.
Jalajaya	Scindia Steam Navigation Co.
Jalakala	Scindia Steam Navigation Co.
Jalakendra	Scindia Steam Navigation Co.
Jalakirti	Scindia Steam Navigation Co.
Jalamangala	Scindia Steam Navigation Co.
Jalamani	Scindia Steam Navigation Co.
Jalamatsya	Scindia Steam Navigation Co.
Jalamayur	Scindia Steam Navigation Co.
Jalamohan	Scindia Steam Navigation Co.
Jalamokambi	Scindia Steam Navigation Co.
Jalamorari	Scindia Steam Navigation Co.
Jalamoti	Scindia Steam Navigation Co.
Jalapankhi	Scindia Steam Navigation Co.
Jalarajan	Scindia Steam Navigation Co.
Jalarashmi	Scindia Steam Navigation Co.
Jalaratna	Scindia Steam Navigation Co.
Jalatarang	Scindia Steam Navigation Co.
Jalaveera	Scindia Steam Navigation Co.
Jalayamuna	Scindia Steam Navigation Co.
Jalayamini	Scindia Steam Navigation Co.
Jameela	Kerala Lines Ltd.
Jawaharlal Nehru	Shipping Corporation of India
Kanishka	Shipping Corporation of India
Laxmi	Shipping Corporation of India
Lal Bahadur Shastri	Shipping Corporation of India
Lok Adhar	Mogul Line Ltd.
Lok Nayak	Mogul Line Ltd.
Lok Palak	Mogul Line Ltd.
Mahabharat	South East Asia Shipping Co.
Mahabhakti	South East Asia Shipping Co.
Mahabir	South East Asia Shipping Co.
Maratha Progress	Chowgule Steamships Ltd.
Maratha Providence	Chowgule Steamships Ltd.
Neta-ji Subhas Rose	Shipping Corporation of India
Onge	Shipping Corporation of India
Prabhu Daya	Tolani Shipping Co.
Rama	Shipping Corporation of India
Ratna Kirti	Ratnakar Shipping Co.
Ratna Nandini	Ratnakar Shipping Co.
Ratna Shobhan	Ratnakar Shipping Co.
Ratna Usha	Ratnakar Shipping Co.
Sagar Deep	Shipping Corporation of India
Sagar Samrat	Oil & Natural Gas Commission
Samudra Gupta	Shipping Corporation of India
Sanchi	Shipping Corporation of India
Satya Kamal	Seven Seas Transportation Co.
Satyamurti	Shipping Corporation of India
Satya Sohan	Seven Seas Transportation Co.
Shahajahan	Shipping Corporation of India
Shompen	Shipping Corporation of India
State of Himachal Pradesh	Shipping Corporation of India
State of Kerala	Shipping Corporation of India
State of Meghalaya	Shipping Corporation of India
State of Madhya Pradesh	Shipping Corporation of India
State of Mysore	Shipping Corporation of India
State of Rajasthan	Shipping Corporation of India
State of West Bengal	Shipping Corporation of India
Tamilanna	Poomphur Shipping Corporation

Name of Vessel	Owner
Tasneem	Indo-Oceanic Shipping Co.
Vaishnavi	Hind Shipping Co.
Varun Yan	Thakur Shipping Co.
Vishva Abha	Shipping Corporation of India
Vishva Aditya	Shipping Corporation of India
Vishva Amber	Shipping Corporation of India
Vishva Amitabh	Shipping Corporation of India
Vishva Anurag	Shipping Corporation of India
Vishva Apurva	Shipping Corporation of India
Vishva Asha	Shipping Corporation of India
Vishva Bandhan	Shipping Corporation of India
Vishva Bhakti	Shipping Corporation of India
Vishva Bindu	Shipping Corporation of India
Vishva Chetana	Shipping Corporation of India
Vishva Dharma	Shipping Corporation of India
Vishva Jyoti	Shipping Corporation of India
Vishva Kalyan	Shipping Corporation of India
Vishva Kanti	Shipping Corporation of India
Vishva Karuna	Shipping Corporation of India
Vishva Kaushal	Shipping Corporation of India
Vishva Kirti	Shipping Corporation of India
Vishva Lalita	Shipping Corporation of India
Vishva Madhuri	Shipping Corporation of India
Vishva Mahima	Shipping Corporation of India
Vishva Mamta	Shipping Corporation of India
Vishva Mangal	Shipping Corporation of India
Vishva Marg	Shipping Corporation of India
Vishva Nayak	Shipping Corporation of India
Vishva Nidhi	Shipping Corporation of India
Vishva Pratap	Shipping Corporation of India
Vishva Pratibha	Shipping Corporation of India
Vishva Prayas	Shipping Corporation of India
Vishva Prem	Shipping Corporation of India
Vishva Raksha	Shipping Corporation of India
Vishva Sandesh	Shipping Corporation of India
Vishva Seva	Shipping Corporation of India
Vishva Shakti	Shipping Corporation of India
Vishva Shobha	Shipping Corporation of India
Vishva Siddhi	Shipping Corporation of India
Vishva Suman	Shipping Corporation of India
Vishva Tarang	Shipping Corporation of India
Vishva Tej	Shipping Corporation of India
Vishva Tirth	Shipping Corporation of India
Vishva Umang	Shipping Corporation of India
Vishva Usha	Shipping Corporation of India
Vishva Vandana	Shipping Corporation of India
Vishva Vibhuti	Shipping Corporation of India
Vishva Vijay	Shipping Corporation of India
Vishva Vikas	Shipping Corporation of India
Vishva Vinay	Shipping Corporation of India
Vishva Vivek	Shipping Corporation of India
Vishva Yash	Shipping Corporation of India
Visvesvaraya	Shipping Corporation of India
Vivekanand	Shipping Corporation of India
Yerewa	Shipping Corporation of India
Zakir Hussain	Shipping Corporation of India

Auxiliary Ships:
India has 30 Auxiliary Ships.

CANADA (Information dated 1.9.76)

Details given below are changes made since the corrected list published in the January 1976 number of *The Marine Observer*.

The following ships have been recruited as Selected Ships:

Bayfield (Government of Canada)
Canmar Explorer (Canadian Marine Drilling Company)
Canmar Explorer III (Canadian Marine Drilling Company)
Cape Breton Highlander (Leitch Transportation Limited)
Harfleur (J. & C. Harrison Limited)
London Pride (London Shipowning Company Limited)
Lord Seikirk II (Venture Manitoba Tours Limited)
Montcalm (Government of Canada)
Namao (Government of Canada)
Pandora II (Government of Canada)
Petrel V (Government of Canada)
St Lawrence Prospector (Leitch Transportation Limited)
Theta (Christensen Canadian Enterprises)
Zapata Ugiand (Marine Environmental Service)
Emerillon (Shell Canadian Tankers) is now a Selected Ship

The following ships have been deleted:

Agememnon, A. T. Cameron, Bernes, Cape Grenville, Gulf Canada, Havdrill, Imperial Acadia, Incan St Laurent, Irving Steam, Ixia, Northern Seal, Northern Shell, Ponza, Thorsisle and *Ungava Transport.*

Canada now has 85 ocean-going Auxiliary Ships and 77 Auxiliary Ships operating on the Great Lakes and inland waters.

HONG KONG (Information dated 14.9.76)

The following ships have been recruited:

Maersk Tempo (Maersk Line (HK) Ltd.)
Strathcarron (Mackinnon Mackenzie Ltd.)
Star Alcyone (Everett Steamship Corporation S/A)

NEW ZEALAND (Information dated 1.9.76)

The following have been recruited as Selected Ships:

Coastal Ranger (Shipping Corporation of N.Z.)
Tangaroa (N.Z. Government (Oceanography))
Tui Cakau (Pacific Line)
Union Hobart (Union S.S. Co. N.Z. Ltd.)
Westport (N.Z. Cement Holdings Ltd.)

The following ships have been deleted:

Atlas, Glomar, Tasman, Hawea, Rangatira, Woosung.

New Zealand also has a fleet of 12 Auxiliary Ships currently reporting.

SINGAPORE (Information dated 6.10.76)

Details given below are changes made since the list published in the July 1973 number of *The Marine Observer.*

The following ships have been recruited:

Golden City (Guan Guan Shipping (Pte) Ltd.)
Golden Horse (Guan Guan Shipping (Pte) Ltd.)
Neptune Emerald (Neptune Orient Lines Ltd.)
Neptune Orion (Neptune Orient Lines Ltd.)
Neptune Ruby (Neptune Orient Lines Ltd.)
Neptune Sapphire (Neptune Orient Lines Ltd.)

The following ships have been deleted:

Golden Haven, Golden Summer, Klias, Neptune Amethyst, Neptune Aquamarine and *Thorscape.*

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