Met.O. 904

The Marine Observer

A quarterly journal of Maritime Meteorology

Volume XLVII No. 258

October 1977

£1·25 net

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THE MARINE OBSERVER

A QUARTERLY JOURNAL OF MARITIME METEOROLOGY PREPARED BY THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE

VOL. XLVII **No. 258** **OCTOBER 1977**

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Letters to the Editor, and books for review, should be sent to the Editor, 'The Marine Observer', Meteorological Office, Eastern Road, Bracknell, Berkshire RG12 2UR

Published for the Meteorological Office by
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October, November, December

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.

'TYPHOON LOUISE'

North Pacific Ocean

m.v. *King William*. Captain P. S. G. Eckford. Port Walcott, Western Australia to Kure. Observers, the Master and ship's company.

2–6 November 1976. During this period Typhoon Louise was encountered. The following are selected extracts from the meteorological logbook.

2nd November

GMT

0600: Wind NW'ly, force 5. Pressure 1005·7 mb. Moderate sea, low swell. Occasional showers. Typhoon Louise located bearing 045°T distance 450 n. mile from the ship, moving NW at 15 knots, central pressure 925 mb.

0930: Alter course to 037°T to allow typhoon to pass ahead of vessel.

3rd November

0000: Wind w'ly, force 4. Pressure 1006·3 mb. Moderate N'ly swell. Showers. Louise bearing 350°T distance 270 n. mile from vessel moving NW at 15 knots, central pressure 905 mb.

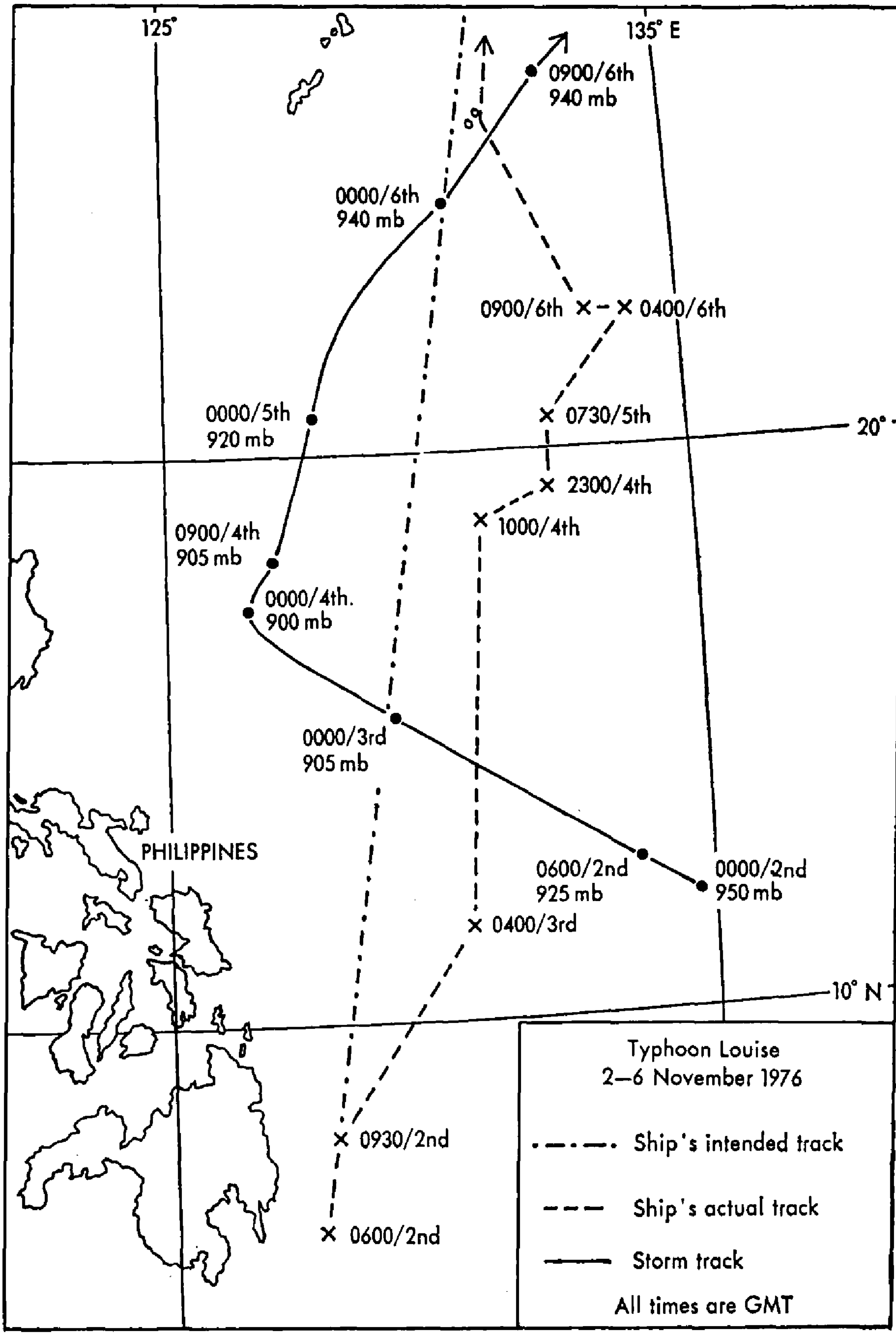
0400: Typhoon now passed well ahead of vessel. Alter course to 004°T towards Japan.

4th November

0000: Wind S'E, force 6. Pressure 1004·7 mb. Moderate confused swell. Showers. Typhoon now located bearing 285°T distance 270 n. mile, moving N at 8 knots. Central pressure 900 mb.

0600: Wind S'E, force 8. Pressure 1001·0 mb. Rough sea, moderate confused swell.

0900: Typhoon now bearing 270°T distance 240 n. mile from vessel, moving NNE at 10 knots. Central pressure 905 mb.



1000: Louise in process of recurving. Alter course to 045°T and speed reduced to 50 r.p.m.

1800: Wind SSE'ly, force 8. Pressure 1004·2 mb. Rough sea, moderate swell. Showers.

2300: Louise bearing 285°T distance 310 n mile moving N at 8 knots. Course altered to 360°T.

5th November

0600: Wind SSE'ly, force 8. Pressure 1003·2 mb. Rough sea, confused swell. Visibility reduced in showers. Typhoon bearing 285°T distance 270 n. mile, moving NE at 10 knots. Central pressure 920 mb.
0730: Course altered to 045°T to maintain distance from Louise.

6th November

0000: Wind S'ly, force 7. Pressure 1007·4 mb. Rough sea, confused moderate swell. Louise bearing 315°T distance 220 n. mile, moving NE at 15 knots. Central pressure now 940 mb.
0400: Alter course to 270°T to allow typhoon to pass to north of vessel.
0900: Wind SSW'ly, force 8. Pressure 1006·5 mb. Rough sea and heavy W'ly swell. Typhoon bearing 350°T distance 260 n. mile, moving NE at 20 knots. Central pressure 940 mb. Vessel alters course to 335°T.
1200: Wind SSW'ly, force 6. Pressure 1008·3 mb. Rough sea and heavy NW'ly swell. Louise now rapidly moving away NE. Normal course and speed towards Japan resumed.

Position of ship at 0600 on the 2nd: 06° 18'N, 127° 54'E.
Position of ship at 1200 on the 6th: 22° 54'N, 132° 54'E.

Note. Louise formed near the Caroline Islands on 30 October and reached typhoon intensity on 1 November. Between 2 November and recurvature on 4 November, when the central pressure fell to 900 mb, winds near its centre were estimated at 135 knots with gusts to 165 knots. After recurvature Louise slowly filled, moving NE to become extratropical on 6 November.

DEPRESSIONS

North Atlantic Ocean

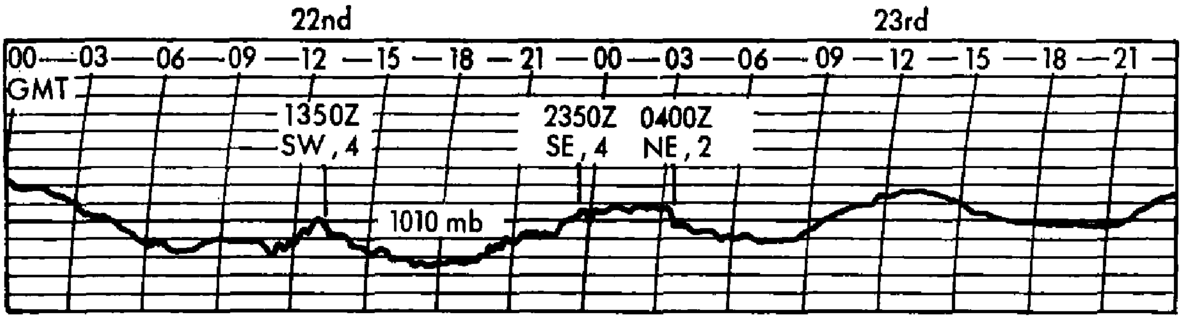
m.v. *Geestland*. Commodore P. W. Groves. Barry to Bridgetown. Observers, the Master, Mr I. M. Grant, Chief Officer, Mr M. Tomlinson, 1st Officer, Mr K. P. Slade, 2nd Officer, and Mr M. McGregor, Radio Officer.

22–23 October 1976. Whilst en route to Barbados the following information was recorded which indicated the presence of a depression in the area although no depressions or fronts were forecast for the locality in weather information received by radio.

At 0130 GMT on 22 October, moderate to heavy intermittent rain fell at the vessel and severe local thunderstorms with vivid lightning were experienced. The air temperature at this time was 26·0°C, pressure 1012·3 mb and wind E'ly, force 5. By 0300 the rain had ceased although the sky remained overcast and the wind dropped and veered to be SSE'ly, force 2 by 0600.

The conditions remained steady until 1130 when the wind rose sharply to SSE'ly, force 7 and the pressure fell rapidly by one mb to 1009·1 mb as shown on the barogram trace. Heavy rain was again experienced. Pressure then rose until 1350 when it reached its highest point of 1010·5 mb and the wind then veered to SW'ly, force 4. Moderate to heavy rain was experienced. The pressure then began to drop until it resumed the normal diurnal tendency about half an hour later. Air temperature was 24·0, the rain was easing and the wind steadied at SW, force 4. Intermittent moderate rain was experienced until 2350 when the pressure rose sharply by one mb and the wind backed to S'E, force 4. Heavy rain fell again and the temperature dropped to 24·0, having risen slowly to 28·0, by 1800.

The wind backed further to the NE'ly, force 2 by 0400 on 23 October. The trades were non-existent until arrival at Bridgetown at 1000, the wind then being variable, force 1–2 or calm. The air temperature was 26·1.



From later information received, it was surmised that we had passed through the beginning of hurricane 'Holly'.

Position of ship at 0000 on the 22nd: 21° 00'N, 52° 24'W.

Note. This depression was the beginning of Hurricane Holly as thought. However, it remained a comparatively weak system with winds of hurricane force being maintained for no more than a day.

North Atlantic Ocean

s.s. *Queen Elizabeth 2*. Captain R. H. Arnott. New York to Cherbourg. Observers, Mr D. Warden-Owen, Mr N. Bates, Mr C. G. Lunny, 1st Officers, Mr M. Scanlan, Mr I. H. Taylor, and Mr S. J. Dowden, 2nd Officers.

25–28 October 1976. During this period the vessel encountered heavy weather and the following are extracts from the logbook:

25 October. At 1500 GMT the barometer pressure was observed to be falling rapidly. The wind at the time was WSW, force 3. Low swell. Sky becoming overcast. Fine and clear. By midnight the pressure had dropped to 993·3 mb. The wind backed to SW and increased to force 4–5. Overcast with rain showers.

26 October. At 0315 in position 50° 26'N, 17° 10'W the wind veered to NW'ly, force 8–9 and the pressure dropped to 986·7 mb. Severe frontal conditions with line squalls were experienced. Very rough seas, but only a moderate swell. The pressure then started rising rapidly and the wind backed slightly, increasing to force 10. From that time the pressure continued to rise until 1200 when it steadied. At 1800 a sharp rise in pressure was noticed, the wind veered NW'ly, force 10 and a very heavy swell from the NW was also experienced. The pressure continued to rise steadily and frequent rain squalls occurred.

27 October. By 0600 the wind had moderated from the NW. It continued to moderate and by 1400 in position 48° 13'N, 35° 45'W it had backed to SW'ly, force 2. The swell was becoming confused and the barometer had steadied at 1022·7 mb before commencing another downward plunge. As the pressure steadily fell, so the wind increased, reaching gale force from the south by midnight.

28 October. At 0230 there was a rapid fall in pressure—4 mb in 15 minutes—and the wind speed reached an estimated 60–65 knots for a duration of about 30 minutes. From 0300–1100 the pressure remained steady and the wind moderated throughout. By 0700 it had become variable, force 1–2. Overcast sky, hazy horizon with a noticeable low inversion level. Main swell SE'ly but with also a shorter SW'ly swell. At 0800 the wind was still variable and the visibility was considerably reduced but by 0830 this was improving. The wind veered to NW and freshened and by 0900 had increased to force 5–6. Swell becoming less pronounced. Wind increased to force 6–7 by 0940.

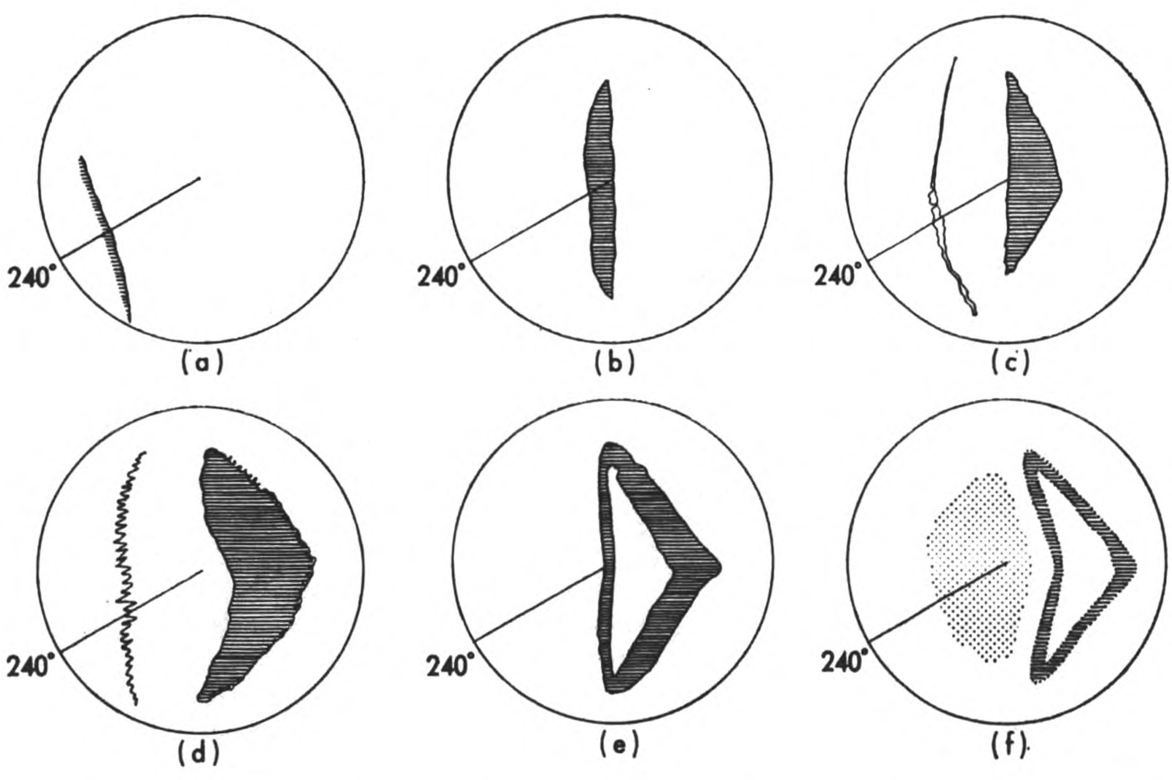
Position of ship at 1500 on 25th: 50° 14'N, 11° 04'W.

SQUALLS

North Atlantic Ocean

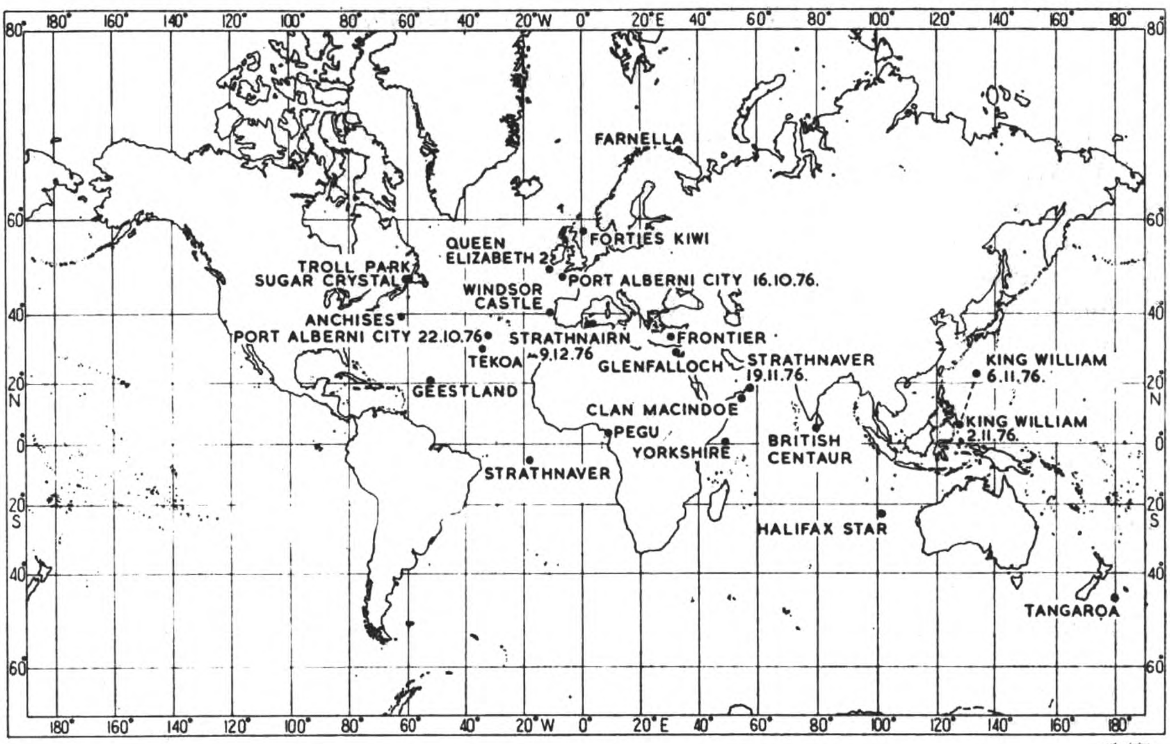
m.v. *Tekoa*. Captain S. T. S. Household. London to Panama. Observers, Mr D. R. K. Vickers, 3rd Officer, and Cadet R. J. Dockett.

26 December 1976. At 2200 GMT a line of rain was observed on the radar west of the vessel at a distance of 14 n. mile, see diagram (a). At 2225 the wind veered sharply to the south-west and increased to force 6–7 and this was followed within seconds by torrential rain. The squall ran in a N/S line over a total distance of 34 n. mile. When it was over the vessel, the pressure was steady at 1006·8 mb as it had been for the previous hour and the visibility was reduced to less than 60 m. By 2228 the main part of the squall had passed and it continued eastwards, light to moderate rainfall remained, the wind was steady and the visibility had increased to 2 n. mile. By all appearances we had passed exactly through the centre of the line. It was noticed at this time that the front of the squall had started to take on a definite arrowhead shape with the two limits of the line remaining in a stationary position to the north and



south of the vessel, see diagram (c) while 11 n. mile west of the vessel another band of rain was forming. At 2237 the rain had stopped and the wind had dropped to force 3, and by 2245 the clouds had become much less developed with occasional breaks in them observed. The radar now showed that the line-squall had formed into a very definite arrowhead with the second line of rain becoming more pronounced. At 2250 the vessel was hit by a second squall; the wind increased to SW'ly, force 9, torrential rain fell and reduced the visibility to less than 30 m while the pressure remained steady. On the radar at this time, the rain had assumed a distinctive triangular formation, see diagram (e). The rain eased to a steady drizzle at 2255 and continued without a break until 0125 on 27 December, the wind dropped to force 3. Diagram (f) shows the situation at 2255 and shortly after this the rain rapidly dissipated. The unusual thing about the observed squalls was the way in which the second one developed so quickly and joined up with the extremes of the first leaving a relatively calm centre.

Position of ship at 2225 on the 26th: 30° 57′N, 34° 19′W.



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

ICE ACCRETION

North Atlantic Ocean

m.v. *Troll Park*. Captain P. T. Boundy. St John to Stephenville. Observers, the Master, Mr G. J. Watt, 2nd Officer and ship's company.

11 December 1976. When the vessel was on the passage along the Nova Scotian coast ice accretion began on the port side of the forecastle (No. 1 hatch) and on the port side of the maindeck including the port sides of No. 2 and 3 hatches. Only at the end of the voyage did No. 4 hatch become affected, but on the port side alone and to a much lesser degree.

The vessel had started shipping spray during the 12–4 watch on 9 December, shipping moderate to heavy spray overnight. Spraying was incessant until the vessel rounded Cape Anguille, Newfoundland. During the voyage, the thickness of the ice was estimated only, as it was impossible for anyone to go forward due to the fact that the vessel was shipping spray over her entire forepart. On arrival off Stephenville, the windlass was so heavily iced up that anchoring was deemed impossible, thus forcing the vessel to lie stopped some 20 n. mile off the port from 2100 GMT on 10 December to 1100 on 11 December. At this stage we were able to measure the ice thickness and found it to be 42 cm on most parts of the forecastle/No. 1 hatch and the port side of No. 2 hatch down to approximately 20 cm in the vicinity of No. 4 hatch.

The loading berth in Stephenville is located in the 'Stephenville Pond', a lagoon of about one sq. mile in area and this was covered with new ice of 20 cm thickness. The ice was broken up by tug and trawler movement and moved freely with various wind changes. Weather conditions at 0600 on 10 December were: air temp. −12.8°C, wet bulb −13·2, wind NW'N, force 11.

Position of ship at 0600 on the 11th: 48° 24'N, 58° 54'W.

RIGHT WHALE DOLPHINS

South Pacific Ocean

r.v. *Tangaroa*. Captain D. N. Gillstrom. Bounty Islands to Wellington. Observers, Mr P. M. Allison, 3rd Officer and Mr J. A. Bartle, Ornithologist (National Museum of New Zealand).

7 November 1976. About 150 n. mile NNE of Bounty Islands a small school of whales crossed the bow. Five Pilot whales were also observed at a distance of about 80 metres moving slowly eastward; they had white patches behind the dorsal fin.

Quite suddenly seven small slim dolphins appeared; they were black above with a white underside and cleared the water in spectacular fashion. It was observed that they lacked a dorsal fin and thus resembled huge penguins. After consulting several books it became clear that they were Right Whale Dolphins, *Lissodelphis peroni*. These are very rarely seen in New Zealand waters. 'We,' write the observers, 'are aware of only 12 previous sightings of this species, although one sighting was of a school of 1000 plus animals.'

The sea-surface temperature at the time was 9.3°C.

Position of ship: 45° 14'S, 180°00'.

Note 1. Mr S. G. Brown, Whale Research Unit of the National Environmental Research Council, comments:

'This sighting is an important addition to records of the Southern Right Whale Dolphin. This species is apparently widely distributed in the southern hemisphere in the zone between the Sub-tropical Convergence and the Antarctic Convergence, but very little is known of its biology. A recent compilation by R. L. Brownell of the available data on its occurrence since the first published description in 1804 plots about 50 records. 28 records are in the waters of Tasmania, New Zealand and the south-west Pacific Ocean west of 135°W longitude. There are 18 records in South American waters but only 2 for the South Atlantic and Indian Ocean sectors of the Southern Ocean between longitudes 45°W and 135°E.

'The position of the present sighting in November 1976 is very close to that of the two sightings in the period late January, February and March 1967, plotted by D. E. Gaskin. During this period he records sightings in the south-west Pacific Ocean of 12 schools, with an average of 7 animals in each school, in waters with surface temperatures of 9°C to 17°C.'

REFERENCES

BROWNELL, R. L. Jr. Small Odontocetes of the Antarctic. *Antarctic Map Folio Series*, **18**, *Antarctic Mammals*. American Geographical Society, 1974.

GASKIN, D. E. Distribution of Delphinidae (Cetacea) in relation to sea-surface temperatures off eastern and southern New Zealand. *N.Z. Jl. mar. freshw. Res.*, **2**, No. 3, 1968, pp. 527–534.

Note 2. r.v. *Tangaroa* is a New Zealand Selected Ship.

SNAKE

Gulf of Guinea

m.v. *Pegu*. Captain J. McGechen. Victoria anchorage, Cameroun. Observers, Mr J. Prosser, Chief Officer, Mr H. A. Price, 3rd Officer and ship's company.

6 December 1976. At 0700 GMT whilst loading cargo from barges, a snake was sighted on deck. It was thought to have been brought on board by eagle-like birds which hovered over it. When approached by an intruder (the Chief Officer) it moved rather quickly in the opposite direction. Eventually the snake was captured and killed as the natives warned us that it was deadly poisonous.

The snake had a dark-brown shiny back which lightened towards the head. Its underside was a lighter brown and close to the head was a yellowish patch containing 4 rings with a fifth in the process of developing. A native informed us that the rings indicated the age of the snake and that this one was about 4½ years old. It was about 1·5 m long and 13 cm–15 cm in circumference.

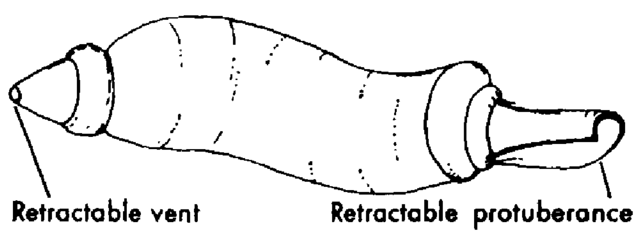
Position of ship: approx. 4° 00'N, 09° 12'E.

MARINE LIFE

Indian Ocean

m.v. *Yorkshire*. Captain H. E. Carlisle. Ra's Tannūrah to Bonaire (Lesser Antilles). Observers, the Master, Chief Officer, Mr F. A. Bayliss, 1st Officer, Mr S. A. McClure, 2nd Officer, and Mr B. Holcombe, Extra 2nd Officer.

30 October 1976. At 0900 GMT the No. 2 permanent ballast tanks were being inspected after discharge at Ra's Tannūrah, having been filled near Los Angeles. Only puddles remained and the creature shown in the sketch was found in one of them, moved around by the motion of the ship. It was placed in a tin of salt water



in which it reclined while observations were made. The 'thing' seemed very elastic and moved in a similar fashion to a worm although the bodily contractions and expansions were much more pronounced. Its body width varied between 0·7 cm and 1·4 cm and the length between 6 cm and 15 cm. The 'head' end had a creamy-white protuberance through which it appeared to draw water which after being passed through the body (one could see white intestines moving backwards and forwards under the skin) was ejected from the tail end. The mouth had the look of a hollow pipe which had been cut on the lower side. Our creature's over-all colour was brown but with white patches below the skin which we believed was transparent.

Position of ship at 0600 on the 30th: 01° 00′N, 49° 06′E.

BIRDS

North Atlantic Ocean

s.s. *Windsor Castle*. Captain P. St Q. Beadon. Cape Town to Las Palmas.

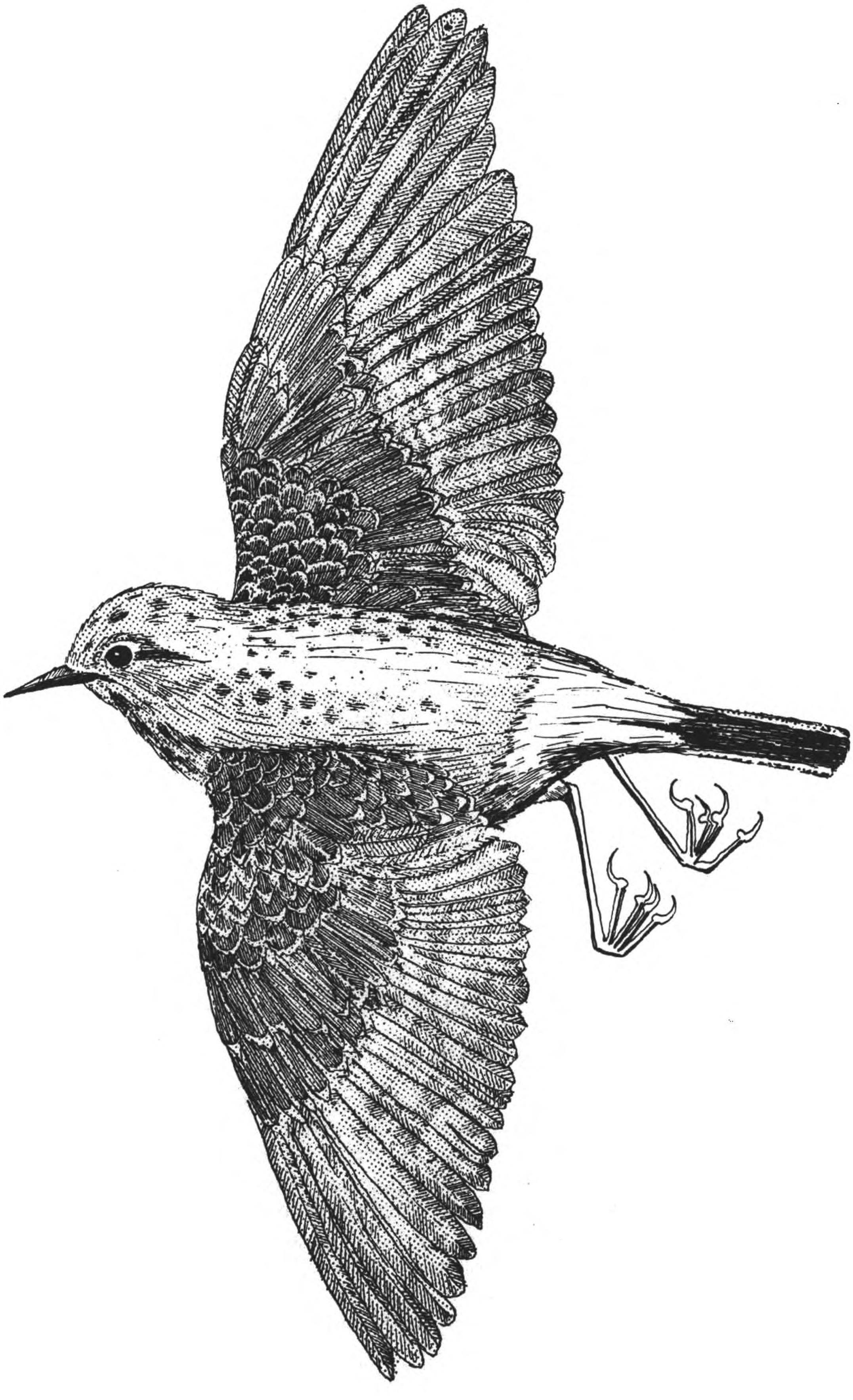
9 October 1976. At 1430 GMT in a position 83 n. mile SE of Cabo Mondego on the west coast of Portugal, a bird was found by a passenger on board the vessel. The bird was seen to fly into the vessel's superstructure thus killing itself.

A painting of the bird, see illustration, was made by the children's stewardess. Later the bird was buried with all due ceremony at sea by the children.

Throughout the day many land birds were observed flying around the vessel and a bird of the same species as that found by the passenger was observed, by the 2nd and 4th Officers, to land on deck to wash and preen itself.

Position of ship: 40° 40′N, 10° 35′W.

Note. Captain G. S. Tuck, Chairman of the Royal Naval Bird Watching Society, comments: 'This is a very charming painting of what I consider to be one of the several very similar sub-species of the Rock Pipit/Water Pipit, *Anthus spinoletta*. A number of races of this species occur, the finely-pointed longish beak places this within this particular group. It is, however, rather hard to place this bird from the painting as its underside is not clearly available. The Rock Pipit is larger than the other breeding pipits and has an overall length of about 16 cm and its 'topside' is rather darker.



'These birds breed in Europe from Norway southwards and from the Baltic and White Sea, and are also found further south in winter in Portugal. They are found on rocky coasts, mountain tops, sea coasts and marshes. The sub-species Water Pipit, *Anthus spinoletta spinoletta* is characterized by a pinkish flush on unstreaked breast.'

North Atlantic Ocean

m.v. *Port Alberni City*. Captain B. A. Boyer. Antwerp to Panama Canal. Observers, Mr P. C. Roberts, 3rd Officer and Mr R. E. Diamond, 2nd Engineer.

22 October 1976. At 1000 GMT four birds were found on deck around the ship. They were all covered in oil and obviously exhausted. The wind at the time was N'ly, force 4 with a moderate sea and swell, air temperature 20·5°C, cloudy with occasional light rain showers. The birds were placed in the 2nd Engineer's shower (not with it on we hasten to add), and here they were cleaned using methods previously described in past copies of *The Marine Observer*. It was whilst perusing these tomes for ways in which to clean the birds, that several photographs and sketches were discovered which identified our birds as Leach's Petrels. All four were fed on tinned sardines which they appeared to enjoy.

Over the next two days three of the birds made seemingly successful recoveries but the fourth's health left much to be desired and was unfortunately found dead on the third morning. As the other three appeared fully fit and raring to go it was decided to release them. Weather at the time was cloudy with occasional light to moderate showers, wind was S'ly, force 4–5. Two of the birds immediately took to the air and were not seen again, the third, however, could not have been quite as fit because he fluttered around for 5 or 10 minutes, then landed on the deck apparently rather exhausted. He was kept overnight for observation and was released on the fourth morning; this time he never looked back.

Position of ship: 34° 00'N, 32° 12'W.

Mediterranean Sea

m.v. *Frontier*. Captain D. Smith. Haifa to Valletta. Observers, the Master, Mr W. A. Lowe, Chief Officer and Mr P. Doyle, 3rd Officer.

12 October 1976. At 0730 GMT two small birds were observed flying around the foredeck and the boat deck. They appeared to be quite lively although in search of food and would not allow anyone to come too close to them. Their over-all colour was grey/dun with a yellowish breast. There was a black 'sickle' shape across the throat/breast and they had black legs with a black and white striped 'fan' tail which was easily seen when the birds were in flight. When walking thay had a curious bobbing motion, almost a strutting sort of walk. This motion was reminiscent of a member of the wagtail family and on checking the *AA pocket book of British Birds* we decided they were Pied Wagtails.

There were also two larger birds, at first thought to be hawks, flying around in a very erratic manner. When these settled (in a very, very tired-looking squat) they were tentatively identified as Nightjars although the plumage of one was very much lighter than shown in the booklet. This we decided was due to the fact that one was male and the other female or else one was an adult and the other a youngster.

They all managed eventually to find some rain water for a drink and one of each species showed great interest in a container of grapefruit that had been opened for ventilation on deck. In fact the wagtail even flew into the container and perched on the cases for a few minutes before taking to the wing again. The birds remained with us for quite some time before heading off in an unknown direction. Wind E'ly, force 2–3. Course of ship 280°T at 13·5 knots.

Position of ship: 33° 30'N, 30° 25'E.

Note. Captain G. S. Tuck comments:

'From the description of the yellow breast and black 'bib', the birds were probably Grey Wagtails (*Motacilla cinerea*).'

North Sea

m.v. *Forties Kiwi.* Captain J. Hobbs. On station, Forties Oil Field. Observers, Mr A. A. Beattie, Chief Officer and Mr H. Benson, Radio Officer.

19 November 1976. Since coming on station at the Forties Field many different birds have been sighted and caught aboard the ship. The most popular species has been the starling—during the second half of October we were inundated with them, which is a common occurrence on the platforms. In the same period we had a colony of Hooded Crows, numerous goldfinches and chaffinches and a mallard duck. The latest arrival was a young male water rail; this was decided after comparing it with a 'Book on Birds'. It flew into Mr D. J. Fraser's (Medic) cabin at about 1900 GMT and was kept overnight. During this time it drank a great deal but would not eat.

Position of ship: 57° 44'N, 00° 55'E.

North Atlantic Ocean

m.v. *Sugar Crystal.* Captain G. Pirie. Gibraltar to Quebec. Observer, Mr G. Dunkley, 2nd Officer.

25–26 October 1976. Birds appeared after dusk on 25 October and flew into as well as around the accommodation. The entirety of the invasion may have included several hundred birds but only a few have been recorded. Many were probably attracted by the accommodation lighting together with the warmth but even more flew into darker unlit areas thus killing or maiming themselves. The black-painted funnel claimed more than 50 victims. With a flashlight the birds were very easy to approach and they all gave the impression of complete exhaustion and bewilderment. A few of the ship's staff gave food and shelter to some of the birds and this was eagerly accepted. A total of 42 birds spent the night in boxes in Mr S. J. Hingston, 3rd Engineer Officer's cabin. Of these, 34 were released in the morning, 6 died and 2 after recovering from their injuries were released later. Those birds spending the night in the accommodation were: 26 Fox Sparrows, 17 Ruby-crowned Kinglets, 15 Swamp Sparrows, 26 Hermit Thrushes, 2 White-crowned Sparrows, 46 Lincoln's Sparrows and 2 Slate-coloured Juncos. The following were found dead on board: 74 Hermit Thrushes, 24 Swamp Sparrows, 3 American Robins, 22 Fox Sparrows, 16 White-crowned Sparrows, 85 Ruby-crowned Kinglets, 55 Lincoln's Sparrows and 58 unidentified sparrows.

The invasion of birds persisted throughout the morning and afternoon of 26 October, but on a lesser scale. Bread, milk, water, cereals, fruit and vegetables were fed to the sheltered birds.

Position of ship: 47° 59'N, 60° 43'W.

Note. Captain G. S. Tuck comments:

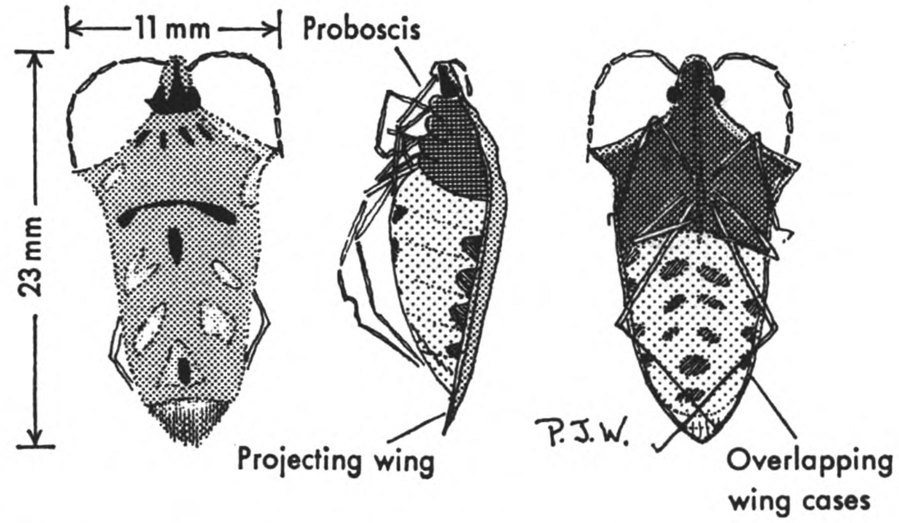
'This was a very marked fall of birds in bad weather during southerly migration, all American species.'

INSECTS

Indian Ocean

m.v. *British Centaur.* Captain R. Towell. Ban Si Racha to Persian Gulf. Observer, Mr P. J. Whiteley, Radio Officer.

11 November 1976. At approximately 0600 GMT the body of an insect was found, see drawing. Its body shell was brown and completely hard, the proboscis was straight rather than spiral and lay flat against the body. The over-all impression gained was that of a large ladybird. It could have landed on the ship anywhere



between Singapore and Thailand and was only one of a number of insects ranging from crickets to dragonflies that were flying around the ship.

Position of ship: 06° 00'N, 80° 00'E.

Note. Mr C. H. C. Lyal, Department of Entomology, British Museum (Natural History), comments:

'The insect depicted is a Scutellerid bug (Hemiptera: Heteroptera—Scutelleridae) *Cantao ocellatus* Thunberg. So far as I know, it has no common English name. The species is fairly common in the Oriental region through which the ship was sailing.'

BIOLUMINESCENCE

North Atlantic Ocean

m.v. *Anchises*. Captain M. R. Foster. Norfolk, Virginia to Redcar. Observer, Mr M. V. Hobbs, 3rd Officer.

18–23 October 1976. During the periods of darkness, examples of bioluminescence were observed. These examples took the form of frequent bright-green flashes in the ship's bow wave and wake together with thousands of minute sparkling flashes which were observed in the seas shipped on deck by the vessel as she rolled. The number of flashes in the bow wave was greatly increased and more pronounced on the evening of 19 December when the vessel experienced rough seas. The white crests of the sea waves also seemed brighter on this evening. Throughout the observing period the sea temperature fluctuated over a wide range.

Position of ship at 0600 GMT on 18 October: 39° 24'N, 62° 36'W.

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

'This might be an example of water containing a high density of luminous copepods (*Pleuromamma* sp.) but other interpretations are possible.'

Arabian Sea

m.v. *Clan Macindoe*. Captain T. E. Roberts. Aden to Bombay. Observer, Mr C. Parkinson, 2nd Officer.

4 October 1976. At 2335 GMT marine bioluminescence was observed on the port bow in the ship's wash. It started as a straight line about 6 m long and very rapidly, almost instantaneously, changed to a crescent moon shape with the apexes towards the ship's side, away from the wash before becoming a full circle and diminishing in brilliance. Weather details at the time were: air temp. 25·3°C, wet bulb 24·7, sea 26·3, pressure 1012·1 mb, wind W'N, force 1.

Position of ship at 1800: 15° 00'N, 55° 00'E.

Note. Dr P. J. Herring comments:

'This is an unusual report. Perhaps a small school of fish was responsible; alternatively a very long specimen of *Pyrosoma* (they are known to grow to 9 m) might have produced the same effect.'

m.v. *Strathnaver*. Captain D. G. Foreman. Dubai to Dar es Salaam. Observers, Mr J. C. Etheridge, 3rd Officer and Cadet N. D. Maclean.

19 November 1976. At 1700 GMT several patches of bioluminescent bloom close to the starboard bow were observed moving across in a SE'ly direction. The largest was oval in shape and approximately 90 m long by 30 m wide; the others, about 4 in number were of a milky-white colour and continuous. No abnormal smell was noticed. Weather details at the time were: air temp. 26·3°C, wet bulb 22·5, pressure 1013·4 mb, wind NE'N, force 3.

Position of ship: 18° 13'N, 57° 23'E.

Note. Dr P. J. Herring comments:

'These were probably local patches of milky sea.'

South Atlantic Ocean

m.v. *Strathnaver*. Captain P. W. Price. Dar es Salaam to New York. Observers, Mr B. J. Kirtley, 2nd Officer, Mr J. C. Etheridge, 3rd Officer and Cadet K. Allmosallam.

28 December 1976. At 0130 GMT numerous flashing patches of bioluminescence were observed on the sea surface. They were about 2–2·5 m in diameter and appeared as explosions of blue/white light. The flashing occurred completely at random and bore no apparent relation to the rhythm of the ship's engine. The extent of the phenomenon was limited to approximately a quarter-mile radius around the ship, but was concentrated for'ard of and on the beam. Shining the Aldis lamp on the sea produced no noticeable effect upon the display which lasted about 30 minutes. No abnormal smell was noticed. Weather details at the time were: air temp. 24·8°C, wet bulb 23·5, sea 25·6, pressure 1012·8 mb, wind SE'E, force 4.

Position of ship: 05° 30'S, 17° 43'W.

Note. Dr P. J. Herring comments:

'These spectacular flashing patches might have been either surface phenomena or the erupting "patches" believed to be induced by underwater earthquakes. The vessel was in the region of the mid-Atlantic ridge which is an area where seismic activity is likely.'

FOGBOWS

Mediterranean Sea

m.v. *Strathnairn*. Captain M. Robinson. Port Said to Avonmouth. Observers, the Master, and Mr J. F. Payne, 3rd Officer.

9 October 1976. At 2200 GMT the ship entered a fog bank of medium thickness through which the moon and stars above about 30° altitude were visible. A bright white bow was observed arching over the foredeck slightly offset to starboard and reaching a height of about 9 m above the deck. A fainter secondary bow surmounted the first and a third, barely discernible bow was detected atop that. At first it was thought to be due to the foremast navigation light, but it was soon realised as the bows gradually moved round to starboard that they were in fact lunar fogbows caused by the very bright moon astern of the vessel. Although the phenomenon was very distinct no colours were observed and the bows vanished at 2230 when the fog thickened. Occasionally after this the fog would thin slightly and a bow once again became visible but only faintly and no secondary bows were observed again. The

wind was calm and the temperatures were as follows: air temp. 14·7°C, wet bulb 14·0, sea 16·1.

Position of ship at 1800 on the 9th: 37° 06′N, 02° 06′E.

Note. Fogbows are produced in the same way as ordinary rainbows but because of the smallness of water droplets in fog less refraction occurs, the colours overlap and the bow appears white. When a fogbow is caused by the sun, its outer margin may have a reddish tinge and in its inner margin a bluish colouring but the middle of the band is quite white.

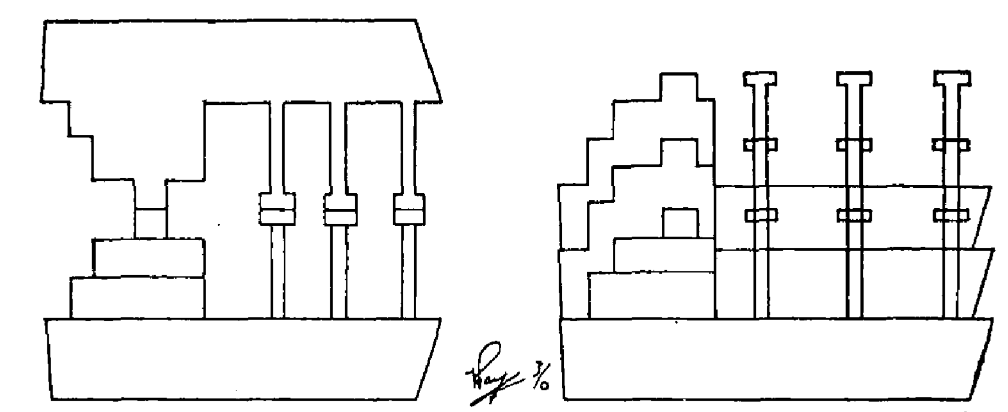
ABNORMAL REFRACTION

Mediterranean Sea

m.v. *Strathnairn*. Captain M. Robinson. Port Said to Avonmouth. Observers, the Master, Mr J. F. Payne, 3rd Officer, Mr R. Willcocks, Radio Officer, and Mr R. Major, 4th Engineer.

9 December 1976. At 1020 GMT whilst the vessel was off Cap Corbelin, it was noticed that the horizon ahead of us was very ragged and broken giving the appearance of a low-lying, sandy tree-covered coastline—causing a certain amount of consternation for a minute or two! A whitish and shimmering line lay along the horizon, similar in appearance to an approaching fog bank and stretched from ahead, down the coastline and round to astern of the ship. It was then that the insignificant coastal vessels, the nearest being about 14 n. mile 'inside us' were observed to be suffering the strange effects of abnormal refraction.

There were six ships in all strewn along different parts of the coastline. Three of them were greatly magnified, vertically extended, laterally 'squashed' and had an inverted image over them. The remainder were similarly distorted but had three or more non-inverted images above them, see diagram. All the ships observed seemed



to be floating just above the surface of the sea. These effects lasted until 1050 when the ships became vertically squashed and laterally extended, looking at times as if they possessed no accommodation or superstructure. No secondary images were observed at this time and by 1115 the phenomenon had ceased, the ships resuming their original speck-like appearance.

The sea at the time was calm with no wind and there was a low, short SW'ly swell. Cloud cover was 5 oktas hooked cirrus and the temperatures were: air temp. 18·5°C, wet bulb 14·0, sea 15·9.

Position of ship: 37° 12′N, 03° 48′E.

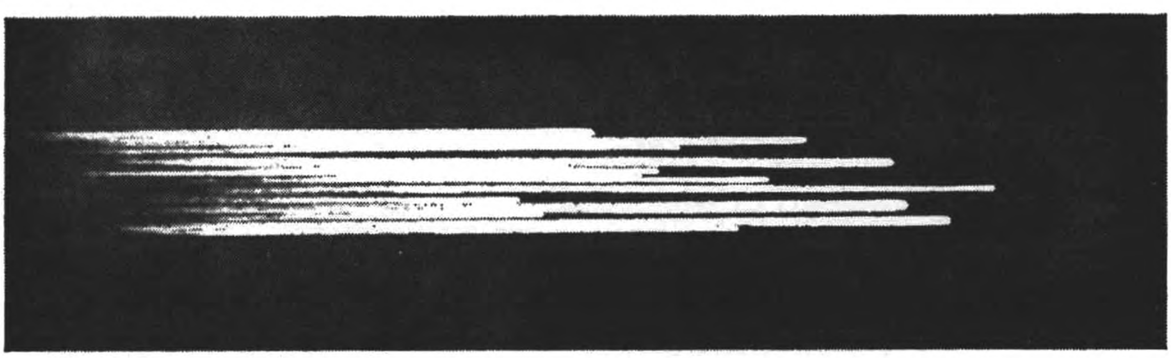
UNIDENTIFIED PHENOMENON

Indian Ocean

m.v. *Halifax Star*. Captain P. W. W. Hunt. Bahrein to Melbourne. Observers, the Master and ship's company.

15 October 1976. At approx. 1610 GMT a bright light was seen to appear in the northern skies. It rose rapidly and it was then noted that it comprised several leading lights all of a very bright nature. It came from the north through an arc, reaching a zenith of about 35° and then appeared to set ahead of the vessel in a SE'ly direction. At its zenith it was easily the brightest object in the sky and the particularly vivid tail could be clearly seen. This appeared to consist of smaller but also brilliantly lit particles and was about 15° in length, with a magnitude greater than that of Venus (−3·4) which had just set. As a social function was taking place on deck at the time, the incident was witnessed by nearly all personnel. The whole spectacle was sighted through binoculars by Mr R. P. Ruegg, Third Officer and Mr B. Swan, A.B.

A general discussion amongst all who witnessed the above did not come to any conclusion as to the identity of the object although the majority passed the opinion that it could have been perhaps either a comet or a rocket or meteors. It was in full view for about 90 seconds but did not appear to burn out when it disappeared in a SE'ly direction.



Captain Hunt adds:

'At the time of the incident I was on the boat deck and my attention was first drawn to it by one of the ratings. My first impression was that it was a large rocket rising astern of the vessel. By the time I arrived on the bridge the object was nearly abeam and perhaps I could best describe its appearance as being similar to what one would view if one were positioned about three miles from the end of a runway with a large passenger aircraft making its final approach at night with all its cabin lights switched on. However, there was no question of this object being an aircraft as the speed at which it was travelling would be far in excess of any known 'plane. In addition there was this long bright tail which seemed to be made up of small bright particles falling away from the main body'. (See sketch by Mr C. I. Mackillop.)

'As a matter of interest, I had heard that morning on the BBC's World Service that the USSR had placed a satellite in orbit on the same day. This operation I believe, was later terminated owing to technical faults developing. Could our unidentified object have anything to do with this satellite making its re-entry?

'To sum up I must say that during the years I have been at sea I have never experienced anything of a similar nature.'

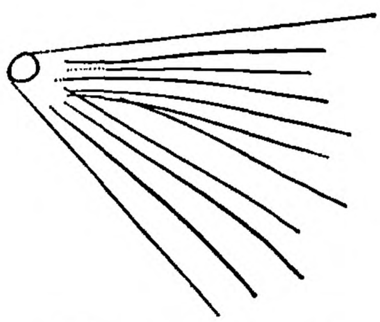
Position of ship: 22° 55'S, 101° 54'E.

UFO

Arctic Ocean

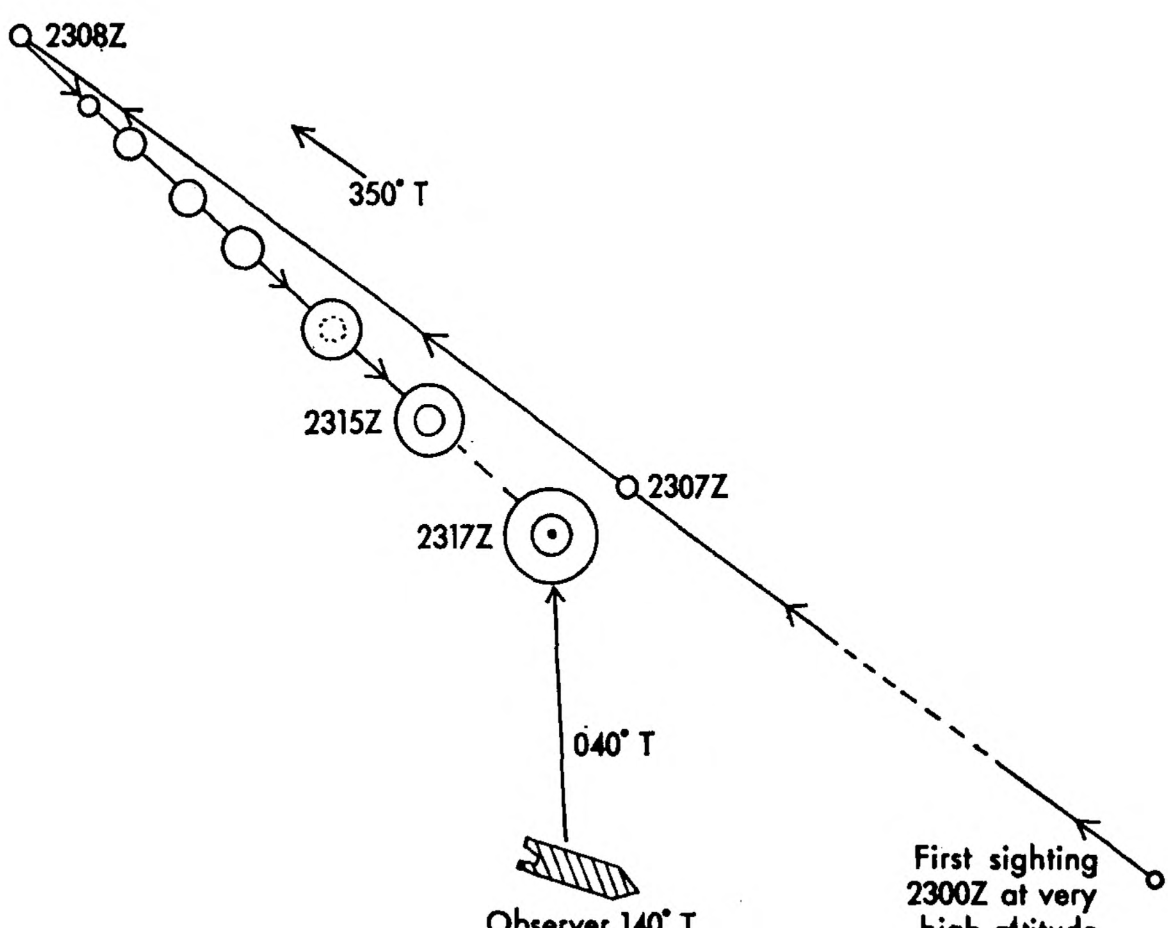
m.t. *Farnella.* Skipper H. Powdrell. Barents Sea fishing grounds. Observers, the Skipper and Mr G. Christmas, Radio Officer.

16 October 1976. At 2307 GMT while I was visiting the wheelhouse, the Skipper pointed out to me an object flying across the sky. It had already been in view for some five minutes or more and was first observed on a bearing of 140°T heading due North. I first sighted it on a bearing of 050°T.



Object as first viewed

As seen at 2315Z
Brilliant pulsating light at centre



Observation was constantly kept by myself and the Skipper with the aid of binoculars from the time I first sighted the object. It could be described as being a brilliant light travelling at a very high altitude, leaving a bright V-shaped trail of rays which could be likened to the sun's rays as they would appear from behind a cloud. However, they were very much smaller due to the height and were also horizontal. The object followed a course from south to north to be astern of us at 2308. It then commenced to come back along its course while losing altitude. I would point out here that there was no visual evidence of the object actually turning back but rather as though it had been put into reverse.

The appearance and shape of the object was now changed becoming totally circular in shape, still losing height and coming closer. The outer edge of the circle I would describe as glowing and within that was another circular object, more intense, and within that was a brilliant pulsating white light as when the object was first sighted. The object reached its closest point to us by 2317 on a bearing of 040°T.

The object stayed in this position for approx. two minutes and then vanished within the outer glow, this glow finally fading from our sight also. At 2320 nothing was left to be seen of either the object or the glow.

I have tried to reproduce what the Skipper and I saw in sketch form. The object was also seen by several other vessels who were fishing in the area with us. The night was fine with a small amount of low cloud, a quarter moon and an average number of stars.

Position of ship: 69° 56'N, 33° 46'E.

ASSISTANCE TO YACHT

North Atlantic Ocean

m.v. *Port Alberni City*. Captain B. A. Boyer. Antwerp to Panama. Observers, the Master and ship's company.

16 October 1976. At 1600 GMT whilst the vessel was proceeding from Antwerp, a call for assistance on Channel 16 VHF was heard from a yacht. It stated that she was taking water and gave her position as 49° 00'N, 06° 30'W. This put her some ten miles NW of us and we duly altered course towards her. The weather at the time was not very good with the wind S'ly, force 6 and a rough sea with a moderate/heavy W'ly swell. What made this incident so interesting was that the yacht, *Nispuk*, was the same one we had assisted just a month previously. On 14 September we were on our way to Dublin from the Panama Canal. The weather on that occasion was much better with light winds, slight sea and low swell when we met her about 450 n. mile WSW of Fastnet Rock. Our vessel was stopped and we gave her the provisions that she requested when she came alongside. At that time she had been out of the USA about two months bound for north Germany with three people aboard.

On our second meeting she was sighted at 1650 having set sail on 13 October bound for Brittany from Kinsale, Eire. Attempts were made for her to come alongside, but this proved fruitless due to the prevailing weather conditions. After consultations with the yacht on VHF and with Land's End Coastguard over the radio, it was decided to send a tug to lend assistance. The tug *Amsterdam* was despatched from Penzance to rendezvous with us which she did at 2250. The *Nispuk* then released us from our duties standing by her and we proceeded on our way. Meanwhile she was towed safely into Penzance by the tug.

Weather conditions at the time were as follows: dry bulb 12·2°C, sea temp. 11·8, barometer reading 997·0 mb and falling. Moderate rain reduced visibility to 2 or 3 n. mile.

Position of ship: 48° 54'N, 06° 19'W.

551.5(09) : 551.507.22

History of the British Ocean Weather Ships

By Captain C. R. Downes
(Nautical Officer, Marine Division, Meteorological Office)

Prior to 1936 synoptic observations from the sea were provided almost entirely by voluntary observers on merchant ships apart from those obtained from the relatively small number of naval vessels. These observations, although extremely valuable to the forecaster, were necessarily restricted in nature, and more or less haphazard as regards position.

As trans-oceanic aircraft became a possibility, it became obvious that more detailed information was necessary than could be obtained from voluntary observers in moving ships in order to provide meteorologists and aircraft with accurate information about weather conditions at sea, both on the surface and in the upper atmosphere.

In 1936–37, the British Meteorological Office placed a meteorologist aboard a cargo steamer on the North Atlantic trade route for several voyages and obtained special synoptic observations as an experiment. Visual observations of cloud heights and of upper winds were obtained in this ship by tracking the movement of pilot balloons by using compass bearings and sextant altitudes.

In 1938–39 the French fitted out a merchant ship as a stationary meteorological ship in the North Atlantic. Radio-sonde and surface observations were obtained and transmitted ashore by W/T. About the same time the Germans had two special ships performing similar functions in connection with their trans-oceanic airways—one in the North Atlantic and one in the South Atlantic. The British Meteorological Office was exploring the possibility of fitting out a vessel specifically for this work in 1939.

The 1939–45 war put an end to the above activities but during the latter part of the war the USA and UK employed a number of small naval vessels as stationary meteorological ships in the North Atlantic.

When the war ended, the naval stationary vessels were withdrawn and observations depended again solely on merchant ships. However, these were not capable of providing upper air observations and in 1946 the International Meteorological Organization (IMO), the forerunner of the World Meteorological Organization (WMO), recommended the establishment of stationary meteorological ships in certain areas. Shortly after the International Civil Aviation Organization (ICAO) passed a similar resolution in Dublin and it was subsequently agreed that a total of 13 stations be established in the North Atlantic by July 1947.

The USA, Canada, France, Holland, Belgium, Norway, Sweden, UK, Eire, Denmark, Iceland, Portugal and Spain were all signatories to the 'Ocean Weather Ship' Agreement and the allocation of stations was as follows:

United States	7
Canada and United States jointly	1
France	1
United Kingdom	2
Norway, Sweden and UK jointly	1
Holland and Belgium jointly	1

It was decided that Portugal, Denmark and Iceland already contributed sufficiently by their stations in the Azores, Greenland and Iceland respectively, and that Eire should merely provide an annual monetary contribution to the scheme.

The duties of the weather ship would include:

(*a*) Meteorological observations including surface observations, special observations of meteorological phenomena, upper air observations for wind, temperature, pressure and humidity—all to be reported by radio at the synoptic hours. In addition, observations from merchant ships would be collected and re-transmitted by radio.
(*b*) Search and Rescue (SAR) facilities for aircraft and shipping in distress. This implied provision of special boats and other life-saving equipment.
(*c*) Navigational aids to aircraft in flight consisting of search-radar and special radio equipment including a radio-beacon on which aircraft could 'home',
(*d*) Oceanographic and other scientific observations.

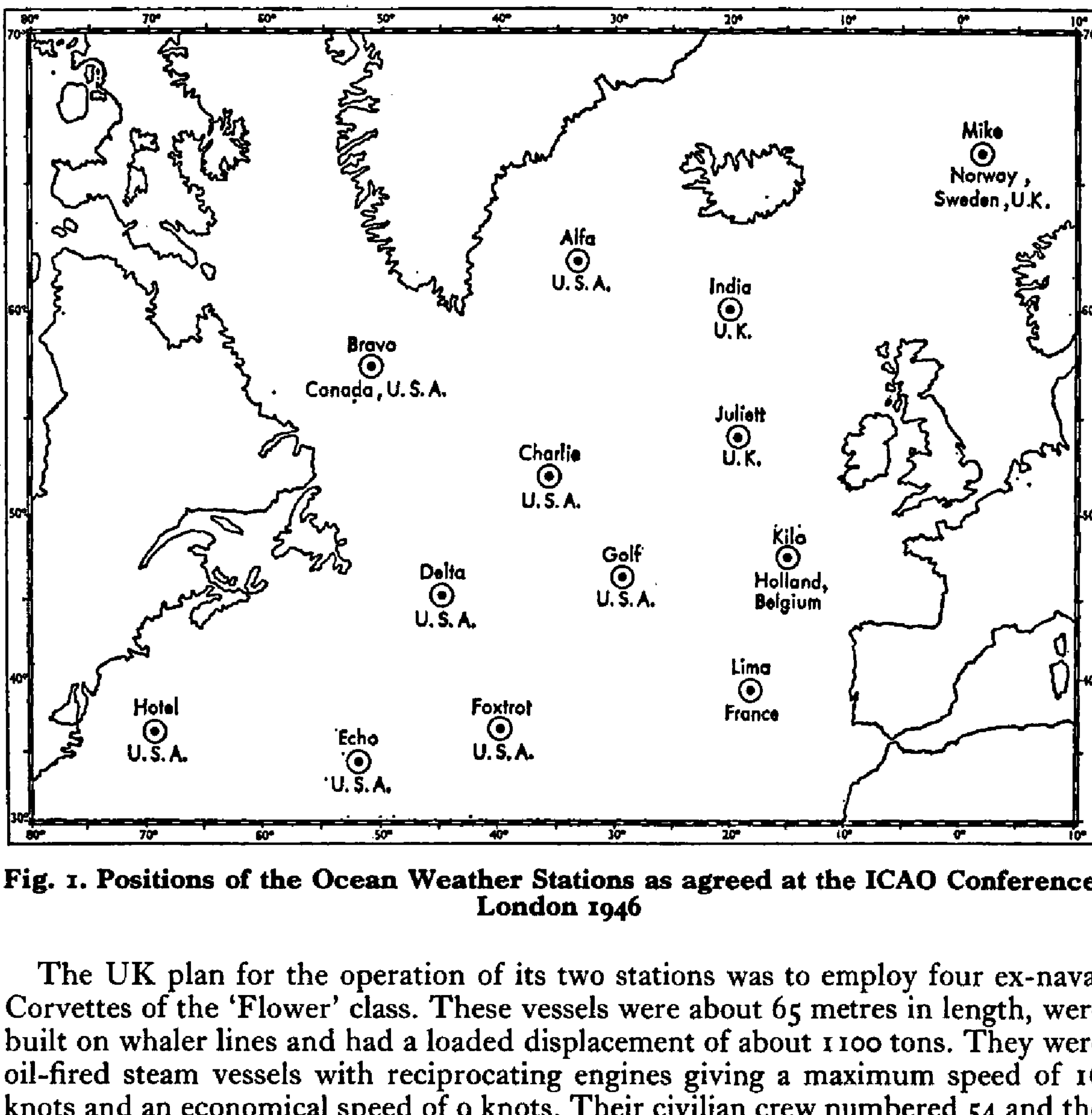


Fig. 1. Positions of the Ocean Weather Stations as agreed at the ICAO Conference, London 1946

The UK plan for the operation of its two stations was to employ four ex-naval Corvettes of the 'Flower' class. These vessels were about 65 metres in length, were built on whaler lines and had a loaded displacement of about 1100 tons. They were oil-fired steam vessels with reciprocating engines giving a maximum speed of 16 knots and an economical speed of 9 knots. Their civilian crew numbered 54 and the ships were directly administered by the Meteorological Office. Each vessel was to spend about 27 days at sea followed by approximately 15 days in port.

On 31 July 1947 the ex-Royal Navy corvette H.M.S. *Marguerite* became the first Ocean Weather Ship and was renamed *Weather Observer* by the then Secretary of State for Air, in Shadwell Basin, London Docks. She had been extensively converted from a war vessel by H.M. Dockyard, Sheerness and her unusual appearance and rig caused considerable interest in shipping circles on London river. On 1 August 1947 *Weather Observer* sailed from London under the command of Captain N. F. Israel D.S.C., to take up her station in the North Atlantic. She was followed by the *Weather Recorder* in October, the *Weather Watcher* in November and the *Weather Explorer* in February 1948.

In April 1949, at the invitation of ICAO, a conference on Ocean Weather Stations was held in London to consider the plan set up at the 1946 Conference to see if it would be practicable to reduce the number of stations. As a result of this conference the number of stations in the North Atlantic was reduced from 13 to 10; the four British Ocean Weather Ships would continue to operate but the reduction in stations would mean very considerable economies in fuel, stores and spares. In 1954 the number of internationally agreed stations was further reduced to nine.

1949 also saw the authorisation for issue of badges and insignia to personnel of the Ocean Weather Service and the granting of permission for the ships to wear the Blue Ensign defaced with the Ocean Weather Service badge. During the year the Ocean Weather Ships supplied meteorological and navigational assistance to a flight of RAF Vampire aircraft flying to the United States. Air/sea rescue exercises in conjunction with aircraft of RAF Coastal Command were carried out successfully at intervals to keep the ships' companies conversant with air/sea rescue organization and drill. In the Marine Division Report of the Year ending 31 March 1950 it is recorded that 4172 aircraft—both Civil and RAF—made use of the weather ships' navigational aids and the ships assisted in three SAR emergencies.

During 1950 a scheme was implemented whereby a Dutch weather ship would carry out five periods of duty each year at one British station, thereby permitting the 'lay-up' of each British weather ship annually for survey, repairs and overhaul.

In 1951 oceanographical work consisting of towing plankton recorders, plankton sampling, taking sea water samples and jettisoning of drift bottles was commenced on behalf of the Ministry of Agriculture, Fisheries and Food and the Scottish Home Department, Fisheries Division.

At the request of Cambridge University, 20 shearwaters were taken to sea in *Weather Recorder* in July 1952 and released when the ship was more than 100 n. mile away from any land. The first bird arrived back to its nest at Skokholm Island, 450 n. mile away, within 36 hours and a total of 18 birds returned.

During the year ending 31 March 1954, 8422 civil and military aircraft made use of the aero-navigational facilities provided by the ships. The year also saw the commencement of observations utilising a wave-recorder, loaned by the then National Institute of Oceanography, aboard *Weather Explorer*. This ship also attended the Review of the Fleet by H.M. the Queen at Spithead on 15 June 1953. Special routine observations of the sea water temperature-gradient were made aboard *Weather Recorder* with a bathythermograph loaned by the Admiralty to depths of 150 metres and during 1954 arrangements were made to equip the other three weather ships with bathythermograph equipment. Also during 1954 magnetic variation swings were carried out on station for the Hydrographic Department of the Admiralty.

Owing to a serious boiler defect which necessitated her withdrawal from service for six weeks, *Weather Explorer* was unable to carry out her duties on station from 20 February to 16 March 1955. The R.R.S. *Discovery II* was therefore chartered from the National Institute of Oceanography to undertake this patrol. Special air-sea rescue and radio equipment was supplied for the voyage and a temporary shelter erected on the after deck for balloon filling. She was thus able to carry out the normal communication duties of a weather ship and modified navigational aids to aircraft were available but no radar fixes were possible.

In connection with the Meteorological Office centenary celebrations, *Weather Recorder* visited Edinburgh in June 1955 and *Weather Explorer* was at Cardiff the following August. During these periods over 3400 visitors were conducted around the ships.

By 1957 the four British weather ships had completed 10 years' service. Being former 'Flower' class corvettes, they were designed for rough work and had certainly lived up to their reputation for good sea-keeping qualities. They were also very economical to operate and had carried out their duties very effectively. However, they were now beginning to 'show their age' and needed to be replaced by somewhat newer vessels. It was therefore decided to convert four 'Castle' class frigates to Ocean Weather Ships.

On 16 May 1958 the former frigate H.M.S. *Oakham Castle* was renamed *Weather Reporter* by Lord Hurcomb, the then Chairman of the Meteorological Committee, thus marking the beginning of her career as a weather ship. *Weather Reporter* replaced *Weather Explorer*—the former 'Flower' class corvette H.M.S. *Thyme. Oakham Castle* was built in Glasgow by A. J. Inglis and launched in July 1944. Her conversion to a weather ship, which involved extensive work and took about nine months to complete, was carried out by James Lamont and Company at Glasgow. The new weather ships were somewhat bigger than their predecessors with a length of 70 metres compared with 65 metres; hence they provided larger and more comfortable accommodation. They also had the advantage of greater fuel capacity. They were propelled by a 4-cylinder steam reciprocating engine associated with two oil-fired water tube boilers. In November 1959 the second 'Castle' class frigate, H.M.S. *Amberley Castle*, was taken over by the Air Ministry for conversion to a weather ship at Blyth Dry Dock and Shipbuilding Company. She was commissioned and renamed *Weather Adviser* by Lady Sutton, wife of the then Director-General of the Meteorological Office on 22 September 1960 at Greenock. She replaced *Weather Observer* which was the first British weather ship to take up duty on a North Atlantic station in August 1947. *Weather Adviser* sailed on her maiden voyage on 28 September 1960.

The third of the 'Castle' class frigates to be converted—H.M.S. *Pevensey Castle*—was renamed *Weather Monitor* on 12 May 1961 by Mrs A. C. Best, wife of the then Director of Services of the Meteorological Office at Blyth Dry Dock and Shipbuilding Company. She replaced *Weather Recorder* which was then withdrawn from service after 14 years as a weather ship. Formerly H.M.S. *Genista* and prior to her weather ship duties, she had seen service as an escort vessel during the 1939–45 war mostly in the South Atlantic and Indian Ocean areas and took part in the invasion of Madagascar. In addition to her normal duties as a weather ship, *Weather Recorder* had shown her usefulness in other ways. In January 1948 she rescued the whole crew of the Norwegian steamer *Veni*, aground on the Isle of Islay and in August 1955 she stood by the disabled m.v. *Argobeam* for two days in heavy weather and directed tugs to her.

Weather Surveyor, the fourth and last of the 'Castle' class frigates to be converted, was renamed and commissioned by Provost J. Reid of Greenock on 21 December 1961. Formerly H.M.S. *Rushen Castle* she also was converted by Blyth Dry Dock and Shipbuilding Company and replaced *Weather Watcher*.

In September 1961 *Weather Adviser* visited the Isle of Man whilst *en route* to her North Atlantic station. She aroused considerable interest and a number of visitors were shown round the vessel. During the year radar wind observations attained an average height of 60 200 feet, the maximum being 90 500 feet.

A new Ocean Weather Ship Base at Greenock, made necessary because of the inclusion of the site of the old base in the construction work of a new dry dock at Greenock, was completed and occupied in July 1962. During this year *Weather Adviser* assumed the duties of control vessel in the Search and Rescue operation for survivors of an American Super Constellation aircraft, forced by engine trouble to ditch in the Atlantic on 23 December, in a position approximately 165 n. mile from *Weather Adviser*'s North Atlantic station. She was not the nearest ship to the position of the ditched aircraft and, when she arrived in the area, the 48 survivors of the 76 persons on board had been picked up by a merchant ship. The weather ship, however, recovered 11 bodies.

During the year the weather ships carried out sea temperature and salinity soundings to depths of 3000 metres and one ship, *Weather Reporter*, continued to carry the National Institute of Oceanography's wave recorder to instrumentally record wave heights.

In 1963 the Flight Safety Foundation Award, for distinguished service to aviation, was made to the personnel manning all the weather ships in the North Atlantic. The Flight Safety Foundation, with headquarters in New York, was a world-wide organization dedicated to the furtherance and improvement of air safety in all forms of flight. The award in the form of a plaque is permanently exhibited at the Headquarters of ICAO in Montreal and a certificate was awarded to each ship. The ships also had the distinction of being awarded the 'Hunt' Trophy in 1964. This award, in the form of an inscribed silver tray, was awarded annually by the Guild of Air Traffic Control Officers to the organization considered to have made the most outstanding contribution to Air Traffic Control.

On 1 November 1965, towards the end of her period on station, *Weather Monitor* answered a distress signal from the British ship *Newfoundland* bound from Liverpool to St John's, Newfoundland. A dangerous fire had broken out in No. 1 hold and the Master required ships in the vicinity to stand by. *Weather Monitor* immediately proceeded at full speed towards *Newfoundland*'s position. On her arrival on the scene the fire was under control but still considered to be dangerous. At her Master's request *Weather Monitor* escorted *Newfoundland* to Cobh—maintaining her normal meteorological program of surface and upper air observations *en route*.

During February and March 1968 the British weather ship on duty at ocean station 'Alfa' (62° 00'N, 33° 00'W) had on board a Control Officer and provided special advice by radio to British trawlers fishing north of Iceland at the request of the then Board of Trade, as a result of the earlier loss of two British trawlers in the same area during exceptionally severe gales and freezing conditions. Later, this task was transferred to a trawler chartered by the Board of Trade, carrying an Advisory Officer accompanied by a meteorologist and a doctor.

Late in March 1968, *Weather Reporter*, while on station in the North Atlantic rescued the American pilot of a single-engined aircraft *en route* from Newfoundland to the Azores, who had been blown off course and advised to ditch because of a shortage of fuel and instrument trouble. The rescue was carried out in darkness with a 23-knot wind and a 5-metre swell.

During 1971 the biological sampling program for the Institute of Marine Environmental Research was intensified with an investigation of the vertical distribution of plankton throughout the year in the upper 500 metres at Station 'India' (59° 00'N, 19° 00'W) using a Longhurst/Hardy Plankton Sampler. In association with the investigation into vertical plankton hauls, water samples for phytoplankton analysis and extra net hauls for analyses of toxic organo-chloride residues in the plankton were made.

Weather Adviser, with the research vessels *Discovery* and *Researcher* took part in the Joint Air–Sea Interaction Experiment (JASIN) in the area of Station 'Juliett' (52° 30'N, 20° 00'W) in September 1972. The purposes of the experiment were:

(*a*) To examine the structure of the atmospheric boundary layer by making repeated vertical soundings simultaneously from the three ships.
(*b*) To make spatial and temporal measurements of temperature and currents in the oceanic mixed layer with a view to including advective terms in heat budget calculations for the mixed layer.
(*c*) To make surface measurements from three buoys to allow estimation of fluxes across the air–sea interface and of their horizontal variability. In particular, to measure horizontal pressure gradients to allow calculation of the geostrophic wind.
(*d*) To test our ability to measure currents in the top 10 to 20 metres of ocean in the presence of surface waves.
(*e*) To examine vertical gradients of currents and density at the bottom of the oceanic mixed layer and across the seasonal thermocline.

During the early hours of 11 January 1974, *Weather Adviser* on Station 'Juliett' in very heavy weather conditions, received a distress message from the Greek vessel *Despina* reporting that her rudder was out of action and requesting urgent assistance.

After ascertaining the *Despina*'s position by means of cross D/F bearings from ships in the vicinity, *Weather Adviser* proceeded at all possible speed in the prevailing weather conditions towards the disabled vessel now located some 125 n. mile to the eastward. Soon after daylight an RAF Nimrod aircraft sighted the *Despina* and circled her at an altitude of 2000 feet, thus enabling *Weather Adviser* to pinpoint the position by means of her air-search radar. Shortly after midday surface radar contact was established with the disabled vessel but, at about this time, the distress was cancelled by the *Despina* as she had managed to effect temporary repairs to her steering gear. However, at her master's request *Weather Adviser* escorted the *Despina* towards Cobh and was not finally released until the south-west coast of Ireland was sighted.

For budgetary reasons the United States phased out their weather ships from the western side of the North Atlantic between 1973 and 1974. The British weather ships, having been in service for about 14 years, continued to give satisfactory service although, as a natural consequence of their age, repair and maintenance costs began to mount.

In the few years prior to 1975 the more reliable jet-engined aircraft had superseded many piston-engined airliners, aircraft navigational aids had become more sophisticated and aircraft flying between Europe and North America now tended to use the 'Polar' route instead of the more or less East–West route. Thus there was no further need for the weather ships' commitment to air navigation and special search and rescue involvement for aircraft in distress. On 30 June 1975 the ICAO Joint Financing Agreement on North Atlantic Ocean Stations terminated and the UK ceased to operate weather ships on stations 'India' and 'Juliett' but WMO planning made provision for the UK to man the new ocean weather station 'Lima'.

From 1 July 1975 and pending the ratification of a new Joint Financing Agreement on North Atlantic Ocean Stations (NAOS) under the auspices of the World Meteorological Organization, NAOS operating states organized a network of ocean weather stations in the central and eastern North Atlantic. The new network consists of the following stations:

'Charlie' latitude 52° 45'N longitude 35° 30'W—manned by USSR ships.
'Lima' latitude 57° 00'N longitude 20° 00'W—manned by UK ships.
'Mike' latitude 66° 00'N longitude 2° 00'E—manned by Norwegian and Dutch ships.
'Romeo' latitude 47° 00'N longitude 17° 00'W—manned by French ships.

The alteration in the UK operating commitment to the NAOS network from two to one ocean station reduced the UK requirement for weather ships from four to two vessels and, as financial support for the construction of new purpose-built weather ships could not be obtained, the opportunity was taken to refurbish two of the existing four ex-'Castle' class frigates to extend their service to 1981. The ships selected for refurbishment were *Weather Adviser* and *Weather Monitor* and these were withdrawn from service pending a shipyard being available.

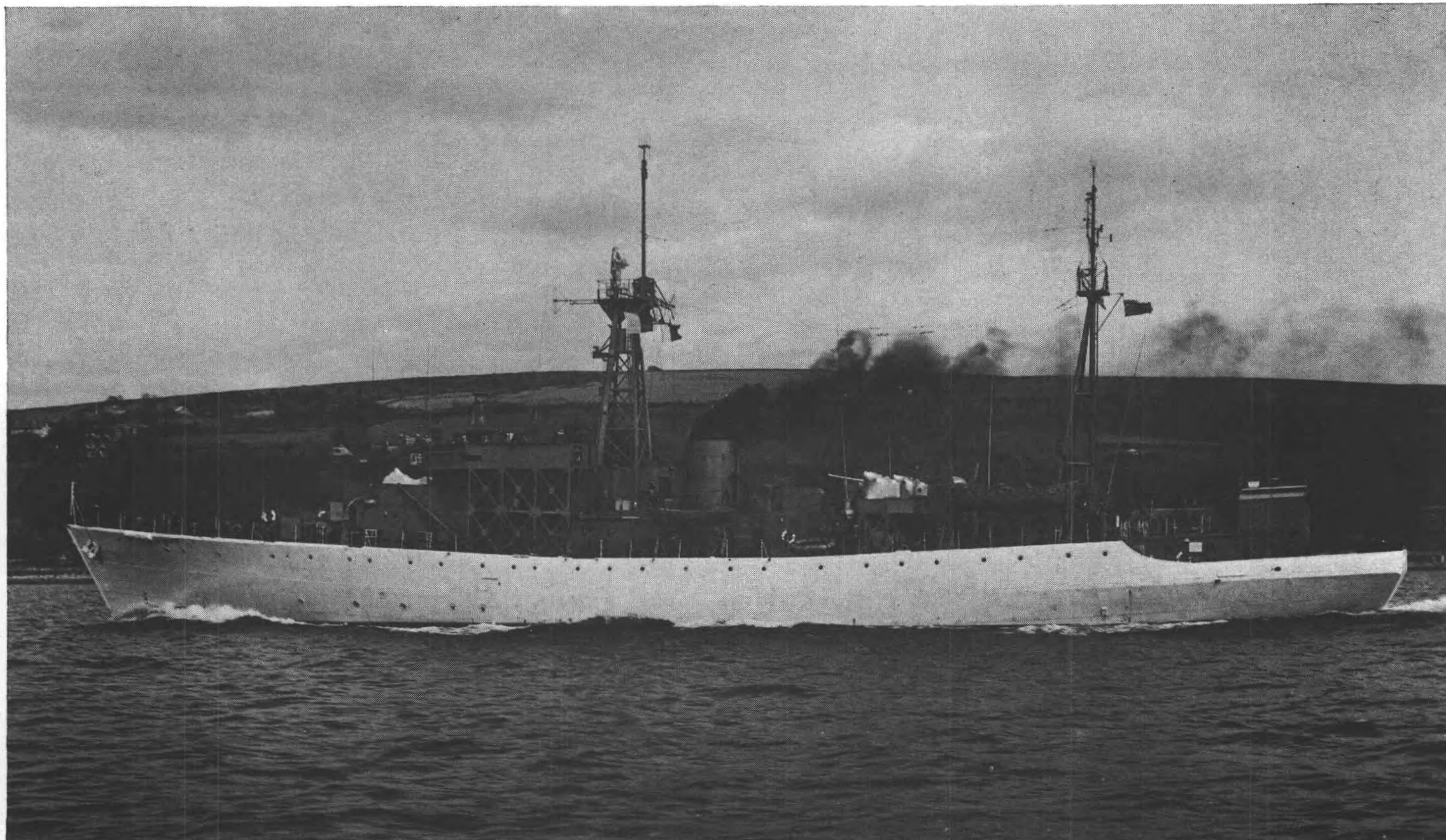
Weather Reporter and *Weather Surveyor* manned Station 'Lima' until the refurbished vessels returned to service. Although all aviation commitments were now discontinued these ships continued to keep a listening watch on the international aircraft distress radio frequency in addition to carrying out the meteorological and oceanographical work as before. The new WMO Agreement for Joint Financing of North Atlantic Ocean Stations entered into force on 1 December 1976.

In July 1976 *Weather Adviser* and *Weather Monitor* proceeded to Manchester Dry Docks Company for refurbishment. This consisted of improvement to accommodation and crew recreation spaces, provision of a new, fully-equipped, modern bridge structure, fitting a completely new galley, conversion of the ships' electrical power supply from D/C to A/C, automation of the boiler controls, installation of new upper-wind finding equipment and the complete re-equipping of the communications installation.

(*Opposite page* 184)

Ex-'Flower' class corvette, O.W.S. *Weather Recorder* on station in the North Atlantic

(Opposite page 185)



Copyright James Hall

Ex-'Castle' class frigate, O.W.S. *Weather Reporter* on trials after her conversion in 1958

To usher in a new, albeit limited, era of British weather ship history it was decided to change the ships' names. Thus, on recommissioning, *Weather Adviser* was renamed *Admiral FitzRoy* by Mrs J. Walsh, wife of the Provost of Greenock on 14 March 1977 and *Weather Monitor* was renamed *Admiral Beaufort* by Mrs M. Fletcher, wife of the new Provost of Greenock on 25 May 1977.

As most readers will know, these new names perpetuate the memory of Vice-Admiral Robert FitzRoy C.B., F.R.S., who established the British Meteorological Office in 1854 and Rear-Admiral Sir Francis Beaufort K.C.B., F.R.S., Hydrographer to the Admiralty 1829–1855 and who devised the Beaufort wind scale in 1805.

O.W.S. *Admiral FitzRoy* sailed from Greenock for Ocean Station 'Lima' on her first voyage under her new name on 20 March 1977. *Admiral Beaufort* relieved her sister ship on Station 'Lima' two months later on 30 May 1977. We wish them both every success in their new lease of life.

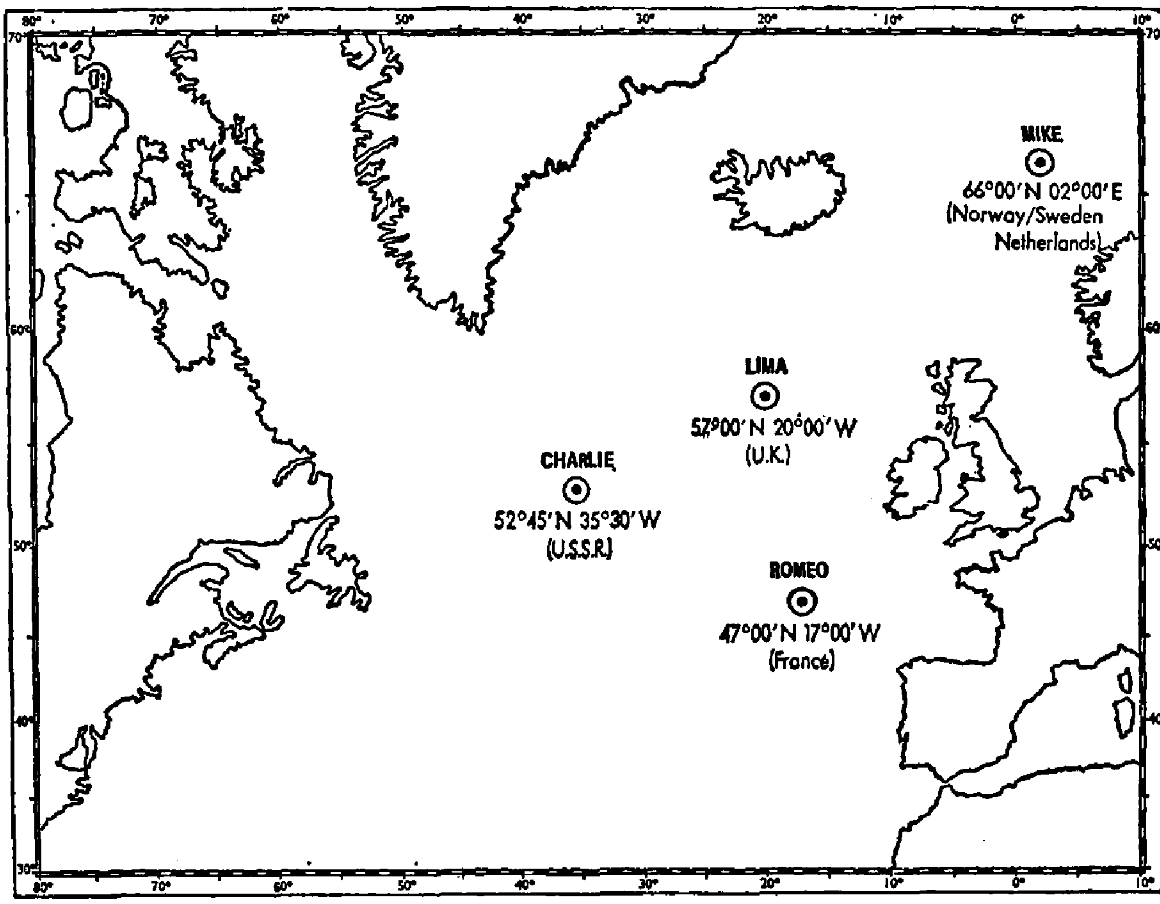


Fig. 2. Positions of the Ocean Weather Stations under the Joint Financing Agreement on North Atlantic Stations, 1975

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The Effect of Temperature and Humidity on Goods in Standardized Containers

By Dr G. Grunewald

(This article is reproduced from *Der Wetterlotse* Vol. 28, March/April 1976 by kind permission of the Editor)

The decisive advantage of containers lies in the economy of time and effort they bring about in the transport and turn-around of goods. An economic journal wrote as follows on this: 'Goods are moved directly from the manufacturing conveyor into the container and taken directly from the latter in the country of destination'. Despite the rationalization claimed in this quotation, the considerable investment bound up with this system of conveyance is justified only for the transport of air-conditioned goods.

The initial optimism that the introduction of containers would solve a whole range of packaging and storage problems and obviate climatic effects, thus removing the danger of damage by heat and humidity, has given way to a more realistic approach. This is reflected by the fact that large shipping concerns have set up advice centres inland, staffed with experienced mariners, to deal with the loading of containers. These centres are intended to cut down or preclude transport damage to goods, especially at sea, by applying rational storage principles in multi-mode transportation.

Regardless of the legal distinction as to whether containers should be classified as on-deck cargoes or under-deck cargoes, as far as climatic factors and their consequences are concerned, this means of conveyance must be looked upon as an under-deck cargo in miniature, with all the relevant advantages and disadvantages. Whereas, if containers are carried inside a ship their walls provide additional protection against daily temperature changes and the effects of moisture, when they are carried on deck they are exposed to wind, precipitation, spray, temperature fluctuations and insolation. In the case of multi-mode transportation, which first raised the possibility of full profitability for containers, there is a need to add the climatic conditions experienced during road and rail shipment, and particularly during parking time. Every container is subject to these factors. Extreme examples are the two combined land and sea routes to and from Japan, the one across Siberia, the other through Canada. Again, the sea route from eastern Asia to Europe via Africa, involving two crossings of the Line, and that from Australia to Europe, present their own climatic problems.

The research undertaken at the Deutscher Wetterdienst based in the Seewetteramt in Hamburg by the Working Group on the Meteorology of Ship's Holds was concerned with the temperature and moisture conditions affecting containers during parking time at the terminal and also during movement by container ship, either on deck or in the hold. Some of the results are given here.

Temperatures in containers during parking time at the terminal

Over the summer months a white forty foot plywood container and a yellow twenty foot steel container were permanently exposed to the environmental conditions, in particular the insolation*, at the 'Burchardkai' Container Terminal at Hamburg Docks, by being placed in the open air on a concrete support. Temperature sensors, mounted on the walls and ceilings inside and out, were distributed throughout the

* Insolation: the intensity of direct solar radiation expressed herein in calories per square centimetre.

containers and returned readings to a multi-channel recorder located in a neighbouring container, so that temperature conditions in the test space were undisturbed. For the purpose of comparison, records were taken of the temperature of the surrounding air in a meteorological screen mounted at a height of five metres on a neighbouring light mast and of the global radiation affecting the container.

Figure 1 shows the variation during July 1971 of air temperature under the roof and in the middle of an empty forty foot plywood container in comparison with the temperature of the ambient air and the daily totals of global radiation. The sunshine duration in hours, wind speed and direction, with mean cloud cover and other weather elements such as rain, showers, etc. are also given. It will be seen that there is a marked relationship between the diurnal variation, particularly near the ceiling, and the duration and intensity of insolation, the amount of cloud cover, wind strength and rain (though less marked with showers).

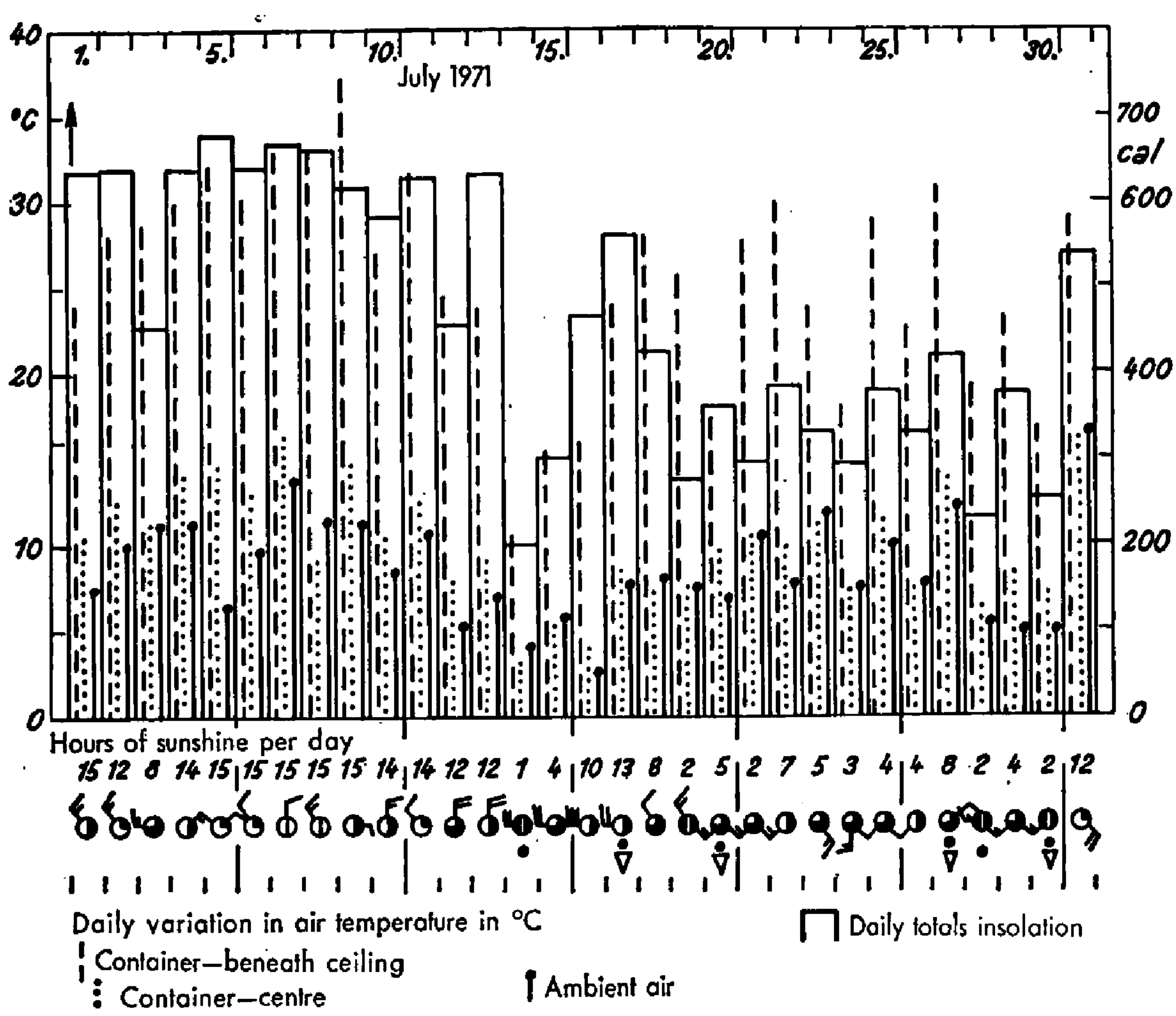


Figure 1. Daily variation of the temperature of the air in a 40-foot plywood container during July 1971.

Figure 2 shows the temperature conditions in the yellow twenty foot steel container during September of the same year. Owing to the higher thermal conductivity of steel and despite the lower insolation, the temperature variation inside this container is extraordinarily large both near the ceiling and in the middle of the container.

An even better impression of the overheating possible in a container is obtained by comparing the temperature variation inside with that of surrounding air on a sunny day.

Figure 3 shows the variations during 20 May 1971 of air temperature outside and

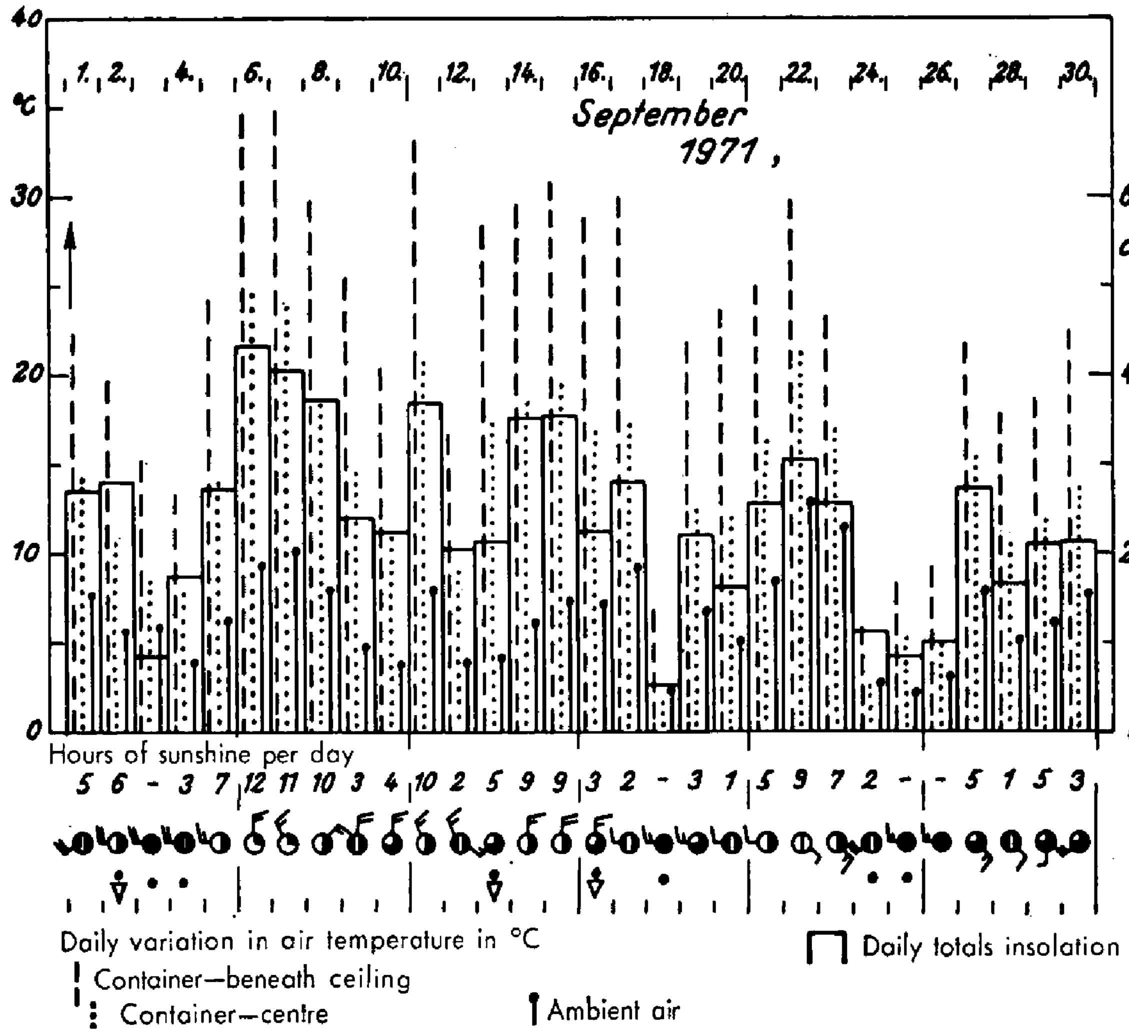


Figure 2. Daily variation of the temperature of the air in a 20-foot steel container during September 1971

inside the roof, and in the centre of a forty foot white plywood container at the Hamburg Terminal. The results are compared with the shade temperature in a meteorological screen and with the hourly totals of global radiation. The wind was NNE force 2 on the Beaufort scale. Although the screen temperature had a maximum hourly mean of only 19°C, the temperature reached 41·3° immediately beneath the ceiling of the empty container and 30·2° in the centre of the interior for the same maximum total hourly insolation of 62 cal/cm².

Figure 4 shows the conditions in a yellow twenty foot steel container on 6 September 1971. For a light northerly wind and a total hourly insolation of 58 cal/cm² an ambient temperature of 20·3°C contrasted with the temperatures of 41·0° just beneath the ceiling and 34·6° in the interior.

Even more conclusive, however, must be the distribution of temperature inside the container at the times of minimum and maximum ambient temperature in the morning and at noon on sunny days.

Figure 5 represents these conditions in the longitudinal and transverse sections of a forty foot plywood container for 6 May 1971. With a force 3 easterly wind, the temperature of the surrounding air at 0500 was 4·2°C. There was considerable cooling on the windward side of the container, while a thermal cushion remained operative on the lee side. With a force 4 easterly wind and an ambient temperature of 17·4°C the temperature just beneath the ceiling exceeded 35° at 1400: here, the gradient was particularly steep. However, even in the interior, temperatures of 25–26°C were recorded. Thus, given that on a summer's day of normal insolation in

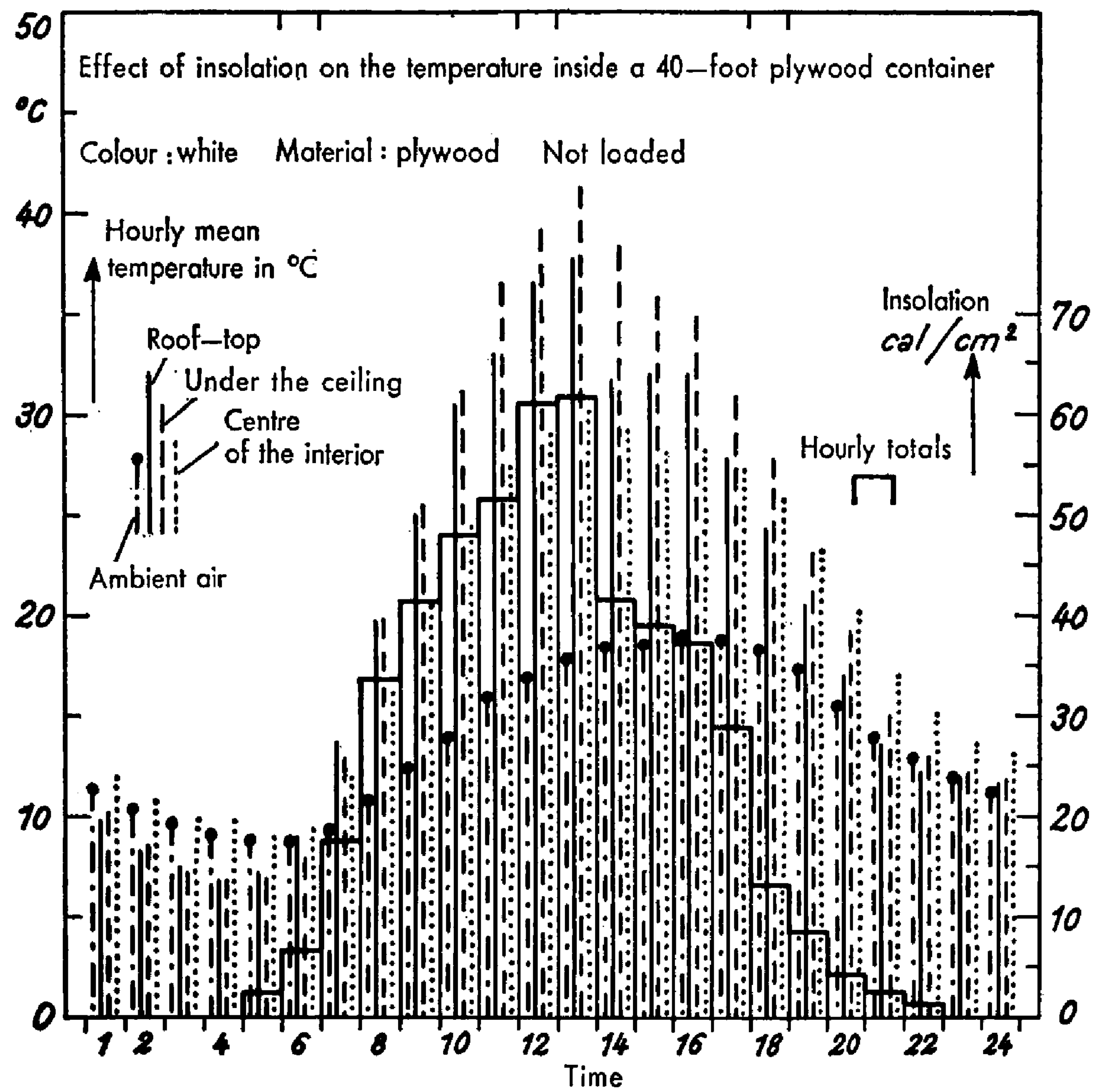


Figure 3. Diurnal variation of the temperature of the air in a 40-foot plywood container on 20 May 1971

Hamburg the ambient temperature may be exceeded by 20 degrees or more just beneath the ceiling and by all of 10 degrees in the interior of a container, it follows that these values must be much higher in the sub-tropics where the insolation is substantially stronger. Admittedly, the distribution of temperature in a loaded container is different since the conditions in the interior are determined by the temperature within the load. However, the outer edges of the cargo behave in sympathy with the large diurnal temperature fluctuations of the ceiling and walls exposed to the sun. In the dry sub-tropics, temperatures of 70°C and above need to be considered in the upper part of the container should it be left in the open air. Temperature-sensitive goods, particularly those with a low ignition point, may thus be damaged. Indeed, it may even cause fire or explosion through spontaneous combustion. Consequently, it is inadvisable to pack temperature-sensitive goods up to the ceiling when conveying them through hot climatic zones. Further, when temporarily stowing such goods in a container, it is imperative not to expose the container to direct sunlight. Effective protection can be provided by shade cast by custom-built roofs or by awnings mounted some distance above the container.

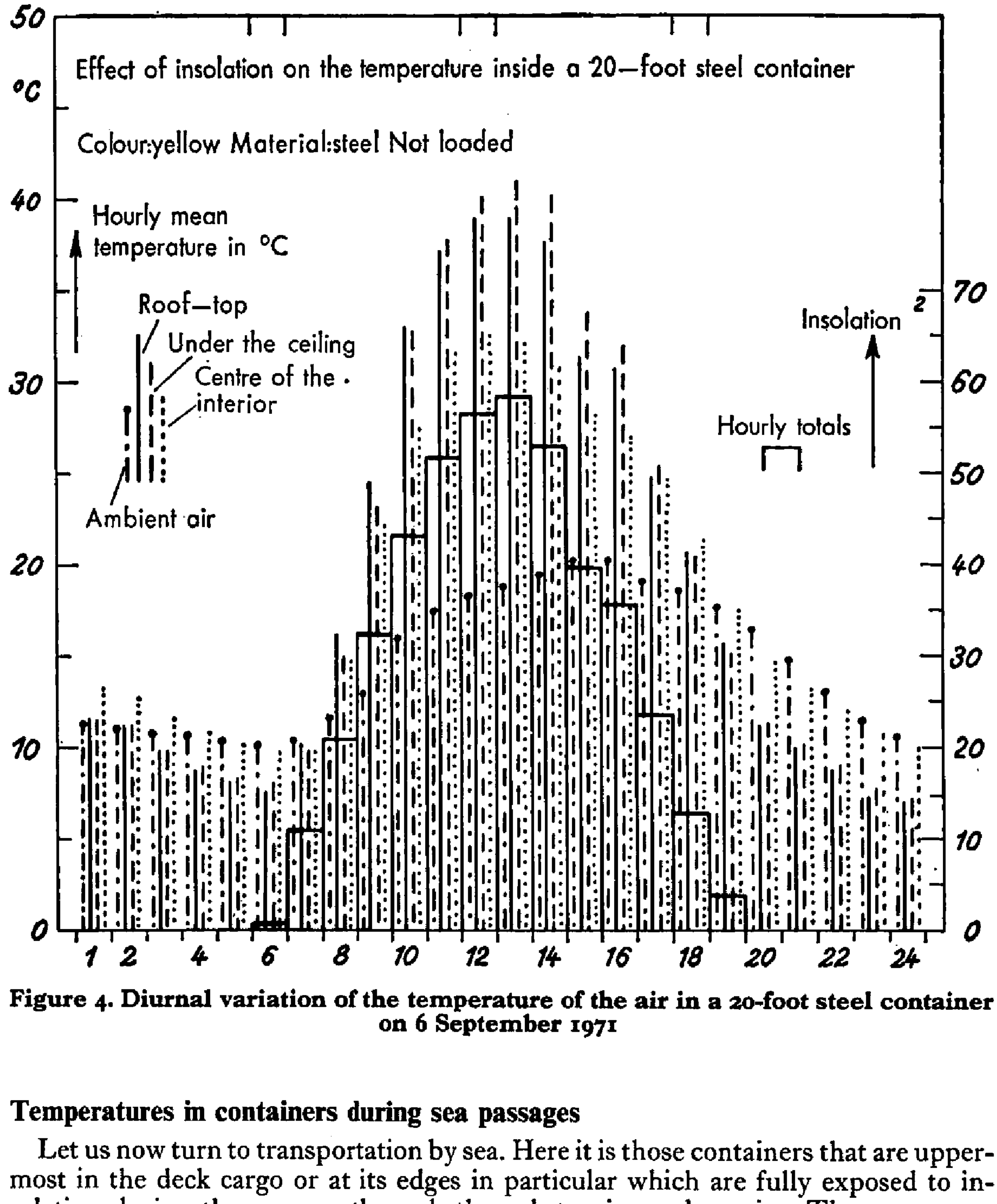
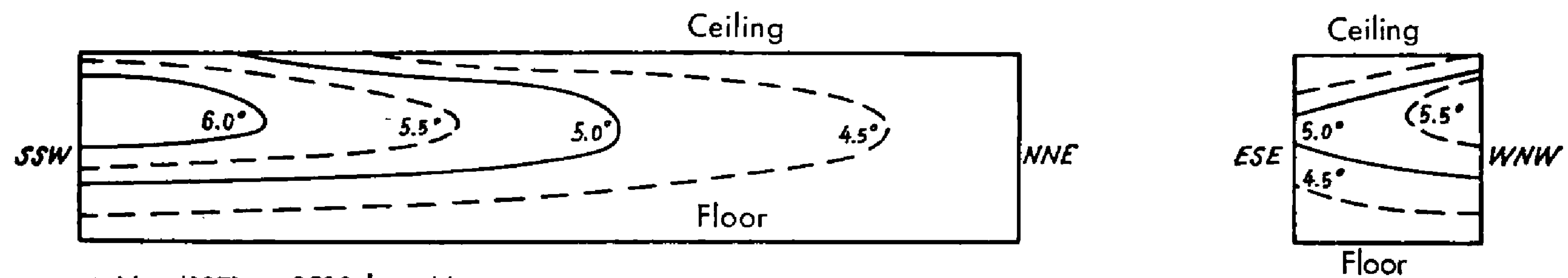


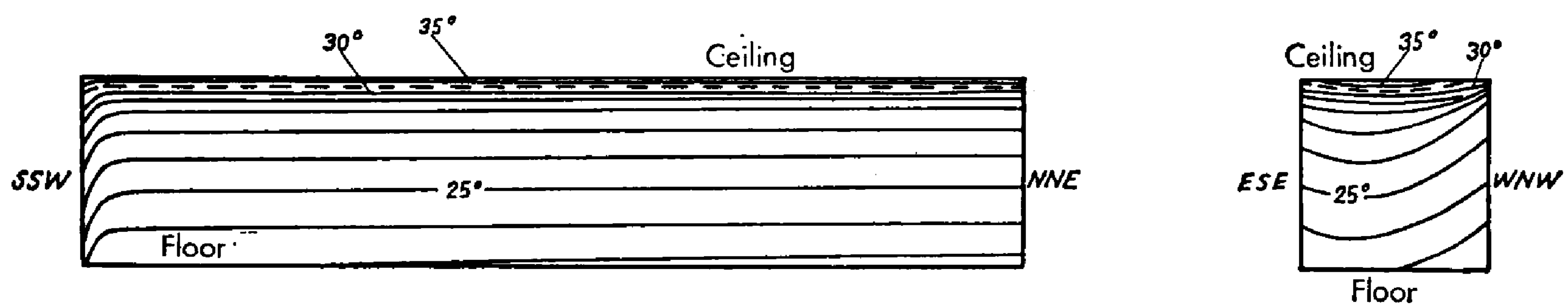
Figure 4. Diurnal variation of the temperature of the air in a 20-foot steel container on 6 September 1971

Temperatures in containers during sea passages

Let us now turn to transportation by sea. Here it is those containers that are uppermost in the deck cargo or at its edges in particular which are fully exposed to insolation during the passage through the sub-tropics and tropics. Thus, two new white twenty foot plywood containers loaded with preserves were tested by being exposed to the weather on the deck of s.s. *Sydney Express* on passage from Europe to Australia and back between the middle of March and the end of May 1973. In one container the preserves were packed in cartons on wooden pallets; the container itself was stowed amidships on the fore-deck. The goods in the other container were packed in foil, avoiding any hygroscopic storage or packaging materials; this container was located immediately in front of the bridge structure. In both containers the strong overheating that had been expected during the passage through the sub-tropics and tropics did not materialize. This, apparently, resulted from the ship's speed (20–22 knots on average) in conjunction with the wind speed and direction and also from the evaporation of rain and spray which showered the containers on deck almost continually. As Figure 6 shows, even near the ceiling of a container in the sub-tropics or tropics the internal temperature exceeded the ambient value by only a few degrees. In the Indian Ocean the temperature near the ceiling was roughly of the same order as the ambient value owing to occasional strong head



6 May 1971 at 0500 hrs Minimum temperature
Weather: fair Air temperature: 4·2°C
Wind: Easterly, force 3
Container orientated SSW—NNE



6 May 1971 at 1400 hours Maximum temperature
Weather: fair Air temperature 17·4°C
Wind: Easterly, force 4
Container orientated SSW—NNE

Figure 5. Morning and mid-day distribution of temperature in a 40-foot plywood container

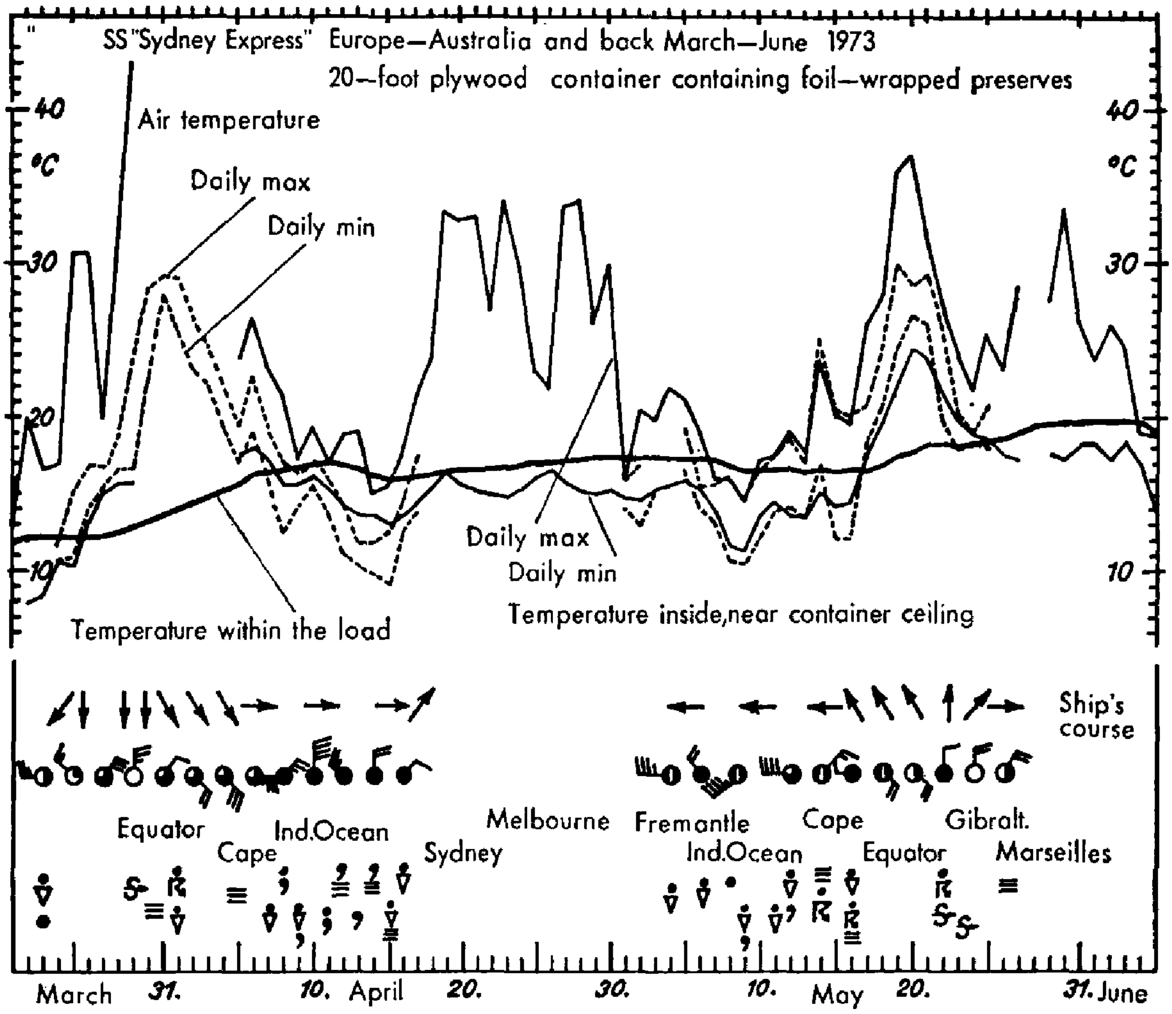


Figure 6. The variation in temperature in a 20-foot plywood container filled with preserves on a voyage from Europe to Australia and back

winds and frequent precipitation, and even remained below it on the return passage because of strong evaporative cooling. By contrast, on the outward passage sudden overheating to the extent of 15 degrees and 19 degrees occurred under cloudless conditions on 25–26 March in the latitudes of Gibralter and Dakar respectively. This happened because there was a following wind of about the same strength as the ship's speed, so that any cooling effect was removed. Moreover, more pronounced heating occurred during the days alongside in Australian ports, even though the containers remained on board. Without doubt, even stronger overheating would have arisen on the concrete floor of the terminal. Also of interest is the steady progressive rise in the temperature, particularly in the centre of the foil-wrapped preserves.

Moisture in containers

Damage caused by moisture is a source of particular concern to importers and exporters and also to shippers and insurers. In this respect, the extraordinarily slow temperature changes in the centre of a container cargo can be important. As happens in a conventional hold, damage may arise in the form of cargo sweat, here better termed container sweat, and also in the formation of mould. The sources of moisture may be either the cargo itself or the packaging and storage material. Should there be no moisture carrier in the container, as in the case of machinery or similar objects, and the container be not only water-tight but wholly steam-tight, then neither the corrosion nor mould is to be feared during the transport of the cargo from cold climatic zones into or through extremely warm and damp ones. This is not the case if fog occurs during loading so that the initial humidity of the air in the container is 100 per cent. It is assumed however, that no drops of water, which could later evaporate, adhere to the cargo, and that the wooden floor of the container has not taken up moisture while being cleaned or while standing in the open during a period of wet weather. While the container is being transported the temperature inside follows the rising ambient temperature and the increasing radiative warming of the walls. Thus, given a constant water vapour content, the relative humidity of the container air decreases. Even if the cargo temperature is very slow to follow the increase in the ambient temperature, it still remains permanently above the unaltered dew-point of the container air. In such a case, ventilation holes of the type seen particularly in some kinds of steel containers would be a real danger; they would allow the warmer and moister surrounding air uncontrolled entry to the container. Were the dew-point of the latter to exceed the temperature of the colder cargo, sweat would form and cause corrosion.

Usually, however, when non-hygroscopic industrial goods are despatched, hygroscopic packaging and stowing material is introduced into the container. Let us examine the representative case of a plywood container carrying preserves in cartons stored on pallets. The container was transported as deck cargo from Australia to Europe round Africa during the cold season. A total of 760 cartons, each containing 13 kilogrammes of fruit preserve, were stored on 12 pallets in the twenty foot container. Assuming each pallet weighed some 16 kilogrammes the total weight of wood amounted to approximately 200 kilogrammes and the total weight of the cardboard cartons would amount to approximately 600 kilogrammes.

At the time of departure the conditions in Australia were, in average terms, air temperature 10°c and relative humidity 75 per cent. Assuming that both the pallets and the cartons achieved equilibrium in humidity with their surroundings, it follows that under the given initial conditions the moisture content of the wood, referred to that of a dry mass, would be 15 per cent while the corresponding value for the cardboard cartons would be 11 per cent. While the ship was still in the Indian Ocean the increase in ambient temperature and the effect of the insolation caused the container air to heat up and, after an interruption before South Africa was reached, the temperature inside the container went on to attain its maximum of 30°c south of Dakar after 20 days at sea. Assuming a temperature rise of 10 degrees for the preserves during these 20 days, which may be an overestimate given the high storage density, the difference in temperature between the container air and the preserves would be about 10 degrees, at least in the centre of the cargo. This means that the dew-point of the container air which, in order to preclude sweating and consequent corrosion, may not exceed the temperature of the preserves, must also be 10 degrees less than the ambient temperature. For an ambient temperature of 30°c this would correspond to a relative humidity of 54 per cent. For the sake of simplicity let us set a 50 per cent relative humidity in the container, thus guaranteeing that the dew-point will remain less than the loading temperature for a difference of 11·7 degrees between dew-point and ambient temperature. According to a drying-out experiment I carried out myself, pinewood with an initial relative humidity of 15 per cent will lose 5 per cent of its moisture within 20 days when the humidity of the container air is 50 per cent. Given a mass of 200 kilogrammes this would come to 10 litres of water. Since it happens that pallets of fresh wood are sometimes used initial humidities of 20 per cent in the wood may not be ruled out. As Figure 7 shows, in this particular case the humidity of the wood drops to 10 per cent after 20 days, corresponding to 20 litres of water.

In equilibrium with an initial humidity of 75 per cent for the ambient air the cardboard of the cartons contains 11 per cent water, in round figures. At a container humidity of 50 per cent this is reduced to 8·5 per cent within 20 days. For 600 kilogrammes of cardboard this implies a further supply of 15 litres of water. Certain types of siccative (drying agent e.g. silica gel) have an ability to collect as much as 80 per cent of their original weight in water. As shown in Figure 8 this happens when

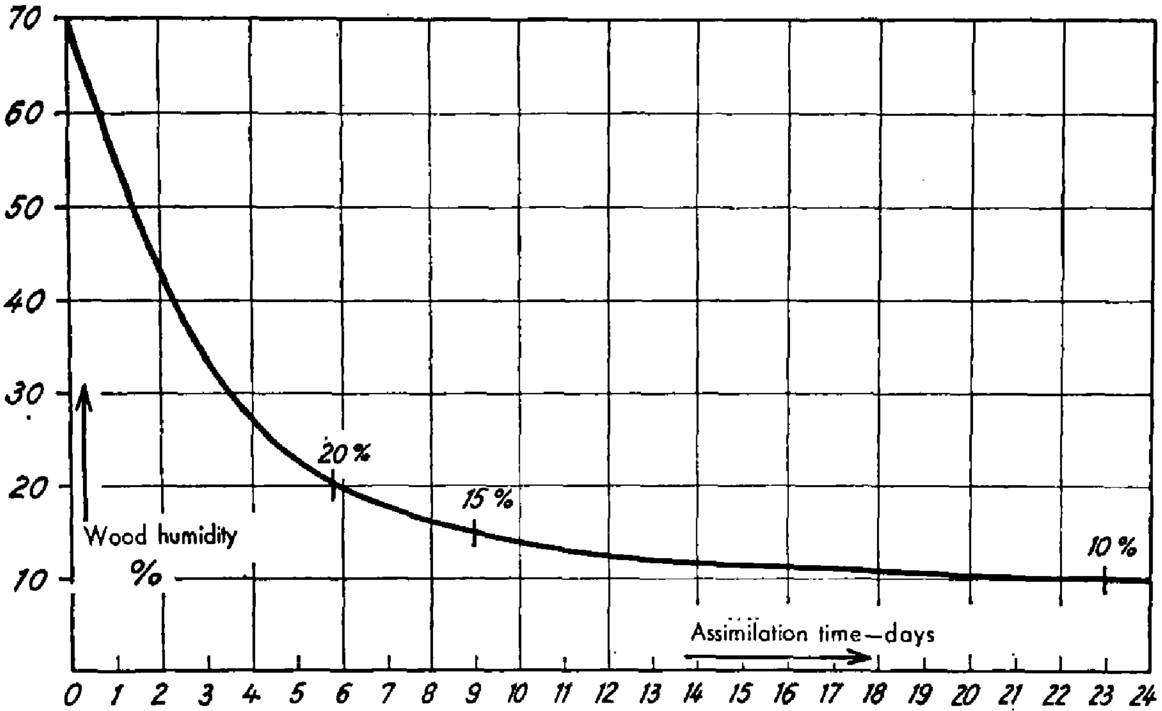


Figure 7. Changes of wood humidity with air in the container initially at 23°C and 50 per cent humidity

the relative humidity is 100 per cent. Owing to the large temperature differences along the route from Australia to Europe (on the East Asia–Europe run temperature differences may be much larger again for winter departures because the tropics are crossed twice) the container humidity may, as already mentioned, fail to exceed 50 per cent. In this humidity range the collection efficiency of a siccative of type B is only 15 per cent. Here, even type A, with a capacity of 25 per cent would be preferable. In our case the amount of siccative required would be 165 kilogrammes, made up of 66 kilogrammes to compensate for the water released by 200 kilogrammes of wood with an initial humidity of 15 per cent and 99 kilogrammes for the 600 kilogrammes of cardboard containing 11 per cent water. For type A the amount reduces to 100 kilogrammes (40 kilogrammes and 60 kilogrammes, respectively, for wood and cardboard of the same humidities as above).

Assuming the pallets have a 20 per cent initial humidity, the wood requires 132 kilogrammes of type B siccative and the cardboard 99 kilogrammes making a total of 231 kilogrammes. For type A the amount is 80 plus 60 equals 140 kilogrammes.

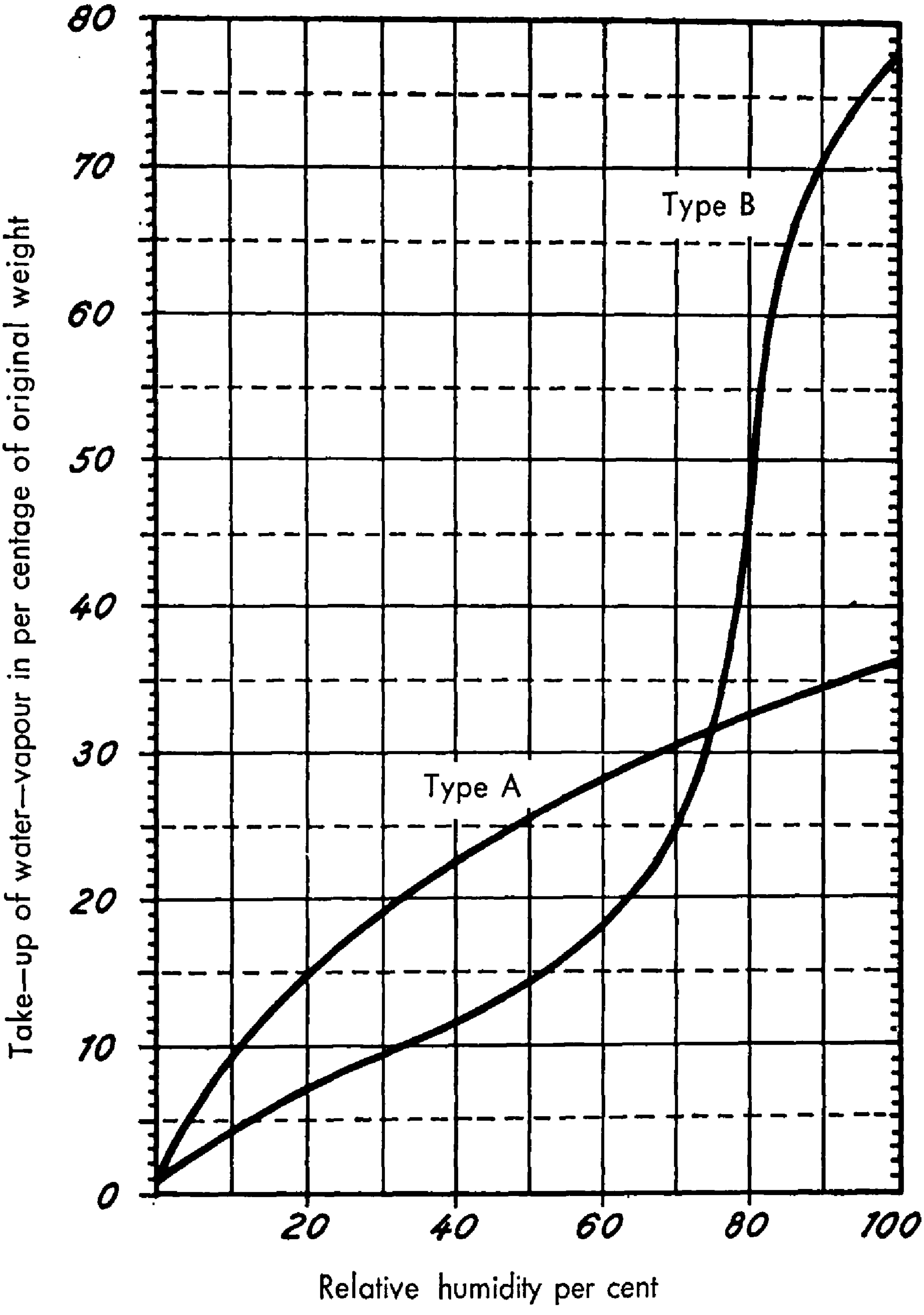


Figure 8. Absorption of a siccative at 25°c

The question arises whether this is worth while financially or even in terms of space. (See table on page 198.)

We have learned from a report that there is a similar estimate for the transport of preserves from Australia to Japan, the USA and Canada. The report takes 50 kilogramme packages of silica jel as sufficient to eliminate 45 litres of water. The related cost of 60 dollars per container is already too high. However, that estimate is based on the highest collection efficiency of silica jel for the appropriate range of atmospheric saturation and it is hardly surprising that the results are not satisfactory. No doubt cargo sweat formed on the preserves during the journey and mould formed on the labels and cartons. For the 50 per cent container humidity we consider it would require 300 kilogrammes of type B (silica jel) and 180 kilogrammes of type A to take up these 45 litres of water released on the voyage from Australia to Europe.

This assessment ought to show how important it is, when loading standard containers, to take heed of the amount of moisture in the packaging and in the wood used for pallets—particularly when the route traverses different climatic zones. Thus, the conclusion regarding the Australia route is that the initial humidity of the pallets should not exceed 12 per cent and that the limit for cartons is 10 per cent. However, the moisture content of the container floor should also not be overlooked. If the container has stood for a lengthy period in the open in conditions of high humidity, and particularly if it has been cleaned by using a liquid agent, the floor may function as a considerable source of moisture.

Summary

There is a high danger of meteorological damage to ship-borne cargo packed in containers, particularly if routes run through radically different climatic zones.

With regard to thermal damage during waiting time in the open air the upper space in a container may overheat by 20 degrees in temperate latitudes and by up to 30 degrees in the sub-tropics and tropics when compared with the ambient temperature. On board ship, however, especially where high-speed ships are concerned, severe overheating occurs only when the wind is out-run, i.e. when wind and spray effects are largely absent even if the containers are stowed on deck as the topmost cargo.

As to damage induced by moisture, it is imperative to be clear in advance about the temperature differences to be expected during the voyage, particularly if this is from cold to warm climatic zones, and about the resultant differences in temperature between the container air and the cargo which assimilate only very slowly. To avoid cargo sweat, the dew-point of the container air must not exceed the loading temperature. There are different ways of ensuring this.

It should be possible to use only non-hygroscopic material when packing and stowing. However, with wooden containers it is necessary to pay attention to their moisture content.

When hygroscopic stowing and packaging materials are used they must have a humidity low enough to ensure that no water will form, if possible, during the voyage. This can be done if the materials are stored beforehand in dry conditions and the containers are packed and closed in similar conditions. Moreover, by prewarming the goods the expected temperature differences between container air and cargo expected on the journey may be lessened, thus reducing or completely eliminating damage. All this is a question of economics and worthy of consideration.

Apart from the question of inherent moisture which, concerning transportation from warm to cold climatic zones, can cause sweating and the formation of mould, as well as self-heating, there is the problem of production of carbon dioxide by virtue of the life processes which persist during the voyage. Treatment of this problem would, however, overstep the bounds of this discussion.

Estimates of siccative required for transportation of goods from Australia to Europe

Container contents and approximate weights:

12 pallets at 16.0 kg each — approx 200 kg of wood
760 cartons at 0.8 kg each — approx 600 kg of cardboard

Initial conditions in Melbourne where container was stuffed:

Atmospheric temperature 10°C
Relative Humidity 75%

Equilibrium water content for:

Wood 15% of weight
Cardboard 11% of weight

Temperature conditions after 20 days at sea:

Container air 30°C
Preserves 20°C

Temperature	Dew Point	Relative Humidity
30°C	20.0°C	54%
30°C	18.3°C	50%

Effect of reduction in humidity of the goods within 20 days for a container humidity of 50%:

(*a*) Pallets (200 kg wood) reduced from 15% to 10% release 10 litres of water
Cartons (600 kg cardboard) reduced from 11% to 8·5% release 15 litres of water

Siccative required:

	Type B	Type A
to absorb 10 litres of water released by pallets	66 kg	40 kg
to absorb 15 litres of water released by cardboard	99 kg	60 kg
Total siccative required	165 kg	100 kg

(*b*) Pallets (200 kg wood) reduced from 20% to 10% release 20 litres of water
Cartons (600 kg cardboard) reduced from 11% to 8·5% release 15 litres of water

Siccative required:

	Type B	Type A
to absorb 20 litres of water released by pallets	132 kg	80 kg
to absorb 15 litres of water released by cardboard	99 kg	60 kg
Total siccative required	231 kg	140 kg

RECOMMISSIONING OF THE OWS *Weather Monitor* UNDER A NEW NAME

On 25 May 1977 at Great Harbour, Greenock, the second refurbished Ocean Weather Ship *Weather Monitor* was renamed *Admiral Beaufort* by Mrs M. Fletcher, wife of the new Provost of Greenock. (See photographs opposite page 201.)

In his address at the re-naming ceremony, Dr N. E. Rider, Deputy Director of the Meteorological Office, welcomed the guests on behalf of the Director General who was unable to be present owing to other commitments. Dr Rider then went on to give a brief history of the Ocean Weather Service and continued: 'The Ocean Weather Ship Service continues under the umbrella of the World Meteorological Organization which was instrumental in encouraging the signing of a new Joint Financing Agreement in 1975. Fourteen nations now contribute to the cost of the Service and four Atlantic stations continue to be manned. Under the Agreement the United Kingdom is responsible for maintaining an uninterrupted presence at Ocean Station "Lima" and this ship is the second to undergo a major refit and overhaul to make this possible. Those familiar with the ships as they were before refit will recognise the very substantial improvements which have been made to the accommodation and to the technical equipment in every department. The object has been to extend the operational life of the ships and to make living and working conditions, for those who sail in them in the hard environment of the North Atlantic, more in keeping with modern standards. I should like to express the appreciation of the Meteorological Office to Manchester Dry Docks Ltd for the work they have done and to Three Quays Marine Services who, as our consultants, have rendered such good service over the long refit period.

'Now a word or two about Francis Beaufort. He was an extraordinary and distinguished man. Born in Ireland in 1774 he entered the Royal Navy at the age of 13 and served under Lord Howe and Admiral Cornwallis, amongst others, and took part in many engagements. In one action alone, the successful capture of a Spanish ship off the coast of Malaga in 1800, he received many wounds and as a result was granted a small state pension and promoted to Commander. He returned to active service in 1805 and in the following few years devised his now universally known "Scale of Wind Force". He also took part in many hydrographic surveys, that of the Río de la Plata being particularly noteworthy. He became well known in these Islands in the second decade of the 19th century when, following an extensive survey of the south coast of Asia Minor, he published a remarkable work entitled *Karamania* which became, in modern terminology, a best seller. It is a work on natural history and antiquity which is still held in high regard today. It is interesting to note that Beaufort refused payment as a result of this publication because, in his own words, "the materials were acquired in His Majesty's Service in the execution of a public duty". In 1829 at the age of 55 Beaufort was appointed Hydrographer to the Admiralty and during the 26 years over which he held this post he converted the hydrographic service into a recognised world centre of excellence in survey and the subsequent preparation of charts and in scientific activity in everything connected with the sea. Although much more could be said about him I think I can best sum up this short description of his life and work by reading an extract from a newspaper article published in 1844 in New Orleans when he had been the Hydrographer for 15 years—

> "Of Beaufort it may be said that the navigators of all nations owe him a deeper debt of gratitude than to any man dead or living for the well-directed zeal which he has conceived and for the liberality he has shown in communicating the surveys made from his office."'

Dr Rider then invited Mrs Fletcher to rename the ship. After the ceremony the guests were shown around the ship and entertained to luncheon onboard. We join Mrs Fletcher in wishing the ship every success.

INDIAN EXCELLENT AWARDS

(From the Deputy Director-General of Observatories (Forecasting), India)

The Indian Meteorological Department is pleased to note and record its appreciation of the co-operation between the ships of the Indian Voluntary Observing Fleet (IVOF) and the India Meteorological Department for collecting meteorological data from the high seas during the year 1975–76. Year by year the ships traversing the oceans have a greater part to play in their contribution to the progress of science and the exploration of marine resources. This year sees the commencement of the Monsoon Experiment (MONEX) program for the detailed study of monsoons which involves international collaboration. We hope the ships of the IVOF will also contribute to this program.

During the year ending 31 March 1976, 20 ships were added to the strength of the IVOF and 6 ships withdrawn. At the end of the year therefore, 247 ships were on the IVOF list, consisting of 44 Selected, 173 Supplementary and 30 Auxiliary ships. Meteorological logbooks received from these ships contained 11 628 weather observations. It may, however, be mentioned that although the number of voluntary observing ships increased during the year, there was a decline in the total number of ships' recorded observations.

Timely reception of weather observations from ships is of vital importance for day-to-day forecasting and issue of weather bulletins and we hope that observations will be transmitted promptly to the nearest coast radio station. Special encouragement is given to those ships which send crucial observations, particularly when a depression or cyclonic storm is in its formation stage or when it is intensifying into a severe cyclonic storm. Recognition is also given to ships which transmit such important observations even though they do not belong to the IVOF.

The meteorological work of the ships of the IVOF during the year 1975–76 has been assessed taking into account the quality and quantity of observations and also the percentage of observations which have been actually transmitted to coast radio stations. Allowance has also been given to individual ships for the actual number of days spent at sea. This year 15 ships have been selected to receive Excellent Awards in the form of books while another 10 ships will receive Certificates of Merit. The masters and officers who have served 6 months or more on board these ships during 1975–76 are awarded books/certificates. The names of the ships to receive Excellent Awards are as follows:

Name of Ship	Owner
B. R. Ambedkar	Shipping Corporation of India Ltd
Chidambaram	Shipping Corporation of India Ltd
State of Haryana	Shipping Corporation of India Ltd
Vishva Kanti	Shipping Corporation of India Ltd
Jalagopal	Scindia Steam Navigation Co. Ltd
Jaladhruv	Scindia Steam Navigation Co. Ltd
Jalamorari	Scindia Steam Navigation Co. Ltd
Jaljawahar	Scindia Steam Navigation Co. Ltd
Jag Kisan	Great Eastern Shipping Co. Ltd
Jag Jawan	Great Eastern Shipping Co. Ltd
Maratha Progress	Chowgule Steamships Ltd
Akbar	Mogul Line Ltd
Satya Kamal	Seven Seas Transportation Co. Ltd
Daman	Damodar Bulk Carriers Ltd
Karanja	Mackinnon Mackenzie & Co. Ltd

Certificates of Merit have been awarded to the following ships:

Indian Prestige	*Sanchi*
Jag Rekha	*Satya Sohan*
Jalajyoti	*State of Tamilnadu*
Jalamoti	*Vishva Chetana*
Maratha Providence	*Vishva Seva*

ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM APRIL TO JUNE 1977

The charts on pages 202 to 204 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

(*Opposite page* 200)

The recently refurbished O.W.S. *Admiral Beaufort* (formerly *Weather Monitor*) at Station 'Lima'.

(*Opposite page 201*)

Renaming ceremony of O.W.S. *Admiral Beaufort* at Greenock, 25 May 1977; left to right: Captain P. B. Swift (Master of *Admiral Beaufort*), Provost M. Fletcher, Dr N. E. Rider, Mrs M. Fletcher, Captain G. A. White (Marine Superintendent) and Captain J. Morgan (Shore Captain, O.W.S. Base) 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).

April

The pressure anomalies were to a large extent the reverse of those during March, e.g. over the Arctic pressure was lower instead of higher than normal and over the central North Atlantic pressure was higher instead of lower than normal. In places temperature anomalies were reversed and elsewhere they were reduced. In most sectors the ice edge reverted to nearer its normal position by the end of the month but substantial deficits of ice persisted in Davis Strait and off Labrador; west of Novaya Zemlya the ice edge receded rapidly resulting in a considerable excess at the beginning of the month being replaced by a deficit by the end of the month. The Great Lakes and the Gulf of St Lawrence were nearly free of ice by the end of April and in the Baltic ice persisted only in the Gulf of Bothnia.

May

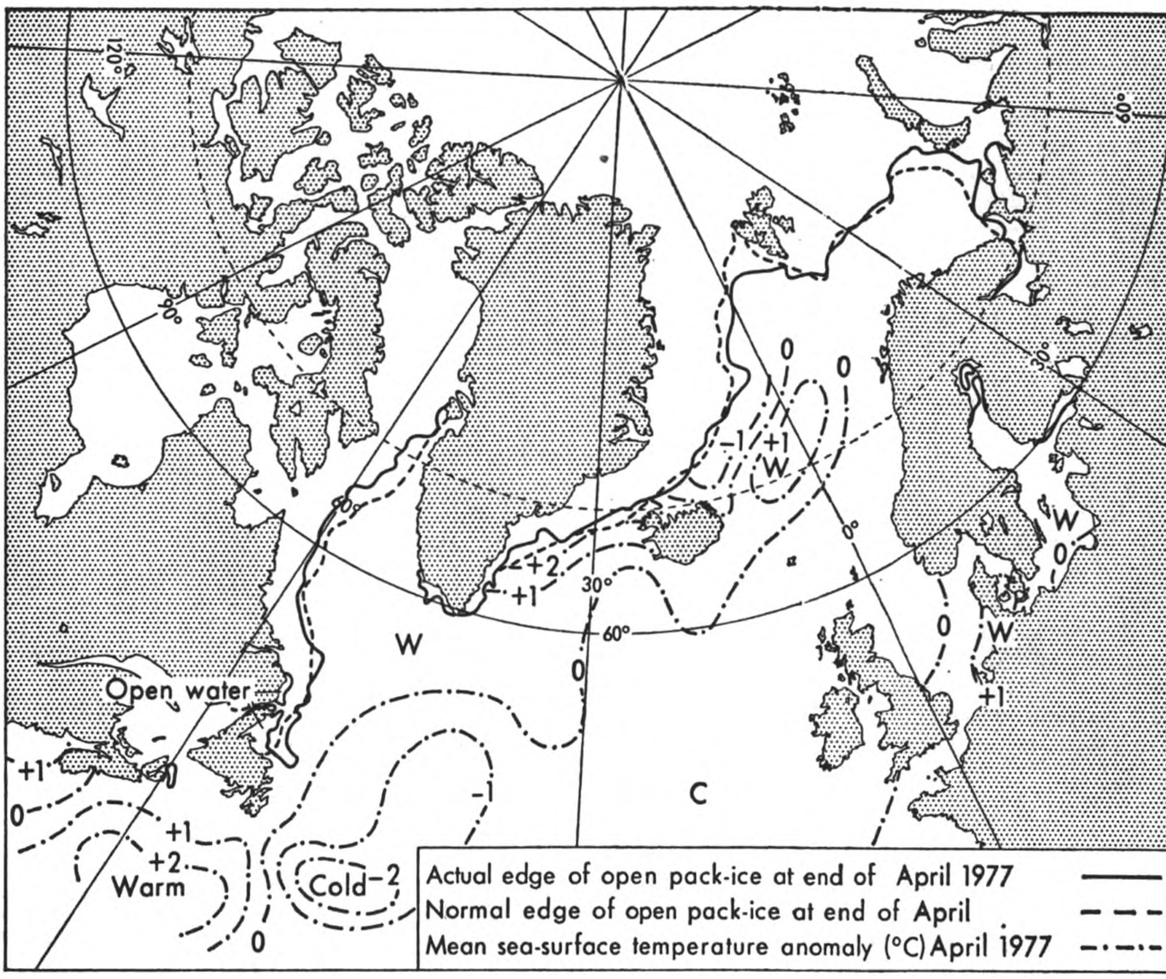
Anomalies for southerly winds and above-average temperatures gave quicker than usual melting and disintegration of ice over the western part of Hudson Bay. Similar anomalies south-east of Greenland accentuated the deficits of ice there during the month. In most of the remaining sectors ice receded to more or less the extent that would be expected during May but in the Greenland Sea the recession was offset by an anomaly for westerly winds which drifted ice towards the open sea—in places even beyond the limits at the end of April—so that May ended with a considerable excess of ice in this area.

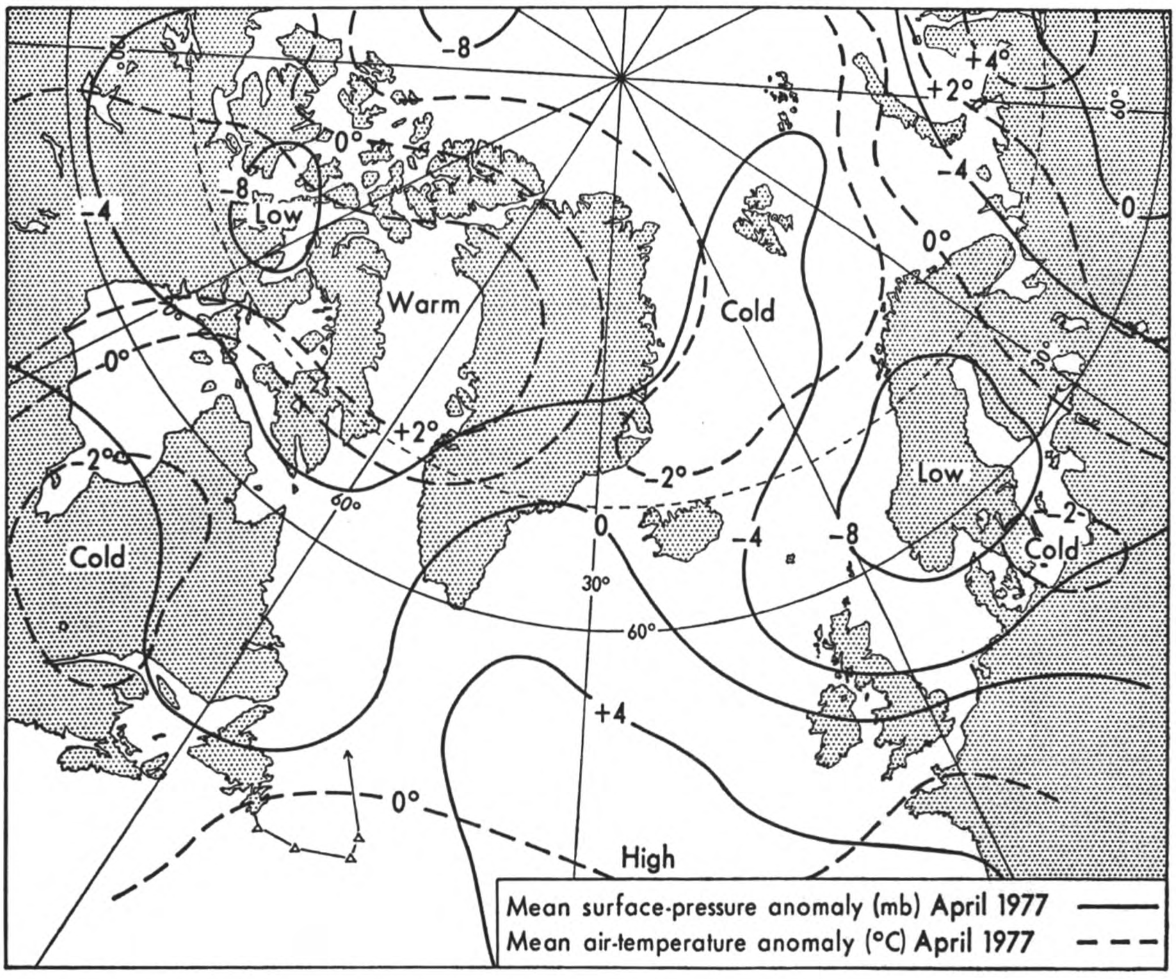
June

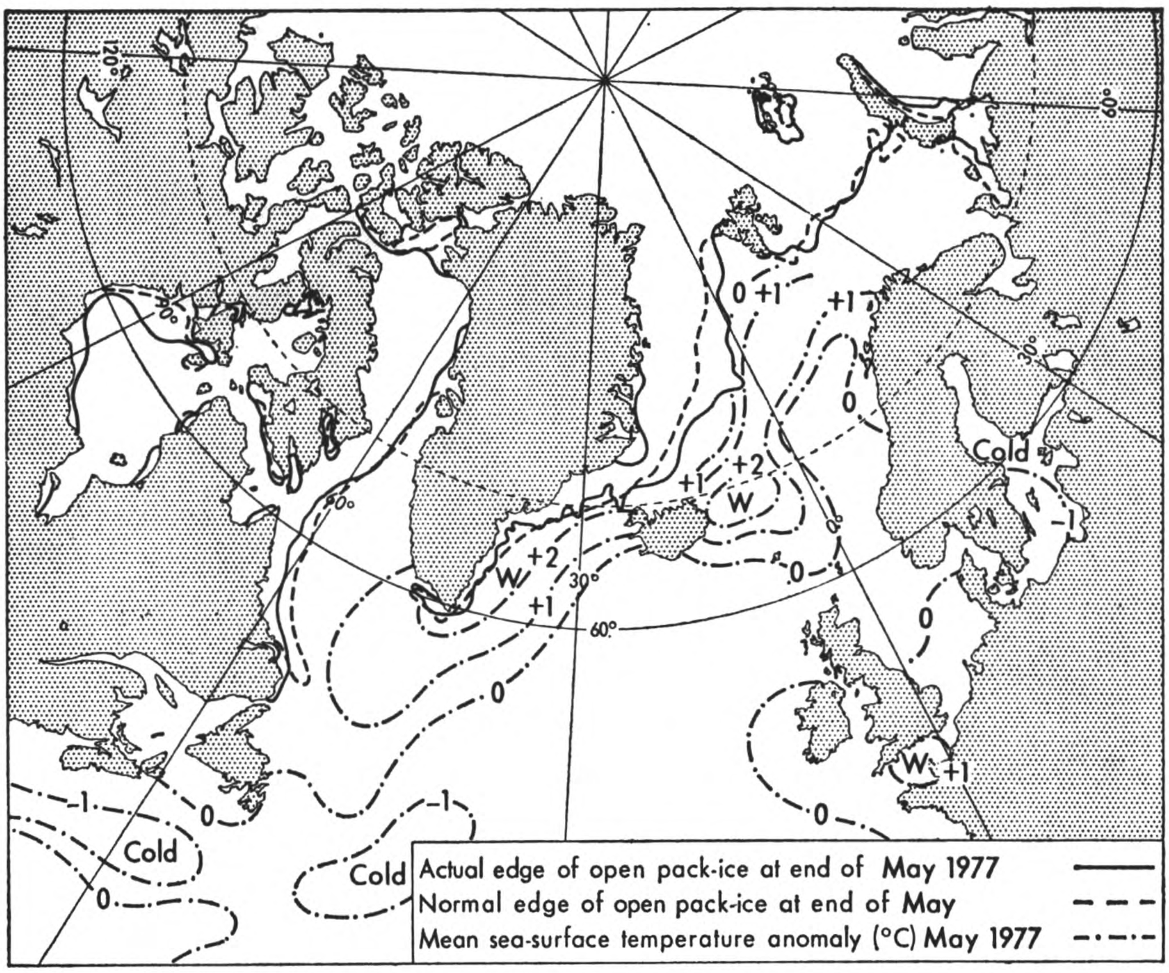
Anomalies over the month were not pronounced—the main ones being for low temperature over Baffin Bay (leading to some excess of ice there) and for high temperature over the Kara Sea (where ice melted more rapidly than normal). The melting of ice continued ahead of normal over the western side of Hudson Bay though ice was more persistent over the eastern side. The excess of ice in the Greenland Sea remained a marked feature.

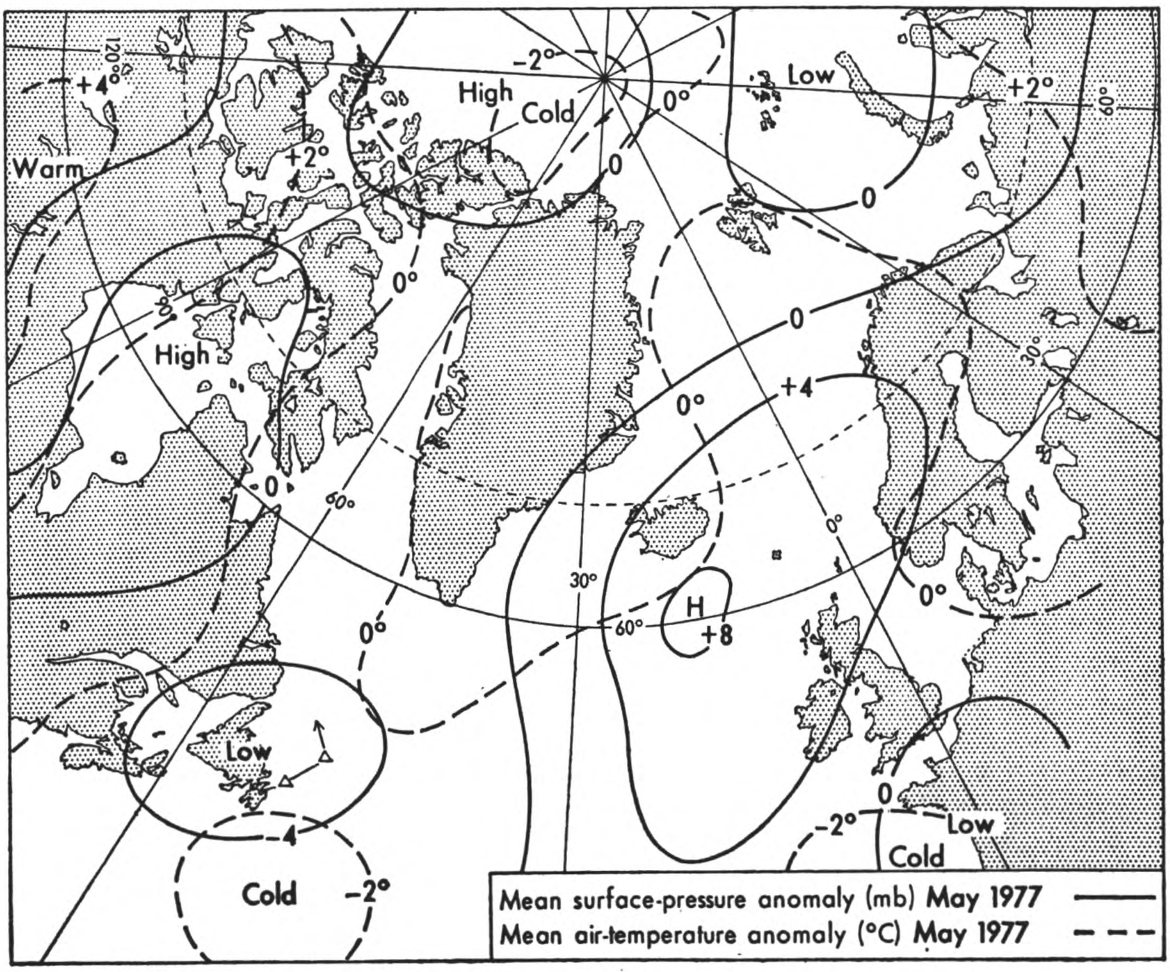
REFERENCES

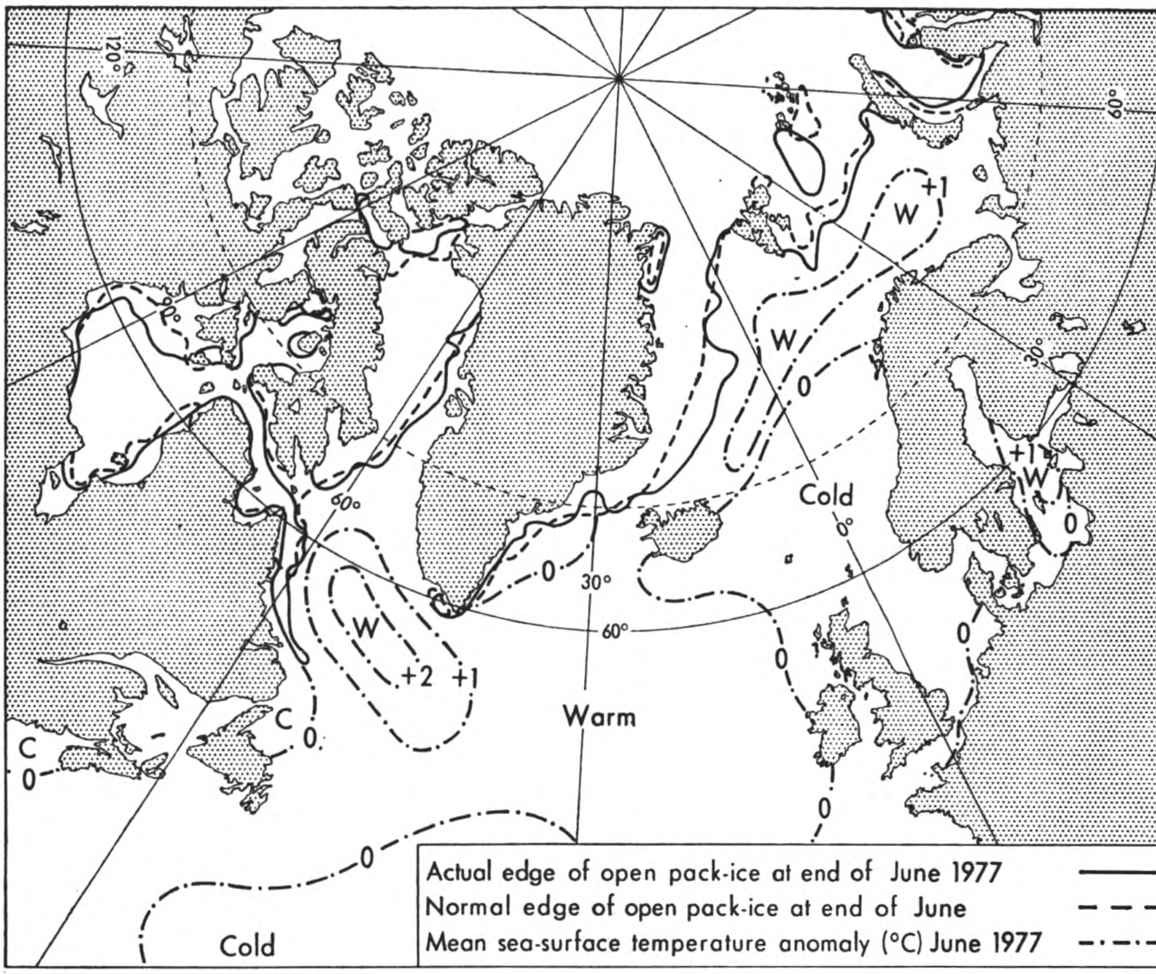
Meteorological Office, London	1966	Monthly meteorological charts and sea surface current charts of the Greenland and Barents Seas.
	—	Sea ice normals (unpublished) and various publications.
U.S. Department of Commerce Weather Bureau, Washington, D.C.	1965	World weather records, 1951–60. North America.
U.S. Naval Oceanographic Office, Washington, D.C.	1967	Oceanographic atlas of the North Atlantic Ocean, Section II: Physical properties.

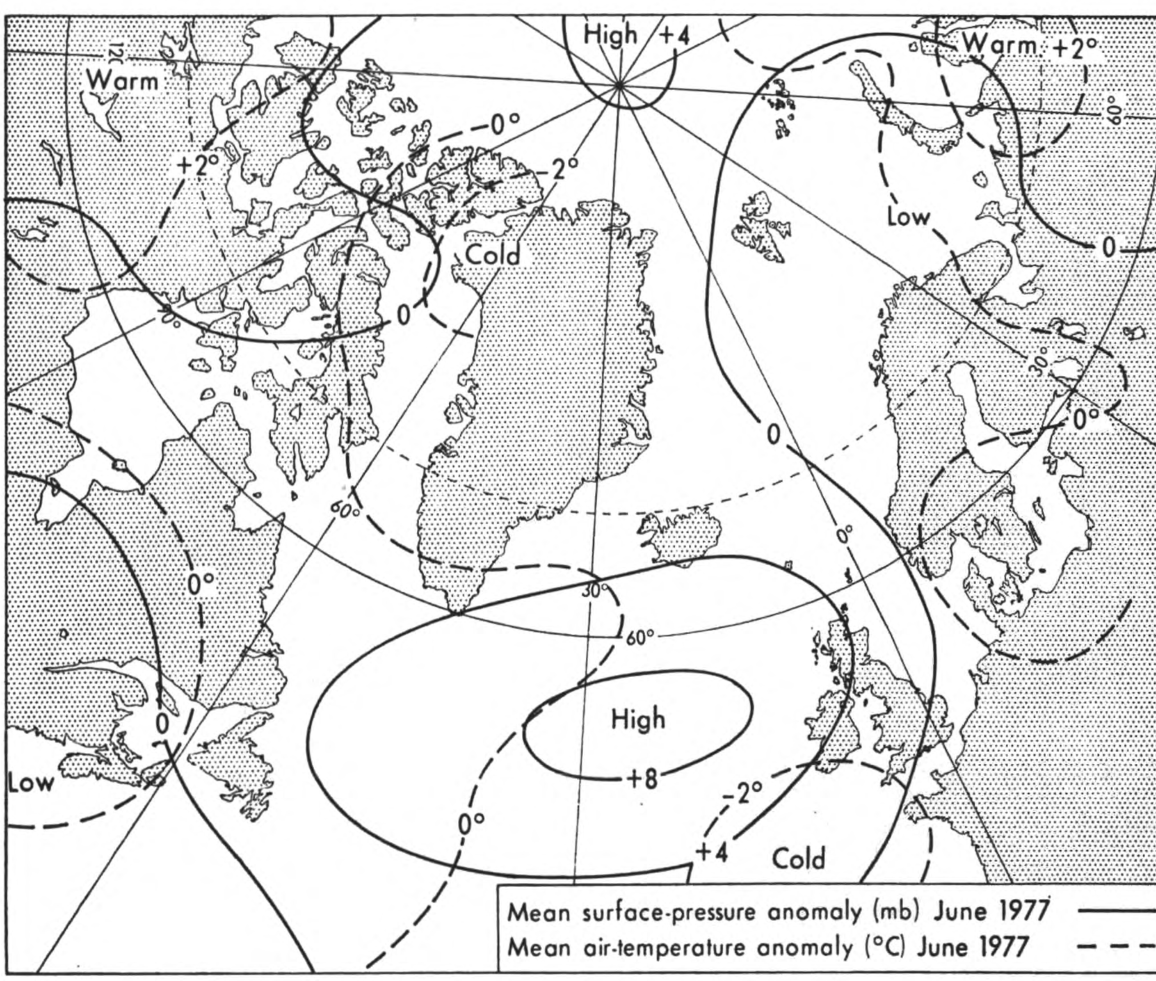

Open water
W
C
Warm
Cold
Actual edge of open pack-ice at end of April 1977
Normal edge of open pack-ice at end of April
Mean sea-surface temperature anomaly (°C) April 1977


Low
Warm
Cold
Cold
Low
Cold
High
Mean surface-pressure anomaly (mb) April 1977
Mean air-temperature anomaly (°C) April 1977


Actual edge of open pack-ice at end of May 1977
Normal edge of open pack-ice at end of May
Mean sea-surface temperature anomaly (°C) May 1977
Cold
Cold
Cold
W
W
W
+2
+1
0
-1
120°
90°
60°
30°
0°
60°


Mean surface-pressure anomaly (mb) May 1977
Mean air-temperature anomaly (°C) May 1977
High
Cold
Low
Warm
High
H
+8
+4
Low
Cold
Cold
Low
-2°
+2°
+4°
0°
-4
120°
90°
60°
30°
0°


Warm
Cold
W
C
+1
+2
0
Actual edge of open pack-ice at end of June 1977
Normal edge of open pack-ice at end of June
Mean sea-surface temperature anomaly (°C) June 1977


High
+4
+8
Low
Warm
Cold
+2°
0°
-2°
Mean surface-pressure anomaly (mb) June 1977
Mean air-temperature anomaly (°C) June 1977

Baltic Ice Summary: April–June 1977

No ice was reported at the following stations during the period: Klaipeda, Ventspils, Mariehamn, Kalmar, Göteborg, Visby, Emden, Lübeck, Hamburg, Bremerhaven, Kiel, Flensburg, Stettin, Gdansk, Stralsund, Aarhus, Copenhagen, Oslo, Kristiansandfjord.

No ice was reported at any of the stations during June.

Station	April									May								
	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree Days	Length of Season		Ice Days			Navigation Conditions			Accumulated Degree Days
	A	B	C	D	E	F	G	H	I	A	B	C	D	E	F	G	H	I
Leningrad ..	1	17	14	1	2	12	2	0	—	0	0	0	0	0	0	0	0	—
Riga ..	1	2	2	0	0	1	0	0	—	0	0	0	0	0	0	0	0	—
Pyarnu ..	1	30	30	17	10	9	0	21	—	1	8	5	0	0	2	0	0	—
Viborg ..	1	30	30	27	2	3	0	27	—	1	12	11	0	1	3	0	0	—
Tallin ..	1	27	25	0	18	3	16	0	—	1	1	1	0	0	1	0	0	—
Helsinki ..	1	30	28	17	1	0	28	0	—	0	0	0	0	0	0	0	0	—
Turku ..	1	30	14	0	0	0	14	0	—	1	1	1	1	0	0	1	0	—
Mantyluoto	1	12	12	0	2	1	11	0	—	0	0	0	0	0	0	0	0	—
Vaasa ..	1	30	30	30	0	0	30	0	—	1	2	2	0	0	0	2	0	—
*Oulu ..	1	30	28	28	0	0	28	0	—	0	0	0	0	0	0	14	0	—
Roytaa ..	1	30	30	0	30	0	30	0	—	1	22	18	0	17	0	22	0	—
Lulea ..	1	30	30	0	30	0	30	0	—	1	23	17	0	0	6	11	0	—
Bredskar ..	1	30	24	0	3	5	19	0	—	1	4	4	0	0	1	0	0	—
Sundsvall ..	12	22	11	0	0	11	0	0	—	0	0	0	0	0	0	0	0	—
Stockholm	1	20	20	0	7	20	0	0	—	0	0	0	0	0	0	0	0	—
Skellefteå ..	1	29	29	25	0	0	28	1	—	0	0	0	0	0	0	0	0	—

*Oulu: No ice reported in May but ice in the vicinity dangerous to navigation

CODE:

A First day ice reported.
B Last day ice reported.
C No. of days when ice was reported.
D No. of days continuous land-fast ice.
E No. of days of pack ice.
F No. of days dangerous to navigation, but assistance not required.
G No. of days assistance required.
H No. of days closed to navigation.
I Accumulated degree-days of air temperature (°C) where known.*

* These figures give a rough measure of the first probability of the formation of sea ice, and later the progress of the growth and its thickness. They are derived from daily averages of temperature (00 + 06 + 12 + 18 GMT) and are the sum of the number of the degrees Celsius below zero experienced each day during the period of sustained frost.

Book Review

Triumph and Tribulation, by H. W. Tilman. 220 mm × 140 mm, pp. 153, *illus.* Nautical Publishing Co., Lymington, Hampshire, in association with George G. Harrap & Co. Ltd, High Holborn, London. 1977. Price: £3·85.

Major H. W. Tilman born in 1898, served in the Army with distinction in two world wars; erstwhile coffee planter, mountaineer, explorer and mariner, he adopted sailing as a means of journeying to remote areas of the globe in order to satisfy his passion for climbing and to follow in the footsteps of the early seamen-explorers whose experiences it has always been his aim to emulate.

This, the fifteenth book covering his travels and adventures and the sixth to be reviewed in this Journal, follows his voyages to Spitzbergen in 1974 and Greenland in 1975 and 1976. The voyages were made in a converted pilot cutter, *Baroque*, built 1902.

Having made ten or more voyages to Greenland the Major decided in 1974 to attempt the circumnavigation of Spitzbergen and having successfully achieved this he then explains his fondness for Greenland by saying: 'Greenland is the ideal objective, combining remoteness, difficulty of access, the grandest scenery, an inexhaustible number of mountainous fjords each with its own character and on the whole still sufficiently unfrequented for a man in a small boat to feel very remotely akin to the early seamen-explorers. All this being so, why go elsewhere? As the man from Texas advised: 'When you strike ile stop boring'.

The voyage to Spitzbergen—by way of Bear Island—with a volunteer crew of four covered the round voyage from Lymington from 1 June to 21 September 1974 during which time practically every conceivable kind of weather was encountered.

After calling at Longyeerbyen, the capital, and several other small towns and fjords on the west coast where climbing expeditions and explorations were carried out, they finally arrived at the northern entrance of Hinlopen Straits for the south-bound passage down the east coast.

The Major relates points of historic interest about every cape, bay and island that they passed and intersperses his narrative with appropriate passages from the *Arctic Pilots*.

The main 'trial' in this voyage came about in early August when the boat ran aground between two small islands in Freemansund, and only by the Herculean efforts of the crew was she refloated after jettisoning ballast, fresh water and excess gear—losing three anchors in the process—all the while fending off huge ice floes which threatened to wreck the boat and did in fact damage the rudder. Adverse weather retarded the homeward passage and they finally arrived in Lymington on 21 September.

His objective achieved, mostly through atrocious weather conditions of fog, ice and gales, the Major considers this a happy voyage and ends the first part of his book with: 'Much, if not all, depends on the crew. I had with me a good crew and if a man chooses to put his ship aground in Freemansund that is what he needs'.

After difficulties in finding suitable crew the 1975 voyage to Greenland finally commenced on 6 June, three weeks later than intended. A voyage in which the Major had hoped to reach Ellesmere Island at the north end of Baffin Bay. Foul weather caused *Baroque* to take 24 days to cover the 1000 miles to Cape Farewell, logging 1300 miles in the process. On one occasion, they found themselves amongst heavy ice floes which necessitated some of the crew having to jump on to the floes to push the boat clear then to leap back on board, an extremely hazardous and uncomfortable operation.

The main 'trial' in this second voyage occurred off the west coast of Disko Island in late July when without any warning at 1 a.m., a violent wind blew up from the south-west breaking the boom in two. This put paid to any possibility of sailing further north and being unable to find anyone willing to make a new boom, the Major decided to head for home and arrived at Lymington on 18 September.

In 1976, unlike the previous years, the author had a crew long before sailing day, which on paper at least 'abounded with promise'. How first impressions and ideas can be so entirely false was to be revealed later. However, at the time, as the Major puts it: 'Ellesmere Island seemed almost in the bag'. Crew troubles and ill fortune harassed the boat from the start. She sailed on 12 May from Lymington and had to land the first recalcitrant crew member at Falmouth. A replacement was found and they sailed from there on 26 May.

On 12 June a seam in the mainsail started to open and with increasing wind all sail was struck. *Baroque* then shipped two seas which damaged the chartroom bulkhead, leaving the chartroom awash and nearly taking the Major over the side. These experiences un-nerved the crew, one of whom threatened to quit at the first opportunity.

Repairs were effected in Reykjavik where another crew member left, but once again a replacement was obtained. *Baroque* sailed on 29 July for Angmagssalik, on the east coast of Greenland, which was only reached after many attempts at breaching a passage through heavy ice floes more often than not accompanied by gales, rain, snow or fog.

A combination of circumstances made 26 August the blackest day so far. On trying to clear the harbour the boat grounded hard and fast on a rock on a falling tide; despite all attempts to prevent it, she ended up on her beam ends.

The boat was quickly pumped out and the small amount of gear which had been salvaged was then ferried back on board. One can only attempt to imagine the feelings of disappointment, despair and frustration at the scene of devastation, caused by the ravages of diesel oil and sea water, which met the Major's eyes when returning on board. A lesser man might have 'thrown in the towel' there and then, but not this indomitable character.

Two more of the crew left and *Baroque* sailed for Reykjavik on 7 September, manned by skipper and crew of two, arriving a week later where two further crew were 'signed on'. She sailed for home on 19 September into the teeth of a south-east gale whereupon the two original remaining crew demanded a return to Reykjavik. The Major had no option but to comply and return they did. Despite these intolerable setbacks the Major was still determined to find new crew in order to get his boat back home; however, no further volunteers were available and by the end of September Major Tilman reluctantly resigned himself to leave *Baroque* to winter in Iceland.

A paragraph from the final page of the book states: 'I hope *Baroque* will sail back to England and that will probably be my last voyage in her. As my birthday is in February it would be difficult to celebrate my eightieth north of the Arctic circle, though I should have liked to have made a voyage in her in 1978 if only as a gesture of defiance'.

This last sentence seems to me to sum up this indefatigable character.

During all his voyages the Major has kept logbooks going for the Meteorological Office; books maintained in the scrupulously neat and tidy manner one would expect from this methodical man and in which the numbers of missing observations have been negligible.

Major Tilman writes with panache in an inimitable and amusing style, he is a master of the understatement where danger is concerned. His narrative is interjected with interesting accounts from previous voyages as well as appropriate quotes and passages from other authors' works to illustrate a point and his dry 'off the cuff' humour might make the reader imagine that his expeditions were no more hazardous than a Saturday afternoon sailing in the Solent.

Several photographs of *Baroque* are included together with maps of the areas covered in her travels.

This aptly-named book makes compelling reading.

J.D.B.

Personalities

OBITUARY.—It is with great regret that we have to record the tragic death as a result of an accident onboard his ship at Auckland on 25 January of Mr I. N. CONABEARE, Chief Officer of m.v. *Beaverbank*.

Ian Nicholas Conabeare was born in Hull in 1948 and was educated at King's School, Grantham. He was indentured as Apprentice to Trident Tankers Limited in 1965 but, on obtaining his 2nd Mate's Certificate in 1970, transferred to Shell Tankers (U.K.) Limited as 3rd Officer. In February 1973 he again transferred companies, this time to Bank Line Limited and was appointed 2nd Officer of m.v. *Lossiebank*. After a short period standing by new tonnage he was appointed to m.v. *Forthbank* and in early 1974 was promoted Chief Officer of this ship.

He continued in this capacity on m.v. *Pinebank* from June to December 1974 before commencing study for Master's Certificate. He obtained this Certificate in July 1975 and then served as Chief Officer of m.v. *Tweedbank* from October 1975 to April 1976. He joined m.v. *Beaverbank* in August 1976 and served in her until his untimely fatal accident.

Mr Conabeare sent us his first meteorological logbook from the *Asprella* in 1970. Since then we have received a further seven logbooks bearing his name of which two were classed as Excellent. As a result of his valuable voluntary work for the Meteorological Office he gained Excellent Awards in 1971 and 1974.

We extend our sincere condolences to his widow and young daughter in their very sad loss.

RETIREMENT.—MR D. F. MCGREGOR M.B.E., Shore Engineer at the Ocean Weather Ship Base at Greenock retired on 1 June 1977.

Duncan Fairlie McGregor was born in 1911 and was educated at Renfrew High School. On leaving in 1925 he served a five year Apprenticeship as Marine Engine Fitter with Simons and Company at Renfrew, and between 1934 and 1935 was a Marker Officer with Babcox and Wilcock Company.

Mr McGregor first went to sea in 1935 as a Junior Engineer with Ellerman's Hall Line of Liverpool. He remained with that company until 1947 rising to the rank of Chief Engineer. During the early part of the war he was engaged in the transportation of troops and supplies to France. Thereafter he served in Atlantic Convoys followed by service in the Middle East on the long haul round the Cape of Good Hope culminating in voyages to the Far East. The cessation of hostilities found him in Shanghai. Throughout the war he experienced various convoy battles but came through them all unscathed.

On leaving Ellerman's Hall Line in 1947, Mr McGregor served for a short time with Burns Laird Shipping Company before joining the Ocean Weather Service as 2nd Engineer in 1948. Thereafter he rose rapidly to the post of Shore Engineer to which he was appointed in 1952. He brought with him a wealth of experience which has been invaluable during the conversion and modernization of ocean weather ships in their many years of operation. His fine personality together with reliable and conscientious attention to duty earned him the highest esteem of the Ocean Weather Service and others who had the pleasure to work with him. In recognition of his contribution to the Ocean Weather Service he was made a M.B.E. in the New Year Honours List 1969 and was awarded the Queen's Silver Jubilee Medal this year.

We take this opportunity of wishing him and his wife a long, healthy and happy retirement.

Notice to Marine Observers

NAUTICAL OFFICERS OF THE MARINE DIVISION OF THE METEOROLOGICAL OFFICE, GREAT BRITAIN

Headquarters.—Captain G. A. White, Marine Superintendent, Meteorological Office (Met. O. 1a), Eastern Road, Bracknell, Berks. RG12 2UR. (Telephone: Bracknell 20242, Ext. 2456.)
Captain G. V. Mackie, Deputy Marine Superintendent. (Telephone: Bracknell 20242, Ext. 2543.)
Mr J. D. Brown, Nautical Officer. (Telephone: Bracknell 20242, Ext. 2461.)
Captain C. R. Downes, Nautical Officer. (Telephone: Bracknell 20242, Ext. 2738.)
Mersey.—Mr W. G. Cullen, Master Mariner, Port Meteorological Officer, Room 709, Royal Liver Building, Liverpool L3 1HN. (Telephone: 051-236 6565.)
Thames.—Captain R. C. Cameron, Port Meteorological Officer, Movement Control Building, South Side, Victoria Dock, London E16 1AS. (Telephone: 01-476 3931.)
Bristol Channel.—Captain J. H. Jones, Port Meteorological Officer, 33, The Hayes, Cardiff CF1 6NU. (Telephone: Cardiff 21423.)
Humber.—Captain D. H. Rutherford, Port Meteorological Officer, c/o Dept. of Trade, Posterngate, Hull HU1 2JN. (Telephone: Hull 223066, Ext. 27.)
Clyde.—Mr H. M. Keenan, Master Mariner, Port Meteorological Officer, 118, Waterloo Street, Glasgow G2 7DN. (Telephone: 041-248 4379.)
Forth.—All enquiries to Mr H. M. Keenan above.
Southampton.—Captain D. R. McWhan, Port Meteorological Officer, Southampton Weather Centre, 160 High Street below Bar, Southampton SO1 0BT. (Telephone: Southampton 20632.)
Tyne.—Mr D. J. F. Southon, Master Mariner, Port Meteorological Officer, 1–2 Osborne Road, Newcastle upon Tyne NE2 2AA. (Telephone: 0632 811616.)
Ship Routeing Service. (Telephone: Bracknell 20242, Ext. 2577.)
Captain A. Phillips, Nautical Officer.
Captain K. E. Stacey, Nautical Officer.

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[*Subjects of* Books Reviews, Editorial, Notices to Marine Observers, Notices to Mariners, Photographs *and persons named in* Retirement *and* Obituary *notices are indexed under these general headings*].

Printed in England for Her Majesty's Stationery Office by
William Clowes & Sons Limited, London, Beccles and Colchester

Dd. 497685 K19 10/77

ISBN 0 11 724386 8
ISSN 0025-3251