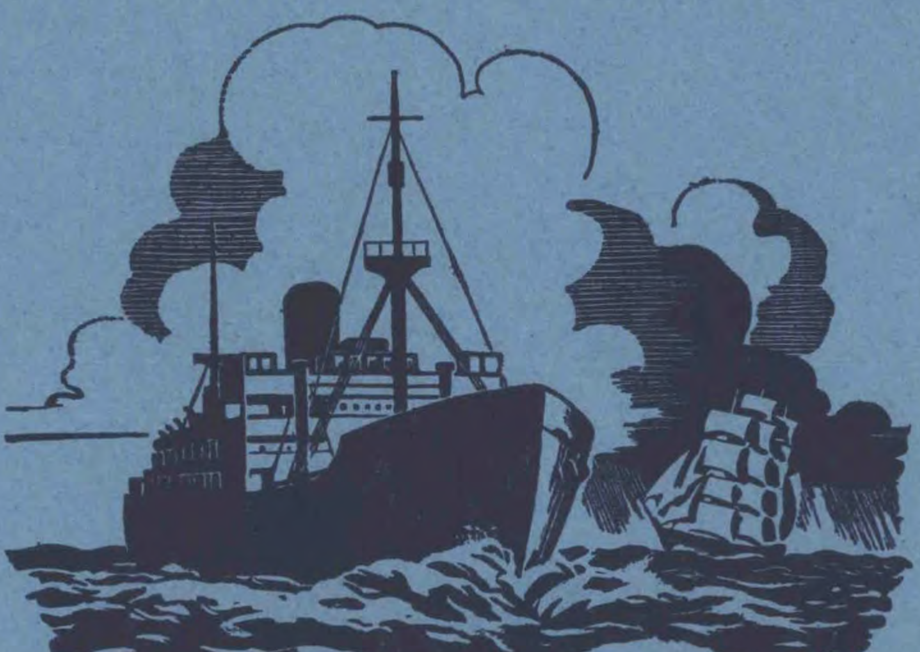
Met.O. 786

The Marine Observer

A quarterly journal of Maritime Meteorology



Volume XXXVII No. 215

January 1967

PRICE *6s. 6d.* NET

THE
MARINE OBSERVER

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

Vol. XXXVII

1967

Met.O. 786

THE MARINE OBSERVER

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

VOL. XXXVII **No. 215** **JANUARY 1967**

TABLE OF PRINCIPAL CONTENTS

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

Published for the Meteorological Office by

HER MAJESTY'S STATIONERY OFFICE

To be purchased direct from H.M. Stationery Office, at any of the following addresses: 49 High Holborn, LONDON, W.C.1; 423 Oxford Street, LONDON, W.1; 13a Castle Street, EDINBURGH, 2; 109 St. Mary Street, CARDIFF; Brazennose Street, MANCHESTER, 2; 50 Fairfax Street, BRISTOL, 1; 35 Smallbrook, Ringway, BIRMINGHAM, 5; 80 Chichester Street, BELFAST, 1, or from any bookseller.

PRICE 6*s*. 6*d*. NET or £1 7*s*. 8*d*. per annum (including postage)

Editorial

These are the generations of the heavens and of the earth when they were created, in the day that the Lord God made the earth and the heavens, and every plant of the field before it was in the earth, and every herb of the field before it grew: for the Lord God had not caused it to rain upon the earth. . . . But there went up a mist from the earth, and watered the whole face of the ground. *Genesis ii.*

In 1966 the World Meteorological Organization published a little booklet entitled *World Weather Watch*, the introduction of which begins as follows:

"Each nation of the world . . . shares with all other nations a common interest in the weather. This interest in weather can, however, only be translated into useful knowledge by international collaboration, for the weather moves across the earth's surface without regard to national boundaries and barriers. Thus, over the last century or so, a world system for studying the weather has been developed for the common good. But modern scientific and technological developments, notably earth-orbiting meteorological satellites and high-speed computers, now make possible a bold new approach to world meteorology. The nations of the world have not been slow to recognise this new opportunity. In 1960 their representatives in the General Assembly of the United Nations adopted unanimously a resolution calling upon the World Meteorological Organization (WMO) to develop a plan which will ensure that these new devices are fully used in man's constant endeavour to improve his basic knowledge of the atmosphere, and that this knowledge will be applied in practical and peaceful ways for the benefit of all peoples of the world.

"The response of the WMO to this challenging request has been the formulation of a plan for a new world weather system to which the name World Weather Watch has been given."

What does World Weather Watch mean? Briefly it is an ambitious and comprehensive extension of the existing international system for observing the earth's atmosphere and for the international exchange of the data so acquired, taking advantage of new and rapidly expanding scientific and technological methods. World Weather Watch implies the development of a much closer network of observations than is available at present in areas where observations are sparse or relatively sparse, both at the surface and in the upper atmosphere, including the extensive use of satellites and automatic stations; improvements in the existing telecommunications for exchanging data on a world-wide basis; and the establishment of a system of world, regional and national centres for receiving, processing and distributing meteorological information. It is hoped that, as a result of World Weather Watch, weather forecasts (short-range, medium-range and long-range) will become much more accurate and extensive than at present, and more detailed and more accurate climatological information will be available for the benefit of all human activities which are affected by the weather. And most human activities are so affected in some way or other—notably agriculture, water resources, health, transportation and the building industry.

In 1966 the Executive Committee drew up a detailed plan for implementing World Weather Watch, for submission to the Fifth Congress of WMO which meets early in 1967. To assist Congress in formulating this plan, representatives of the various Technical Commissions of WMO have held informal planning conferences during 1966, in which representatives of other international organizations directly interested in the weather have played their part.

As the oceans occupy three-quarters of the earth's surface it is obvious that maritime meteorology will play a very important part in World Weather Watch. For over a hundred years practically the only source of weather information from the surface of the oceans—except during recent years in the North Atlantic and North Pacific where Ocean Weather Ships have operated—has been the voluntary effort of officers in merchant ships. It is hoped that many more merchant ships and fishing vessels will take part in this scheme as a contribution to World Weather Watch—either as Selected Ships or as Auxiliary Ships. It is envisaged, therefore, that special efforts will be made by all countries with merchant fleets, during the period 1967–1971, to recruit more ships for doing this important voluntary task. There is no intention to increase the scope of the observations or to make the work any more lengthy or difficult, but merely to increase the number of co-operating ships, especially in the areas where shipping is sparse. Arrangements made by the Commission for Maritime Meteorology in 1964 have already paved the way to make it easier for radio officers to clear their messages to shore stations. Merchant ships are restricted in their movements to trade routes and, even if the officers in every ocean-going ship voluntarily co-operated, it is obvious that there would be vast oceanic areas—particularly in the Southern Ocean—where no observations from merchant ships or fishing vessels would be available.

Upper-air observations are also urgently required from the oceans, but at present these are only obtainable from Ocean Weather Ships, occasional research ships and the larger Naval ships. Efforts will be made to obtain radiosonde observations from up to 100 specially-selected merchant ships of all nationalities during the period 1967–71. It is not intended that these upper-air observations will be made by the ships' officers but that, with the consent of the shipowners, one or two meteorologists will sail aboard the ships concerned to make these special observations; all necessary equipment will be supplied by the meteorological services and the owner will not be involved in any expense. 'Radiosonde observations' implies the use of balloons filled with a gas lighter than air for taking the radiosonde to a height of about 60,000 feet so that readings of pressure, temperature and humidity can be radioed back to the ship by the sonde during the ascent. Hydrogen is the lightest and most efficient gas for use with these meteorological balloons but it is a dangerous gas and special precautions have to be taken when using it. Helium, on the other hand, although not quite so efficient and much more expensive than hydrogen, is perfectly safe under all conditions but has, up to the present, only been available in the United States and Canada. Helium has recently become available internationally and it is intended that this will be the gas to use if and when these observations are made aboard merchant ships. Radiosonde observations have been successfully made by meteorologists aboard certain merchant ships belonging to the U.S.A. over several years—notably on voyages across the Caribbean, North Atlantic and North Pacific. Upper-wind observations are also urgently required from the oceans but no practical and economic way of making such observations aboard merchant ships has yet been evolved, but research is going on in various countries with the object of devising some simple and readily-transportable system for this purpose.

In order to improve the oceanic network in areas where shipping is sparse and to create a network in areas where there is no shipping—notably in the Southern Ocean—various alternatives are under consideration. There is the possibility of establishing some additional fixed ship stations. One way of doing this might be to charter existing medium-sized tankers, which would have the advantage, with their enormous fuel capacity, of staying 'on station' for as long as twelve months at a time—the ships' company being relieved by tender at (say) three-monthly intervals; alternatively specially-built ships might be used for the purpose. Fixed automatic buoys might be used; the U.S. authorities have had operational success from such buoys in the Caribbean, moored in depths of up to 1500 fathoms and transmitting, by radio, observations of pressure, air and sea temperature, wind force and direction, etc. Another possible alternative is to use drifting automatic buoys, also sending a selection of surface observations by radio, their position being approximately determined by some D/F method and perhaps associated with satellites for communication purposes. Any fixed ship stations or automatic buoys that are established would also make oceanographic observations. Meteorological satellites will continue to provide valuable information about cloud cover, etc. in these sparse areas while upper-wind observations might be provided by constant-level balloons fitted with a radio device which can be tracked by satellite or by some long-range electronic method on the earth.

The establishment of World Weather Watch will depend upon decisions of the Fifth Congress of WMO and it is not likely to come into effect until sometime in 1967 or 1968. It is bound to cost a lot of money but improved knowledge about meteorology and its sister science oceanography can do so much to benefit mankind —particularly in relation to our food resources—so that, if successful, the money will be well spent. The success of World Weather Watch will depend upon the co-operation of all nations and all individuals concerned. Observations voluntarily provided by officers serving in merchant ships will undoubtedly play a very large part in the success of this scheme and it is hoped that as a result much better meteorological advice will become available both for the safety and economic operation of shipping.

On behalf of the Director-General and staff of the Meteorological Office we send New Year greetings to all readers of *The Marine Observer* whether they be afloat or ashore.

C. E. N. F.

January, February, March*

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

It sometimes happens that we are unable to offer an explanation for phenomena reported. In such cases we shall be very glad to hear from any reader who can put forward an authoritative or a possible explanation, which could be published in this journal. We should also be glad to hear from any reader who has witnessed a similar phenomenon in the past, but which has not previously been communicated to us.

---

* A few observations from other months are included.

VIOLENT STORM

East of Labrador

m.t. *St. Finbarr*. Skipper R. G. Ellis. Hull to Labrador. Observer, Mr. D. Redshaw, Radio Officer.

The following comments have been extracted from the vessel's meteorological logbook:

15th February 1966.

GMT

1800: Wind WNW, force 12+. Snow. Visibility less than 55 yd.
Air temp. 27°F.
Frequent gusts to 87 kt. Seas 30–35 ft.
Dodging head to wind.

16th

0000: Wind NW, force 11. Gusting to 70 kt. Continuous snow. Visibility less than 55 yd. Seas 35 ft.

0600: Wind NW, force 11. Continuous snow. Visibility less than 55 yd. Still dodging head to wind.

0610: Wind speed increased and blew off the wind cups. The NW'ly winds of force 11–12 accompanied by continuous snow and visibility less than 55 yd continued throughout the 16th. The air temperature fell to 20°F at 1200.

17th

0000: Wind NW, force 11. Continuous snow. Visibility less than 55 yd. Air temp. 22°. Main Tx aerials down: unable to contact VCS.

1200: Wind NW, force 7–8. Showers of snow. Visibility 2½ miles. Using small D/F sense aerial on transmitter managed to contact VCS but he reports my signals only strength 1 to zero.

18th

1400: Attempting repairs of aerials now. If successful, transmissions of obs. will be resumed at 1800 GMT.

1200–1800: Glass has reached its lowest level of 973·6 mb.

2000: Wind shifted at 2000. Now SW, force 5.

Position of ship at 1800 on 15th: 55°N, 56°W.

Position of ship at 1800 on 18th: 54° 30′N, 54° 18′W.

Note. At 1800 GMT on the 15th a very intense depression, with a central pressure of 960 mb, was located at 54°N 51°W. The pressure gradient was extremely tight over a great distance, especially to the rear of the system. On the 16th and 17th NW'ly winds of force 9 and over affected an area of the western North Atlantic some 200–300 miles wide and about 1500 miles in length. The observing officers are to be commended for making and transmitting the weather reports in such extremely difficult circumstances.

VESSEL STRUCK BY LIGHTNING

Vicinity of Santa Cruz

s.s. *Ceramic*. Captain N. S. Milne. London to Curaçao. Observers, Mr. E. Buckle, Chief Officer and Mr. N. Cook, Jnr. 3rd Officer.

26th December 1965. At 1030 GMT, during a very heavy thunderstorm with continuous heavy rain, the starboard wing of the bridge was struck by lightning. The flash was very vivid and was immediately followed by a sharp crack of thunder so loud as to be temporarily deafening. At the same time there was a sulphurous burning smell. A few seconds later a dull glow was seen and investigation showed that the 'man-overboard' light and smoke float had been struck and ignited. The float proved its efficiency in the very heavy rain by blanketing the bridge in a thick pall of smoke: as soon as it could be approached the float was jettisoned. No other

damage resulted from the flash. At 0600: Air temp. 76·4°F, wet bulb 75·2°, sea 78·3°. Wind ESE, force 4–5.
Position of ship: 17° 30′N, 64° 28′W.

ISOLATED BAND OF CLOUD

Indian Ocean

s.s. *Neleus*. Captain D. K. Dunlop, R.D. Adelaide to Aden. Observers, Mr. P. Sharp, Chief Officer and Cadet V. Jemmer.

19th March 1966. At 0120 GMT the vessel passed beneath a long band of thick Ac having a mamillated undersurface. It was at an estimated height of about 10,000 ft and extended from horizon to horizon in an 060°–240° direction. The band was about a mile wide and was the only cloud in the sky. No change was observed to occur in either the air or the sea temperature. At 0000: Air temp. 80·0°F, sea 83·3°. Wind N, force 2. Visibility excellent.

Position of ship: 5° 30′N, 56° 50′E.

Note. The line of cloud seen almost certainly indicated the presence of the Intertropical Convergence Zone. This is defined as the surface of separation between the wind circulations proper to the northern and southern hemispheres. The mamillated undersurface is an indication of the vertical motion which was taking place where the two different air currents converged.

FOG BANK

Vicinity of Strait of Gibraltar

m.v. *Ripon*. Captain J. Parsloe. Rotterdam to La Goulette. Observers, the Master and Mr. S. Peters, Chief Officer.

27th February 1966. After leaving the Strait of Gibraltar at 0300 GMT in perfectly clear weather, the vessel entered dense fog at 0308 and speed was reduced to half. At 0350, steering 082°, the vessel was running along the edge of the bank, ships being plainly visible to the north at a distance of 7 miles while towards the south the visibility was less than 1 mile. These conditions persisted until 0430 when the fog cleared, rolling away to the southward. The sky was almost cloudless and the wind light from ENE. At 0000 the air temperature was 64°F, but it decreased to 60° by 0300. The sea temperature remained at 62°–63°. Brilliant bioluminescence was seen during the duration of the fog only.

Position of ship at 0308: 36° 00′N, 5° 12′W.

Note. Examination of the synoptic weather charts for 0000 and 0600 GMT shows that over southern Spain the skies were practically cloudless and the wind calm or very light. Although no poor visibility was reported by Spanish coastal stations it is likely that a little extra moisture added to the air could have resulted in the formation of fog. The necessary moisture was probably supplied by the sea, as the air over the land moved across the coast in the very light NE'ly air stream. This would account for the visibility being better towards the North than it was in the opposite direction. In the circumstances described, the fog or mist would tend to be patchy.

FOG BOW

off Tampico

m.v. *Barrister*. Captain J. W. Cubbin. At anchor. Observer, Mr. A. N. Wills, 2nd Officer.

3rd March 1966. When the vessel was at anchor in very thick fog, above which was a clear cloudless sky, a horizontal bow was seen around the ship at 1835 GMT.

It extended the length of the midship accommodation, the diameter being about 150–200 ft. One half of the bow was seen on each side of the vessel. Faint colouration was discernible. The bow was seen from the bridge at a height of 51 ft above the water but it was not visible at lower deck levels. The sun was at an elevation of about 60° at the time. Air temp. 65·7°F, wet bulb 65·5, sea 66°. Wind calm.

Position of ship: 22° 15′N, 97° 50′W.

SEA SMOKE

Kii Suido

m.v. *Denbighshire*. Captain C. R. B. Goodman, M.B.E. Kobe to Hong Kong. Observers, Mr. E. I. Grant, Chief Officer and Mr. P. J. Wood, Extra 3rd Officer.

25th January 1966. After leaving Kobe at 0300 GMT where the air temperature was 35°F, the vessel passed through thick, then moderate fog which thinned to give a visibility of 2½–4 miles. At 0730, sea smoke about 6–8 ft in height developed and continued until evening twilight at 0830 when it disappeared. Visibility then began to increase from 3 miles, reaching a maximum at 1200 when shore lights were seen at over 40 miles. At the time when the sea smoke formed, both dry- and wet-bulb thermometers read 44°, while the sea was 60°—a difference of 16°. When the smoke dispersed the difference was 15·1°, the dry bulb being 49·9° and the wet bulb 45·2°. The sea temperature by then was 65°. Throughout the period the wind was N'E, force 4.

Position of ship: off I Shima (33° 30′N, 135° 00′E).

Note. The weather charts prepared by the Japan Meteorological Agency, Tokyo, show that on 25th January a rather diffuse, complex and slow-moving frontal zone lay over the mainland of Japan, giving rise to rain or sleet. Visibility was poor locally in the frontal area but it improved greatly later in the day as the belt of bad weather moved away. The sea smoke formed as a result of the cold damp air moving across the warm sea: it dispersed when the drier air moved in from the NW in the rear of the frontal zone.

Normally there must be a difference of at least 16°F between the air and sea temperatures before sea smoke can form. The process is assisted if a strong wind is blowing.

EXCEPTIONALLY HIGH WAVES

Western Mediterranean Sea

s.s. *Benmacdhui*. Captain W. C. Watson. Port Said to Antwerp. Observer, Mr. G. M. McCrone, 2nd Officer.

13th February 1966. The vessel was experiencing rough seas and a heavy westerly swell when, at 1430 GMT, two waves were encountered considerably steeper and higher than the others. The crests of these waves were much higher than the navigating bridge and were estimated to be in the region of 70–80 ft. No other waves of such dimensions were seen. The waves at the time were usually reaching a maximum of 20–30 ft. Wind W, force 8–9.

Position of ship: 37° 26′N, 8° 07′E.

Note. Mr. L. Draper, National Institute of Oceanography, comments:

"The general wave-height figures quoted by Mr. McCrone fit in well with what one would expect in a wind of force 8–9. The significant wave height (the average height of the highest one-third of the waves) would have been around 15 ft, resulting in the highest wave every ten minutes or so being up to about 25 ft and occasionally, perhaps once an hour, up to 30 ft. Even if the storm had lasted 12 hours we would not expect the highest wind-generated wave to have exceeded about 35 ft in height. The period of these waves would have been about 12 seconds and they would have been travelling at about 35 knots. Although the front which had passed through shortly before these exceptional waves occurred was travelling at about the same speed as the individual waves, we can think of no meteorological mechanism which would have generated just two isolated waves of twice the height of the highest expected storm wave; it therefore seems unlikely that they were purely the result of the storm. It is also unlikely that they were caused by an earthquake because such waves of that size in the open sea would have caused havoc on nearby coasts, so I am afraid that at present we are unable to offer any reasonable explanation. The information given by Mr. McCrone is very interesting and much appreciated; reports on other unusual wave conditions, with as much supporting weather information as possible, would be most welcome."

DISTURBED WATER

Bay of Bengal

m.v. *City of Chester*. Captain J. S. Schofield. Aden to Singapore. Observer, Mr. I. G. Tew, 2nd Officer.

24th February 1966. At 0750 GMT the vessel passed through a band of white horses about 2 miles wide which stretched from N'W to S'E from horizon to horizon. On either side the sea was smooth with a confused swell. In the disturbed area the swell, though partly confused, was predominantly NE'ly. It occurred to me that there was probably a meeting of two currents here but the vessel remained steady on her course, both on entering and leaving the area. There was no change in sea temperature which remained at 83·9°F. The wind outside the area of disturbed water was variable, but mainly N'ly: inside the area it was NE'ly, force 1–2. The appearance of the sea, however, suggested that the wind was force 4. Exactly the same phenomenon was observed at 0830. No depth was given by the echo sounder.

Position of ship at 0750: 5° 50'N, 88° 00'E.

Position of ship at 0830: 5° 50'N, 88° 07'E.

m.v. *Breconshire*. Captain D. D. McIntosh. Aden to Penang.

23rd March 1966. At 0900 GMT the vessel passed through what appeared to be tide rips. Although the wind was only force 3 from N'E the sea state resembled that produced by a wind of force 5. The waves were short and steep, about 6 to 8 ft high and foam-capped. The disturbed area, amounting in size to about half a square mile, was very clearly defined and could be seen at a distance of about 8 to 10 miles. Ship's course 086°, speed 17 kt.

Position of ship: 5° 47'N, 89° 39'E.

s.s. *Zaphon*. Captain C. J. Hedges. Umm Said to Si Racha (Thailand). Observers, Mr. J. P. M. Cusson, 2nd Officer and Mr. M. J. Davison, Senior Radio Officer.

14th April 1966. Between 0645 and 0710 GMT six patches of disturbed water were seen in which the wave form was characteristic of a force 4 wind, although the wind at the time was only force 1–2. Each patch was about 300 yd wide, while the length varied from less than a mile to approximately 5 miles. The distance between patches was about 1 mile. The sea temperature remained at 86·5°F both in the disturbed water and out of it. While passing through the area the steering of the ship was in no way affected. Other patches were also seen during the next three hours but they were not as disturbed as those first encountered.

Position of ship at 0700: 5° 53'N, 87° 42'E.

Position of ship at 1000: 5° 53'N, 88° 28'E.

Note. These observations were forwarded to Dr. L. H. N. Cooper of the Marine Biological Association of the United Kingdom at Plymouth who comments:

"These observations bear on the problems of fisheries' productivity. Surface tropical waters become stripped of plant nutrients and consequently barren but, wherever these nutrients are brought to the surface from deeper waters, productivity may become very high indeed. The phenomena described here, accompanied by a lot of turbulence, should achieve some measure of surface enrichment and lead to the development of a feeding ground for fish like the tuna. Because we are dealing with internal waves, events will be more complex that this but fisheries biologists could well direct work to areas where this phenomenon occurs. Consequently all such observations anywhere have value."

Note 2. Dr. Cooper sent the observations to Dr. E. C. LaFond of the U.S. Navy Electronics Laboratory at San Diego, California, who has worked in the area. Dr. LaFond comments:

"This phenomenon is an internal wave effect. When the crest of the wave is near the surface it constricts the lighter water that spills over the crest and roughens the surface as the wave moves along.

"I observed this in the northern part of the Bay of Bengal and in the Andaman Sea, but not in the southern part of the Bay of Bengal, when I was there three years ago; the internal waves were large but not close enough to the surface to cause the disturbed surface water effect. This region (Bay of Bengal–Andaman Sea) would be an ideal place to spend some time seriously investigating large internal waves.

"Captain Hedges, Captain McIntosh and Captain Schofield and their officers should be commended in making unusual oceanographical observations like this and bringing them to the attention of scientists.

"Others have observed similar phenomena in this region and navigation charts show 'tide rips' noted in several places in the Andaman Sea. In looking up my field notes from the *Anton Bruun* I find the following:

"21st March 1963, between 1405 and 1457 whilst on station in 7° 41'N, 97° 59'E, a series of rough and smooth water passed the ship. The bands were moving at the rate of 1–1½ knots. Twelve bands could be seen and they were moving towards 225°.

"26th March 1963, whilst on station in 10° 41'N, 94° 40'E between 0524 and 0539, alternate bands of rough and smooth water passed the ship. They were approaching from the stern where the hydro wire entered water.

"29th March 1963, on station in 12° 57'N, 95° 01'E at 0515, during a very calm sea, the angle of the hydro station wire was 35° in an 060° direction, indicating relative currents in the vertical with the deeper flow towards 060°. At the same time, repeated wide bands of surface chop, with waves from 1½–2 ft in height, passed the ship. They were coming from 045°. At 0743 a second rough band with white caps reached the ship. A third band with pronounced white caps, coming from 030°, reached the ship at 0830 whilst still on station. One rough patch took 22 minutes to pass the ship.

"30th March 1963, in 12° 51'N, 96° 34'E, rough lines of water passed the ship at 0100, 0130, and 0142. At this time the sea was flat calm and quiet. As the rough bands approached the ship they created, without wind, a low roar accompanied by breaking white caps. Between the bands the sea was again smooth. It was an eerie feeling to hear these bands pass in the middle of the hot, calm night."

DISCOLOURED WATER

South Atlantic Ocean

m.v. *Darro*. Captain W. Wheatley. London to Montevideo. Observer, Mr. W. J. Messenger, 2nd Officer.

9th February 1966. Light brownish-yellow streaks were seen in the water at 1500 GMT, lying NNE–SSW in parallel bands approximately one mile in length. They were about half a mile wide and appeared to extend downwards to a depth of one foot. It was not possible to get a sample. Wind ENE, force 3.

Position of ship: 14° 13'S, 36° 12'W.

10th February. A similar patch of discoloured water was seen today at 1650. A sample was taken and formaldehyde used as a preservative. Sea temp. 85°F. Wind NNW, force 4.

Position of ship: 19° 54'S, 39° 24'W.

28th February, River Plate to Santander. Observer, Mr. M. F. Delaney, 3rd Officer.

Discolouration of the water was again seen, at 1200. On this occasion it covered a very wide area, the ship passing through it for over four hours. At times the substance floating in the water was so dense that it resembled mud. A sample was taken and spirit was used as a preservative as the supply of formaldehyde was exhausted. Before adding the spirit to the sample, three or four tiny creatures were noticed darting about in the bottle, but no description is possible as a microscope would have been needed to observe them properly. Sea temp. 82°F. Wind N'W, force 3.

Position of ship: 20° 44'S, 39° 49'W.

Note. Dr. T. J. Hart of the National Institute of Oceanography comments:

"These three observations are widely separated but all are within the main Brazil current system. The two samples contained rafted colonies and separated filaments of the microscopic blue-green algae *Trichodesmium*, but are remarkable in that the species involved is not the one most frequently observed in the South Atlantic (*T. thiebautii*) but the classic Red Sea/Mediterranean form *T. erythraeum*, with some *T. hildenbrandtii* (still room for argument about the correct name of the latter). *T. erythraeum* has long been known to occur in the Atlantic but mostly north of the equator. This is only the third record I have of it in the South Atlantic, but of course its distribution seems to be completely circumtropical as there are a slowly increasing number of recorded occurrences in the southern hemisphere, in the Indo–Pacific region."

STRANGE RADAR PHENOMENON

off Ponta do Boi

m.v. *Arlanza*. Captain G. A. Gibbons. Santos to Rio de Janeiro. Observers, Mr. C. Stürcke, Jnr. 2nd Officer and Mr. J. Henderson, 4th Officer.

23rd February 1966. Shortly before altering course round Ponta do Boi at 0030 GMT a series of parallel lines running 040°–220° was seen on the radar screen. The lines were all about 0·3 of a mile apart and almost uniform in length. They were moving en bloc in a NW direction at an undetermined speed. As they passed the ship some of the sharpness of defininition was lost and they eventually faded out as the ship altered course. About 5 min later they were no longer seen. Air temp. 79·9°F, wet bulb 75·5°, sea 80°. Wind, light airs. Sky clear except for some $C_{M}2$ towards the horizon. Sea surface rippled, with almost negligible swell.

Position of ship: 24° 01′S, 45° 17′W.

Comment in the log dated 12th May 1966:

The phenomenon described above was seen again on both occasions this voyage when the vessel was in the vicinity of Ponta do Boi, and the conclusion was reached that some effect of current was responsible. It is strange that although nothing was visible to the eye it was seen on the radar.

Note. Captain R. G. Swallow, Director of the Radio Advisory Service, comments:

"No mention is made of the range at which the phenomenon was first observed on the radar, the only clue to work on is that it appeared as 'a series of parallel lines running 040°–220° . . . the lines were all about 0·3 of a mile apart and almost uniform in length' and 'sea surface rippled, with almost negligible swell'.

"Referring to the South American Sailing Directions NP5, on page 31 etc. attention is drawn to numerous currents and in particular to the Brazil current which sets predominantly south-westward and south-south-westward from off Cabo Frio to Rio de la Plata from November to April, extending to about latitude 36°S, as well as to the inshore counter-current.

"If the rippling of the sea surface seen by eye was found to lie in the direction corresponding to the 040°–220° reported by radar then it is reasonably certain that this was the source of the radar echoes. The ripples were most probably due to the meeting of the Brazil Current with the inshore counter-current since, from the position given on the 23rd February, *Arlanza* was only a little more than 3 miles off the coast of Ilha de São Sebastião, when rounding Ponta do Boi."

FLYING FISH

Tasman Sea

m.v. *Somerset*. Captain I. Y. Batley. Sydney to Whangarei (N.Z.). Observer, Mr. W. B. Anderson, 3rd Officer.

16th January 1966. A large shoal of flying fish was encountered at 1035 LMT but, this being a familiar sight, not a great deal of attention was paid to it, other than noting that the fish close at hand appeared to be much larger than the species usually sighted. It was eventually observed that some of the fish which left the water remained airborne for what seemed to be an abnormally long time and so a closer watch was kept. On one occasion the duration of free flight was actually timed as 1 min 40 sec and it was estimated that the fish had left the sea surface about 5–10 sec earlier.

The term 'free flight' may not be 100% correct in this case, for it was noted that on six different occasions this particular fish skimmed low over the surface, lightly touching the water without breaking the continuity of its flight. This was done in such a fashion that only the closest observation could detect the minute ripples caused by contact.

Since the line of flight was parallel to and in the same direction as the vessel's course, a very good estimate of the speed of flight could be made. This, being slightly less than that of the ship, was considered to be about 14 to 15 kt. Although a careful watch was kept there was no sign that the shoal was being attacked by an enemy and trying to escape. Weather conditions at the time were very good, the wind being practically calm with a low sea and swell. Air temp. 73°F, sea 73°.

It may be of interest to note that the same species encountered in the Tasman Sea on the return passage from New Zealand to Australia were again much larger than those found in tropical waters such as the Caribbean Sea, etc.

Position of ship: 34° 05′S, 161° 09′E.

Note. Dr. P. H. Greenwood of the Natural History Museum comments:

"Unfortunately it is not possible to give any identification of the fish involved, but the sort of data which have been collected by the observer are extremely useful. One frequently encounters wild guesses about flight-times and speeds so such well-substantiated observations as these are of great value.

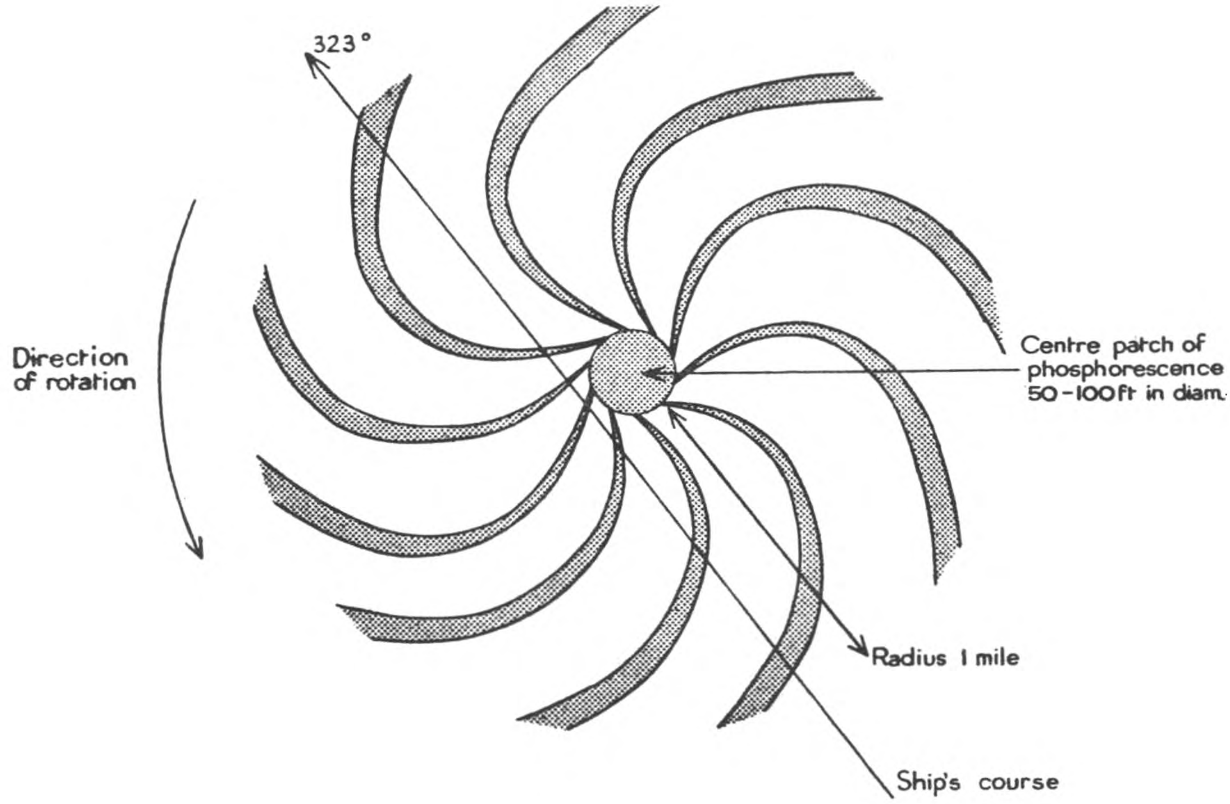
"Mr. Anderson is right when he feels that the term 'free flight' may not be absolutely correct. What he observed were the instances when the fish's tail contacted the water and, by vigorous flapping of the posterior part of the body, the fish is given an extra boost and once again becomes completely airborne. The period of contact is very short and the speed with which the tail is moved is very high."

PHOSPHORESCENT WHEELS

Gulf of Thailand

m.v. *Glenfalloch*. Captain R. B. Tiplady. Singapore to Bangkok. Observer, Mr. J. A. Hampton, 2nd Officer.

28th October 1965. Bioluminescence in the form shown in the accompanying diagram was seen from 0110 to 0116 LMT on a moonless night with little cloud. The 'hub' of the wheel was estimated to be about 50–100 ft across and it fluctuated in brilliance from bright to dim twice per second. It rotated in an anti-clockwise direction throwing out bands of luminosity, rather in the manner of sparks from a Catherine-wheel, over an area of radius of approximately 1 mile. When first seen, about 3 min earlier, the bands resembled low banks of mist being blown past but



they soon brightened and became more frequent as the central area appeared fine to starboard. The vessel passed within about 150 ft of the centre of the display. Air temp. 84°F, sea 82°. Wind NE, force 2. Sea slight. Depth 36 fm. Speed of vessel 20·5 kt. Co. 323°.

Position of ship: 10° 35′N, 102° 35′E.

m.v. *Chengtu*. Captain M. R. M. Seale.

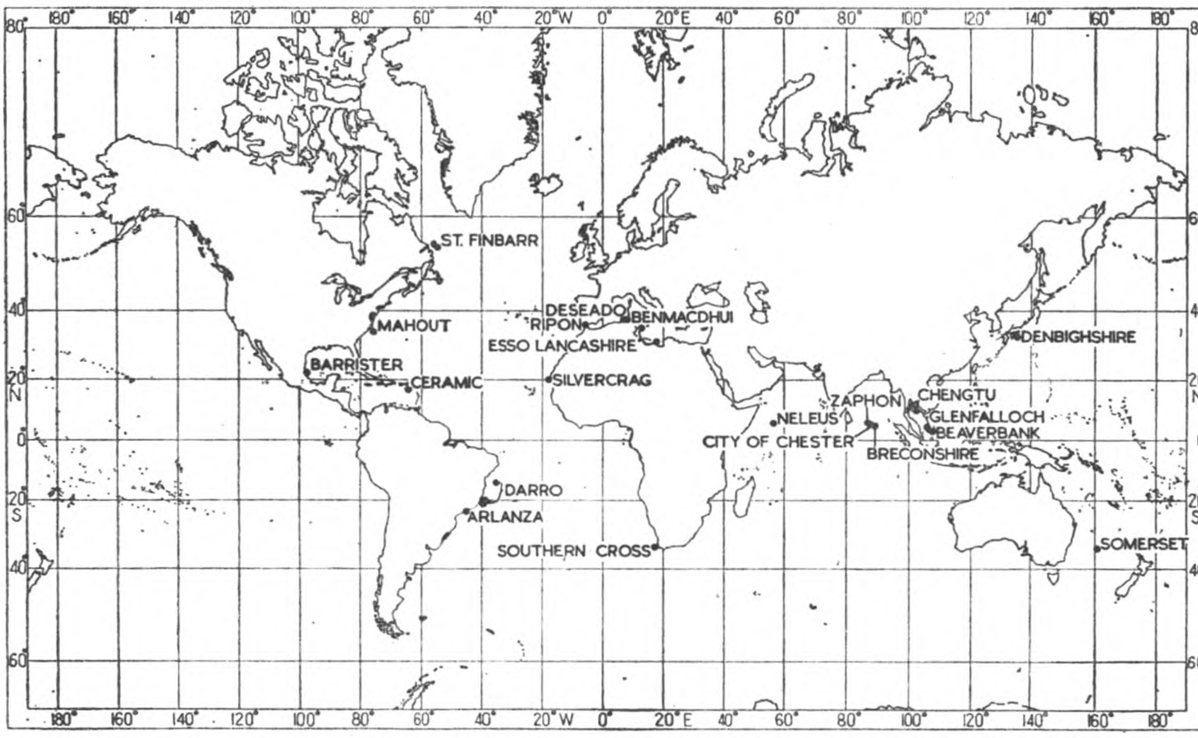
16th March 1966. Between 1918 and 1923 GMT when the vessel was approximately 60 miles NW of Poulo Wai, what appeared to be almost parallel beams or waves of milky-white mist about 30 ft wide and 30 ft apart, were observed flashing across the sea surface at considerable speed. These 'waves of mist' seemed to be about 8 ft in depth and extended to the horizon over an angle of 360°. They appeared to be converging towards some central point, about which the whole system was revolving in a clockwise direction, passing the ship very rapidly like the beam of a quick flashing light, or the spokes of some great revolving wheel. It was estimated that the time intervals were about half a second. When first seen the beams were coming from a direction on the starboard bow but during the five minutes they were observed the direction backed until they came towards the ship from the port quarter (the ship was steering NW). The whole display faded out quickly five minutes after its first appearance.

No bioluminescence was seen in the ship's bow wave and no effect resulted from directing the Aldis lamp on the sea surface after the phenomenon had ceased. At the time of observation there was no cloud in the sky.

Position of ship: 10° 39′N, 102° 13′E.

24th March 1966. Another display was seen between 1925 and 1935 GMT in the Gulf of Thailand, when the vessel was about 105 miles NW of Poulo Wai. The phenomenon was much brighter and lasted longer than the one seen on 16th March. The fade-out was more gradual and was not complete until 0240.

On this occasion the wheels came from two directions resulting in 'peaks' of light as the two wave systems passed each other. (They were similar to the peaks formed when two swell systems cross.) It was estimated that about 80% of the sea surface was illuminated by the waves of light. There were bright flashes everywhere, and



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

these occurred very rapidly as the systems crossed. In the vicinity of the ship there were five or six flashes every second. It is difficult to describe the degree of luminosity but it was not enough to read by.

Position of ship: 11° 15′N, 101° 48′E.

Note. Professor Dr. Kurt Kalle of Hamburg, formerly of the Deutsches Hydrographisches Institut, and an authority on the phenomenon of the phosphorescent wheel, comments:

"The Borneo Sea and the Gulf of Thailand are areas in which the phosphorescent wheel has been seen on many occasions, the last being in 1957 and 1961. The report from m.v. *Chengtu* containing details of the luminescent mist above the sea surface, a phenomenon which has been seen only a few times, is most interesting. One cannot be quite certain whether the mist is real, or an optical illusion which may have been brought about by the darkness."

Note 2. m.v. *Chengtu* is a Hong Kong Selected Ship.

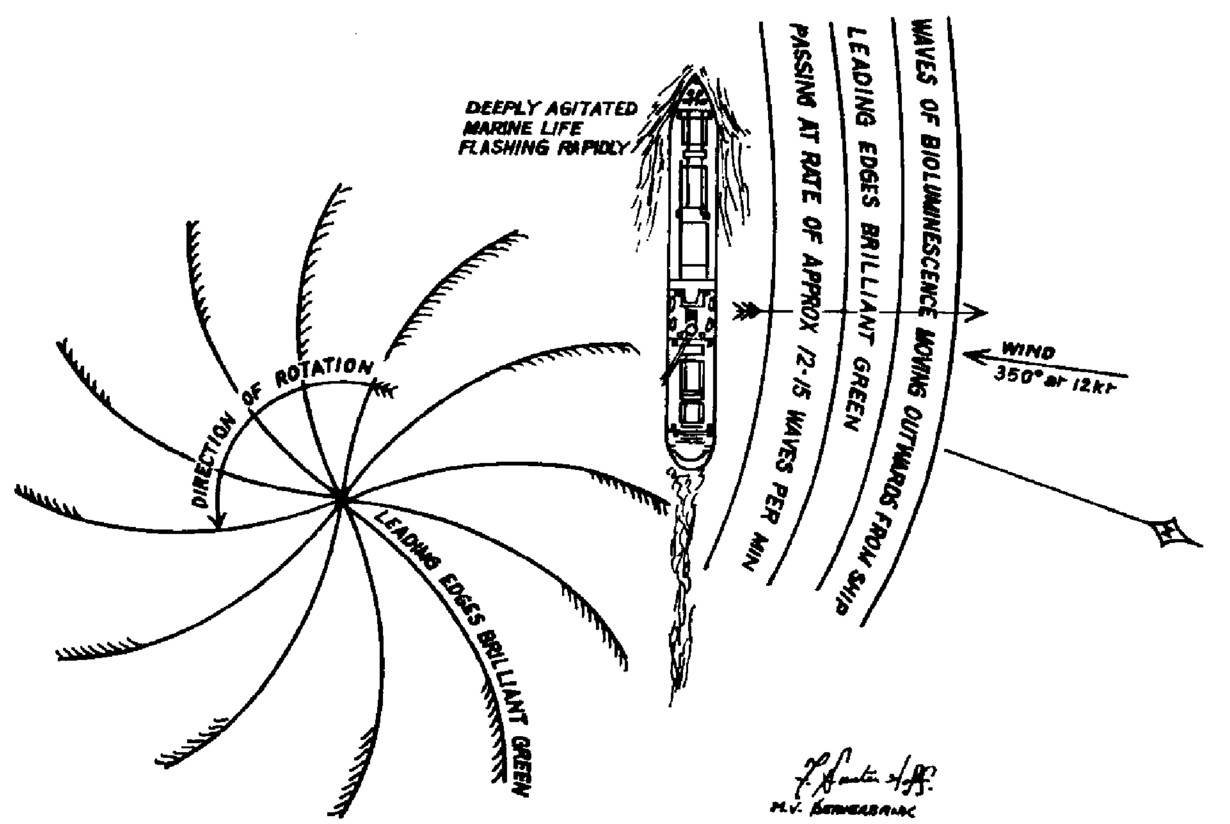
South China Sea

m.v. *Beaverbank.* Captain G. D. Scott. Madang to Cochin. Observers, the Master, Mr. F. Hunter, 2nd Officer and Mr. S. R. Sanyal, Seacunny.

20th March 1966. From about 1700–1800 GMT bioluminescence of a very common type was seen, but at 1805 an unusual amount of pale green light began to appear on the sea surface and it seemed as if all marine life in the vicinity, of the type that is associated with bioluminescence, had become greatly agitated. Waves of light began to pass the vessel from south to north and two or three minutes later they approached from all directions. Then the waves started to move out from the starboard side towards the north, while on the port side a rapidly rotating wheel developed, turning in an anticlockwise direction. Due to the darkness of the surroundings it appeared to be about 2 ft above the sea surface and resembled a gigantic Catherine-wheel. At 1817 the wheel faded out and was replaced by waves passing from south to north; these were much less bright than previously and the whole display ended at 1820. The waves looked as if they were being emitted from some source at a rate of about 72–75 per minute, but it was not possible to note the speed of rotation of the wheel. The only result from shining the Aldis lamp on the sea was to reduce the brilliance of the bioluminescence. Mr. Hunter commented that this was the most amazing example of natural phenomena that he had ever seen. His detailed drawing is reproduced below.

Air temp. 81·7°F, sea 82·8°. Wind N'W, force 4. Visibility excellent. Speed 14 kt. Co. 249°. Depth 46 fm.

Position of ship: 2° 55'N, 108° 17'E.

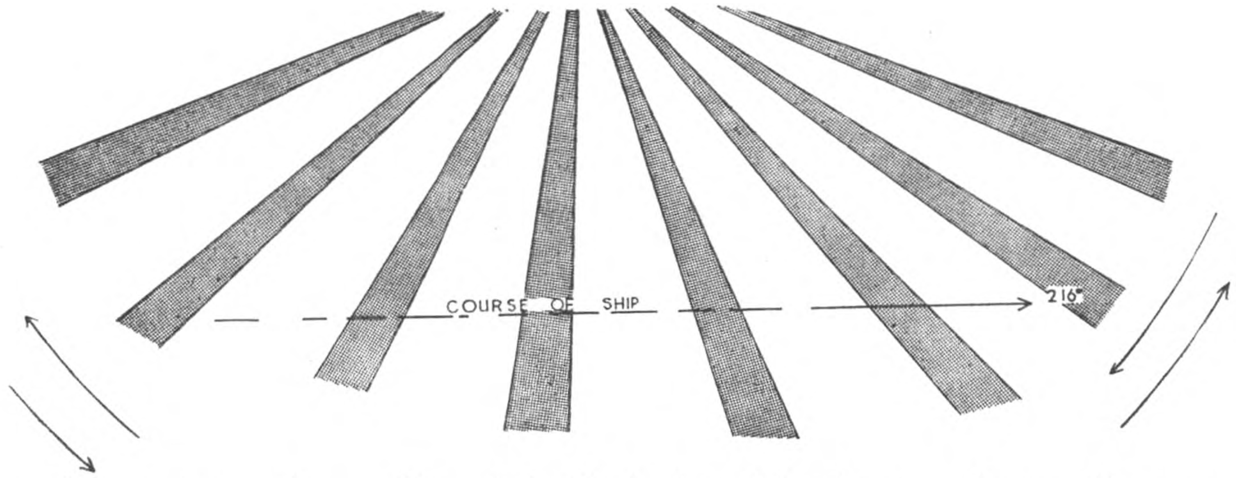


Note. Professor Dr. Kurt Kalle comments:

"This is an interesting and well-described observation. A particularly remarkable feature, I think, is that the direction of rotation of the wheel appeared to be the same throughout the whole of the 360°. Could this perhaps be some sort of optical illusion? It would be helpful in the case of future observations to know whether the whole wheel rotates in the same direction (as in the sketch) or whether there is some kind of mirror-image effect whereby the direction of movement is different for each half. (See R. J. Turner, *The Marine Observer*, January 1966, p. 24.)"

m.v. *Glenfalloch.* Captain R. B. Tiplady. Hong Kong to Singapore. Observers, Mr. J. A. Hampton, 2nd Officer and Mr. P. Appleyard, Officer Cadet.

23rd March 1966, 1800 GMT. Luminescence was first seen as indistinct irregular patches which came and went very rapidly. This condition persisted for about 1 minute. The patches pulsated and then formed into lines about 6–10 ft wide which at first appeared to revolve in a clockwise direction: these converged to a point approximately 2 miles from the ship. They were of a whitish-green colour with a hint of yellow. The first impression was that there was only one wheel, but a second one appeared which seemed to revolve on the top of the other one in the opposite direction. The wheel turning clockwise died out, leaving the other one rotating in an anticlockwise direction. The speed was about 80 revolutions per minute. As the ship drew closer the intensity of the luminosity increased, gradually diminishing again



as the vessel moved away. The whole display lasted for about 5 minutes. Air temp. 81·7°F, sea 82·0°. Speed 20·5 kt. Co. 216°. Light SW'ly airs. Sea rippled.

Position of ship: 4° 32′N, 106° 25′E.

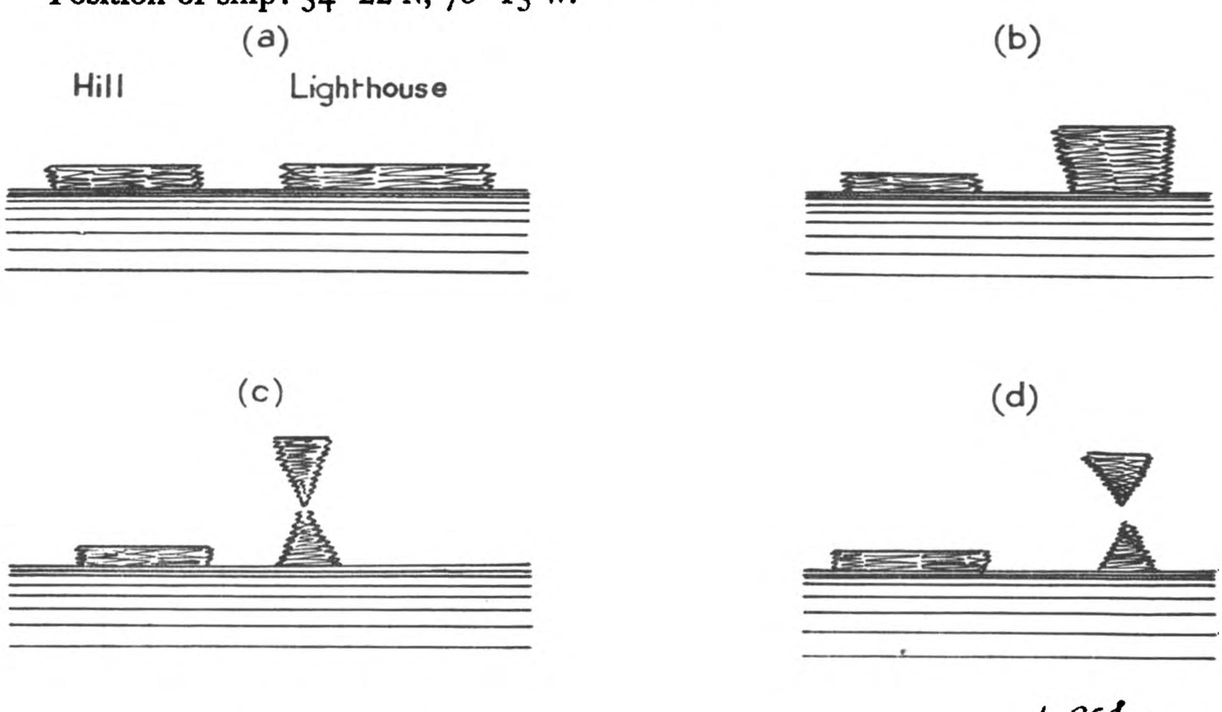
ABNORMAL REFRACTION

Coast of Carolina

m.v. *Mahout*. Captain G. B. Thomas. Wilmington to Savannah. Observer, Mr. M. R. N. James, 3rd Officer.

17th January 1966. When the vessel was off Cape Lookout at 1330 GMT the lighthouse, which bore 300° at 22¼ miles, was seen as a long white structure at first, but it later underwent the changes in appearance as shown in the diagrams. The upper conical shapes were inverted images of the lighthouse. Although the sand-hill to the south of the lighthouse is quite low it appeared to have sheer 'cliff face' sides: no inverted image was seen, however. Air temp. 37·0°F, wet bulb 34·2°, sea temp. fluctuating between 64° and 72°. Wind NW, force 4. Between 0930 and 1430 the vessel passed through areas of dense sea smoke.

Position of ship: 34° 22′N, 76° 13′W.



(a) Sand-hill and lighthouse as they first appeared. Distance 22¼ miles. (b) Range 21½ miles. (c) Range 20¾ miles. (d) Range 22 miles.

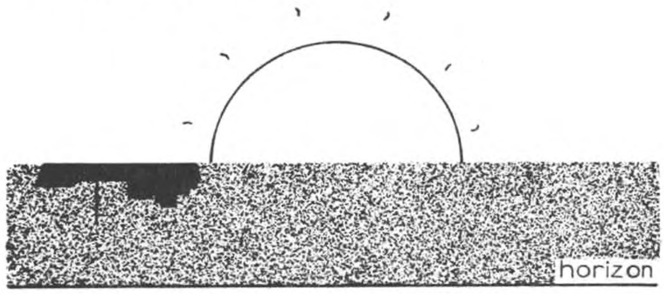
Note. The air temperature on the coast in the vicinity of Cape Lookout was about 28°–30°F at noon, much lower than the temperature at the ship. There must therefore have been considerable variations in the density of the intervening air which would be the cause of irregularities in the paths of the rays of light from the lighthouse, etc. These irregularities would account for the various changes observed in appearance of the lighthouse and sand-hill.

approaching Cape Blanco

m.v. *Silvercrag*. Captain A. A. Walker. Monrovia to Birkenhead. Observers, Mr. D. Robinson, 3rd Officer, Mr. T. M. Ali, Apprentice and Mr. W. Gallant, Quartermaster.

26th January 1966. A clearly-defined mirage in the form of an inverted ship was seen near the south side of the sun's disc when setting at 1836 GMT on a bearing of 251°. The sun was its own diameter above the horizon at the time, but the lower half of the disc was obscured by a bank of medium cloud (see sketch). Air temp. 71°F, wet bulb 64°, sea 68°. Visibility excellent. No low cloud. Wind N, force 2.

Position of ship: 20° 05′N, 17° 30′W.

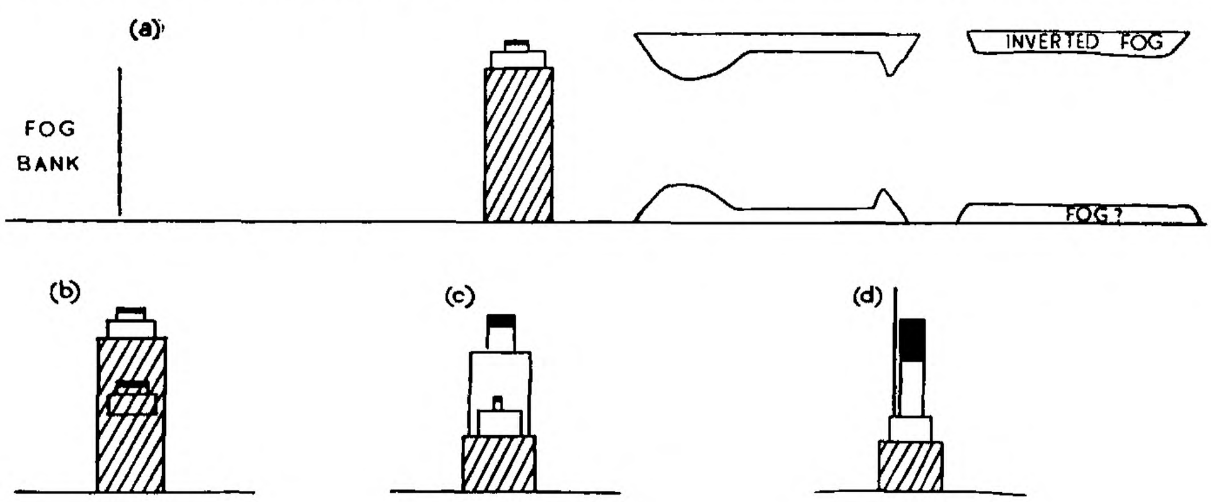


Note. The weather charts prepared by the Meteorological Office show that a warm and dry NE'ly air stream, associated with an anticyclone lying over N.W. Africa, extended across the coastal area of Spanish Sahara. In such circumstances an inversion of temperature is to be expected, i.e. the air temperature in the first few hundred feet above the surface would increase with height. As a result, rays of light from a distant object would be bent in such a way as to make the object appear inverted, hanging from a false horizon a short distance above the true horizon. In the present case only the image was visible, the vessel itself being beyond the horizon.

South African waters

s.s. *Southern Cross*. Captain L. J. Hopkins. Cape Town to Las Palmas. Observers, the Master, Mr. T. F. Williams, Chief Officer, Mr. V. J. Williams, 3rd Officer and Mr. D. Hewitt, Jnr. 3rd Officer.

9th February 1966. Between 0800 and 0815 GMT conditions of abnormal refraction caused the *Kenya Castle*, which was about 10 miles off on our starboard bow,



to undergo the various changes in appearance shown in the diagrams. Diagram (a) shows the vessel at 0800 with her hull greatly elongated vertically. Also, what appeared to be two fog banks to the right of the vessel were seen inverted above the horizon. Diagram (b) depicts a double image of the funnel and superstructure, one superimposed on the other: this occurred at 0805. The two fog banks had by this time dispersed. At 0810 the double image of the funnel and superstructure had the appearance shown in diagram (c) while diagram (d) shows the shape at 0815. Fog moving in from SSW hid the vessel from sight at this time. Air temp. 58·0°F, wet bulb 56·0°, sea 57·4°. Wind SSW, force 3.

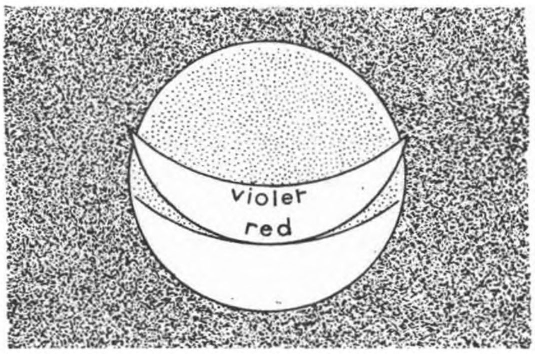
Position of ship: 33° 35′S, 17° 58′E.

Note. The changes in the appearances of the *Kenya Castle* were no doubt due to the light rays from the vessel having been bent in two directions in the vertical plane. Some of the rays had more-or-less followed the curvature of the earth while others diverged away from it, the net result being that the vessel appeared drawn-out vertically. Such conditions could be expected to occur if, in the line of sight, the air in some places was warmer than the sea, and in other places colder.

Mediterranean Sea

m.v. *Deseado*. Captain M. B. Wingate. London to Hobart (via Suez). Observers, Mr. M. T. Crimp, 3rd Officer and Mr. T. D. Walker, Radio Officer.

24th February 1966. At 2000 GMT the crescent moon was seen to have another crescent of similar size in contact with it, the lower edge of the image touching the inside of the real crescent, as shown below. The image displayed all the colours of



the spectrum, the upper edge being violet and the lower edge red. The moon was at an elevation of about 10° above the horizon and setting in thin cloud. With the gradual thickening of the cloud the image disappeared first, followed by the moon. Air temp. 57·2°F, wet bulb 54·6°, sea 58·8°.

Position of ship: 37° 13′N, 7° 26′E.

Note. From time to time reports similar to the one described have been received here. The last reports which we had were printed in *The Marine Observer* for April and July 1965. Single or multiple images of the crescent are formed when the rays of light from the moon pass through one or more layers of temperature discontinuity which cause them to be refracted at different angles.

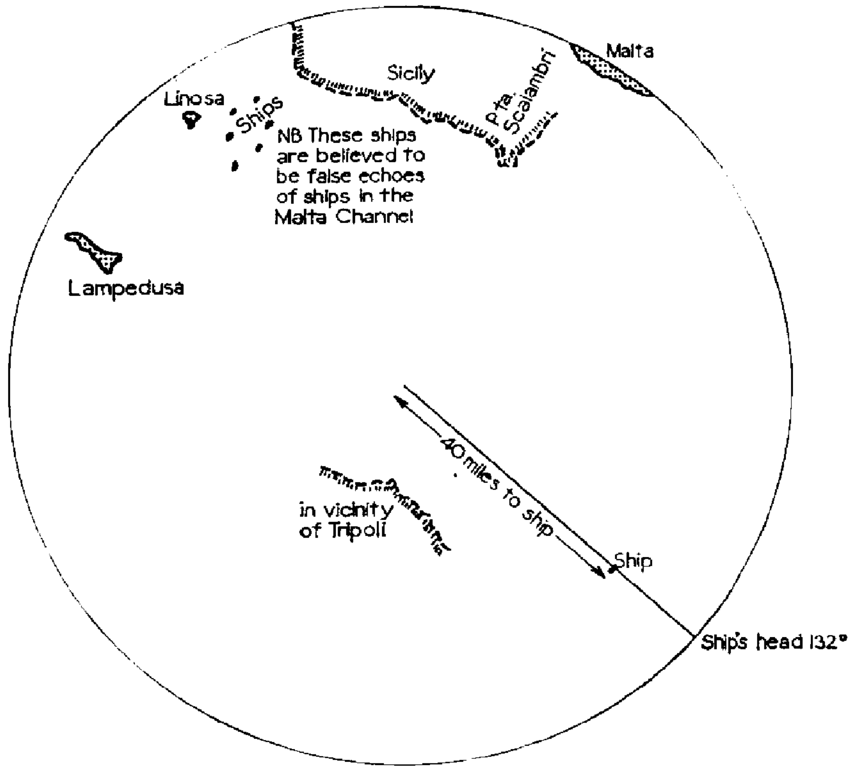
SUPER REFRACTION

Mediterranean Sea

s.s. *Esso Lancashire*. Captain J. Warby. Lavera to El Brega. Observers, Mr. S. N. Pugsley, 3rd Officer and Cadet P. M. F. Copeland.

27th February 1966. On switching on the radar at 2130 GMT several multiple-trace echoes were observed on PPI, e.g. the coast of Sicily, actual distance 120 miles, was observed on PPI at 40 miles. Ships were observed as echoes at 40 miles and many false echoes of ships in Malta Channel were seen. True echoes of Linosa, Lampedusa and Malta were seen at extreme ranges of 60 miles on PPI.

VHF range—noted as extreme—120 miles.



28th February. Super refraction continued, noted on radar and VHF. On the latter, loud and clear reception was attained at a distance of 240 miles. Later in the day we spoke to a ship on VHF at 320 miles and heard, very faintly, a vessel he was in contact with approx. 250 miles west of his ship, which means that the ship we could hear was about 400 miles from us. Our normal range on VHF is 40 miles.

These conditions of super refraction lasted from 27th February to 1st March during which time the sky was cloudless, the atmosphere exceptionally clear, magnificent sunsets were observed and star definition was superb. The wind was very light or calm.

Position of ship at 1800 on 27th: 35° 42′N, 12° 42′E.

Position of ship at 1200 on 28th: 31° 54′N, 17° 54′E.

Note. Captain R. G. Swallow, Director of the Radio Advisory Service, comments:

"This is an excellent report of the presence of anomalous propagation which enhanced the performance of both radar and VHF over a continuous period of three days.

"The very stable atmosphere supported conditions which gave rise to severe super refraction and in part probably also to surface ducting as indicated by the ship-to-ship VHF communication at 320 miles.

"It would be interesting to relate this extract with a report on visual observations during the same period in the same general area as it does appear that a very extensive frequency spectrum from VHF radiotelephone to ultra-violet light was involved.

"The abundance of multiple trace echoes, in particular ship echoes, must have been somewhat disconcerting to the radar observer, but it is most rewarding to find that they were recognized 'on switching on the radar'."

AURORA

The following notes have been received from Mrs. Mary Hallissey of the Aurora Survey:

"Reports of aurora from British ships for the period January–March 1966 are listed briefly below with one recently received for November 1965 from *British Workman*. The expected increase in activity, now that the sunspot minimum is past, is slow to show itself, though at the time of writing these notes there have been positive indications of increased solar activity resulting in spectacular aurora.

"During January and February the planetary index figure of geomagnetic activity was never higher than 5 (21st–22nd January and 23rd–24th February). On 21st–22nd January our charts show aurora sighted from U.S. and French weather ships in the Atlantic to the Trawler *Ross Leonis* off the north coast of Norway. (Congratulations to all in this ship. We were delighted to see the photograph in the July 1966 edition of *The Marine Observer*, and to read of the award.) A similar display was reported by the *St. Giles* from the same position on 23rd–24th February.

"During March there was a slight increase in activity, as expected at the equinox, and three periods of higher geomagnetic activity occurred, when the figure of 7 was reached (13th–14th, 23rd–24th and 28th–29th). The *Weather Surveyor* reported a communication fadeout for much of the 14th. On the first two dates the aurora could be seen as a glow to the latitude of the north of England, and on the 28th–29th to the latitude of the south of England.

"Please keep on sending us your observations. We can only offer you our grateful thanks but, until rockets and satellites take over the job, we need your help."

Date (1965–6)	Ship	Geographic Position	Λ	Φ	I	Time (GMT)	Forms
23rd Nov.	*British Workman*	66°48′N 11°54′E	110	66	+76	1700–1745	HA, N
21st Jan.	*Ross Leonis*	70°00′N 17°00′E	120	68	+78	1650–1715 1730–1845	HA, RR
3rd Feb.	*Weather Reporter*	59°43′N 23°18′W	060	66	+74	2100	HA
8th	*Weather Reporter*	61°48′N 33°24′W	060	70	+76	2200–2300	HA
9th	*Weather Reporter*	61°52′N 33°23′W	060	70	+76	0001–0300	RB, RR, N
	Weather Reporter	62°02′N 32°55′W	060	70	+76	2100–0200	HA, HB, RA, RB, N
12th	*Ross Leonis*	70°00′N 17°00′E	120	68	+78	2359–0015	HA
13th	*Weather Reporter*	61°44′N 33°12′W	060	70	+76	0001	N
18th	*Weather Reporter*	61°48′N 32°50′W	060	70	+76	0300–0630	HB, RB, P
19th	*Weather Reporter*	61°49′N 33°29′W	060	70	+76	0001	N
	Weather Adviser	59°02′N 18°43′W	070	65	+72	0650	HB
	Weather Adviser	59°03′N 19°09′W	070	65	+72	2330	N
20th	*Weather Reporter*	61°51′N 33°12′W	060	70	+76	0050–0100	RA, RB
23rd	*St. Giles*	70°03′N 17°02′E	120	68	+78	1755–1820	HA, RR
3rd Mar.	*Weather Surveyor*	62°00′N 32°55′W	060	70	+76	2250	N
10th	*Weather Surveyor*	62°06′N 32°55′W	060	70	+76	0050	RR
	Weather Surveyor	62°06′N 32°35′W	060	70	+76	2350	RA
11th	*Weather Surveyor*	62°06′N 32°40′W	060	70	+76	0150	RB
12th	*Weather Surveyor*	62°00′N 33°00′W	060	70	+76	0650	RB
13th	*Weather Surveyor*	62°06′N 32°40′W	060	70	+76	0050, 0650	N
	Weather Surveyor	62°00′N 32°55′W	060	70	+76	2150–2400	RA, RB
14th	*Weather Monitor*	59°20′N 19°10′W	070	65	+72	0400, 0500	HA
15th	*Weather Surveyor*	62°10′N 33°00′W	060	70	+76	2250–2400	RA, N
16th	*Weather Surveyor*	62°10′N 33°00′W	060	70	+76	0150–0600	RA, RB, P, V, N
	Weather Monitor	59°00′N 19°10′W	070	65	+72	2300, 2400	HA
17th	*Weather Monitor*	59°00′N 19°10′W	070	65	+72	0500	N
18th	*Weather Surveyor*	62°00′N 33°10′W	060	70	+76	0150	V
	Weather Surveyor	62°25′N 32°35′W	060	70	+76	2250–0400	RA, V
19th	*Weather Surveyor*	61°55′N 33°05′W	060	70	+76	2250–2400	N
20th	*Weather Surveyor*	62°00′N 33°00′W	060	70	+76	0150–0600	P, N
21st	*Weather Surveyor*	62°00′N 33°20′W	060	70	+76	2250–0200	HA, HB, RA, P
22nd	*Weather Surveyor*	62°00′N 33°20′W	060	70	+76	2250–0600	HA, RB, P, N
27th	*Weather Monitor*	58°20′N 18°55′W	070	65	+72	0100	N
		59°05′N 18°30′W	070	65	+72	2345	N

KEY: Λ = geomagnetic longitude; Φ = geomagnetic latitude; I = inclination; HA = homogeneous arc; HB = homogeneous band; RA = rayed arc; RB = rayed band; R(R) = ray(s); P = patch; V = veil; N = unidentified auroral form.

DISCUSSION ABOUT WEATHER ROUTEING OF SHIPS

In the October 1966 number of *The Marine Observer* were published the first three papers read at an informal meeting on 9th March 1966 aboard *Wellington*, Headquarters ship of the Honourable Company of Master Mariners.

The final three papers, together with their relevant discussion, are given below. (It is regretted that the tape recorder was not working very well during the discussion on these three papers so it was difficult to transcribe. We apologize if the report of the discussions is incomplete and the names of so few speakers are identified.)

551.5:359:629.12

Practical Results of Weather Routeing

EXPERIENCED BY U.S. MILITARY SEA TRANSPORT SHIPS ON VOYAGES ACROSS THE NORTH ATLANTIC

By Captain W. E. Cummins

(Commander M. S. T. S., U.S. Navy, London)

In order to make a start on my subject, as assigned, I carefully read the title and assumed that the key word was *Results*. Now we all know that where the seas are concerned and the ships that sail them are concerned numerical *results* will not be difficult to bring forward. The interpretation of those numbers and the conclusions which come from them will vary widely. The title of my talk is 'Practical results . . . as experienced . . .'. I shall therefore review some of the results concerning the weather routeing system as operated by the U.S. Navy authorities.

Before starting on the statistics I would like to give you some second-hand impressions as I gained them from shipmasters and our MSTS (Military Sea Transportation Service) staff members. A tanker master interpreted the Optimum Track Sea Routeing (OTSR) route as *the* route unless the ship were obviously headed for danger. He was not so sure that there were not better routes than the one he was given but he had been fortunate enough to arrive at destination on time and with no damage. Yes, he did encounter some rough seas—and he and his 1st Mate watch the weather development all the time.

I have also talked with several passenger-ship masters who follow the routes recommended by OTSR. All express 'satisfaction' with the service. None seemed interested in analysing the numerical results. All co-operate by making reports as required and alerting the routeing office when the weather conditions encountered differ from those forecast.

The MSTS staff in Washington was questioned on this general subject of weather routeing and replied "We don't know much about it except that it's good, it pays and we're for it".

From a little personal experience I can relate that the service was most helpful. I have visited the Fleet Weather Facility (FWF) on two occasions. I have followed recommended routes on two occasions, and asked for a routeing a third time—which we did not follow. It is a pleasant experience to observe the enthusiasm and energy of the weather routers in their offices.

The FWF in Norfolk, Virginia, commenced weather routeing in 1954–1955 as a result of an enquiry from Chief of Naval Operations. No increase in staff was made until 1958 although some research was proceeding in the meantime. MSTS then submitted a requirement for regular routeing for all the ships in the Atlantic under its control.

It should be noted that the service for the Navy is provided on an efficient and economical basis by making the routeing activity a department in a Fleet Weather Facility which has other duties to perform. Weather communications and weather-chart plotting facilities and personnel are already available there, together with a message communications component. The only extra personnel required to perform the service are two civilian meteorologists and two meteorologically-trained naval officers, assisted by a civilian meteorological technician and an enlisted Aerographer's Mate third class. Messages to routed units are filed at the Facility message centre for transmission in Government channels where possible. Where necessary, commercial communication channels are used but this is held to a bare minimum to hold down communication costs.

The following are some extracts from official reports on the subject, supplied by the U.S. Fleet Weather Facility at Norfolk, Va.

The Optimum Track Ship Routeing Programme

Optimum Track Ship Routeing attempts to select a route which will provide the optimum combination of environmental factors relative to the routed unit's operations. In general, this route will provide the most rapid crossing consistent with safety. Passenger comfort, desirable operating weather and special wind or sea conditions are additional elements which are considered as the specific needs of the individual ship or unit being routed dictate. OTSR began experimentally at the U.S. Navy Hydrographic Office in 1955 and became routinely available on an operational basis throughout the U.S. Naval Weather Service in September 1958. It is the next big step forward since the work of Matthew Fontaine Maury which produced the pilot chart.

The primary aim of the Ship Routeing programme is to recommend tracks which will deliver ship and cargo across a wide stretch of open ocean in the least time with minimum damage. An intensive study of ships' logs indicated that the most significant environmental effect on the steaming performances of ships was the height and direction of encounter of sea and swell waves. In essence, cargo ships tend to keep going with seas abaft the beam and are more or less slowed in head conditions. The amount of slowing in head conditions is increased with decreasing draft forward, with increasing wave heights and in wave periods which correspond to wave lengths which approach the ship's length. Thus the best track is the track which most nearly approaches a great circle between ports, avoids hazards to navigation, gives most time in lower sea heights abaft the beam and avoids possible damaging wave heights. This means that westbound ships should be north of the storm track and eastbound ones south of it. The storm track, not the daily placement of storms along it, is the important consideration in route selection.

The forecast of the storm track is made from considerations based on material received from the National Meteorological Center and the Fleet Numerical Weather Facility. Particularly useful are the 500 mb computer analysis and prognosis received from the Facility, and the computer 500 mb analysis, the 36- and 72-hour surface prognostics, and the individual subjective five-day prognosis, including surface and 700 mb charts, received from the National Meteorological Center. This material is received by data link and facsimile and is already available in the weather units where the routeing activities are located. Copies of ocean surface charts plotted and analysed by the local weather unit are further analysed by ship-routeing personnel to develop wave fields used in maintaining daily surveillance on routes in progress. The OTSR programme is able to function as economically as it does by reason of its location in an already-established weather service organization—a joint operation involving Navy, Air Force, Weather Bureau, Coast Guard and the international meteorological community, not the least of whom are the mariners of all the seagoing nations.

Each route recommended is tailored to the specific needs of the routed vessel. The ships' schedule, hull type and steaming characteristics, speed, loading, together with forecast storm track for the period of the passage and the probable wave heights and directions of encounter, are considered in building the recommended optimum track. The special requirements of the user are also considered. Since 10 to 15-day forecasts of storm tracks are subject to wide variation in skill, a daily evaluation of each route in progress is made and recommendations to change or to improve the route are sent as appropriate. About 40% of the routes are issued with one or more diversions. Route recommendations are provided on a request basis for passages of 1,500 miles or more in unrestricted waters. Hurricane/typhoon avoidance recommendations for shorter passages and routes to minimize ice encounter for Arctic re-supply missions are also recommended.

In the fiscal year 1965 the two ship-routeing authorities issued nearly 1,800 original routeings in the Atlantic and Pacific. This represents a continued growth in utilization of the service by MSTS and Fleet units and is the best measure of the success of the programme.

No firm data are available on the economic advantage of the programme because it is nearly impossible to evaluate the non-occurrence of damage. Only 2% of routed vessels reported any damage in fiscal year 1965 and vessels averaged better than scheduled passage times. The service is provided by a total staff (in both Atlantic and Pacific routeing offices) of thirteen professional and sub-professional military and civil service personnel. This staff works exclusively in this programme and receives meteorological and communications support from and inherent in the two weather units. The most dramatic example of the advantages of the programme occurred in February 1964. The s.s. *Potomac*, a modified T2 bulk carrier with draft 8 ft forward and 20 ft aft, departed early from Rotterdam on the recommended OTSR track and on 16th February was sent a diversion (which was followed) to avoid or minimize head seas. She arrived at Philadelphia late on 24th February. The s.s. *Saint Christopher*, also a modified T2 bulk carrier with draft 10 ft forward and 18 ft aft, departed Rotterdam early 13th February and was also given a diversion recommendation. This route was not followed. Instead she proceeded on approximately the low-powered steamer track. She was forced south of even this track, was hove to on at least two occasions and finally arrived at Philadelphia early on 3rd March, about eight days after s.s. *Potomac*.

The Ship Routeing programme does not promise good weather—it does try to recommend routes which will allow ships to come as close as possible to meeting or beating schedules and still avoid damage. The programme is strictly advisory and the recommendations are only as good as the forecast which can be made; however, these are based on the best and most complete information available. The routes are recommended by skilled meteorologists, experienced in ship routeing, who work exclusively in this segment of the meteorological service.

There are no clearly established numerical standards for measuring the success of OTSR. The value of the service is, perhaps, best indicated by the continued high rate of use by both the Military Sea Transportation Service and Fleet units.

Fiscal Year 1965

During the past fiscal year 841 routeings were issued by Fleet Weather Facility, Norfolk (making a total of 4,288 routeings since the scheme was inaugurated). These are evaluated in Table 1, with comparisons to fiscal year 1964.

An evaluation of the OTSR service is best based on the level of the satisfaction of the user. Continued high utilization of the service and the fact that appreciative comments from users continues to far outnumber complaints, indicates a high level of satisfaction. An evaluation based on comparison between actual steaming time and scheduled or requested time en route is reasonable only if the schedules are based on well-established average times for the given routes, which should vary by season and by ship. However, assuming that tight or unreasonably short schedules are compensated by too lenient ones, time saved/lost information for fiscal year 1965 follows:

No schedule available for comparison	256
Arrived within 4 hours of scheduled steaming time	112
Arrived more than 4 hours early on scheduled steaming time	306
Arrived more than 4 hours late on scheduled steaming time	126

To summarize: Of 800 routes which were valid for evaluation, 63·3% of the ships completed the voyage without slowing for adverse weather, 84·2% of the ships

(Opposite page 24)

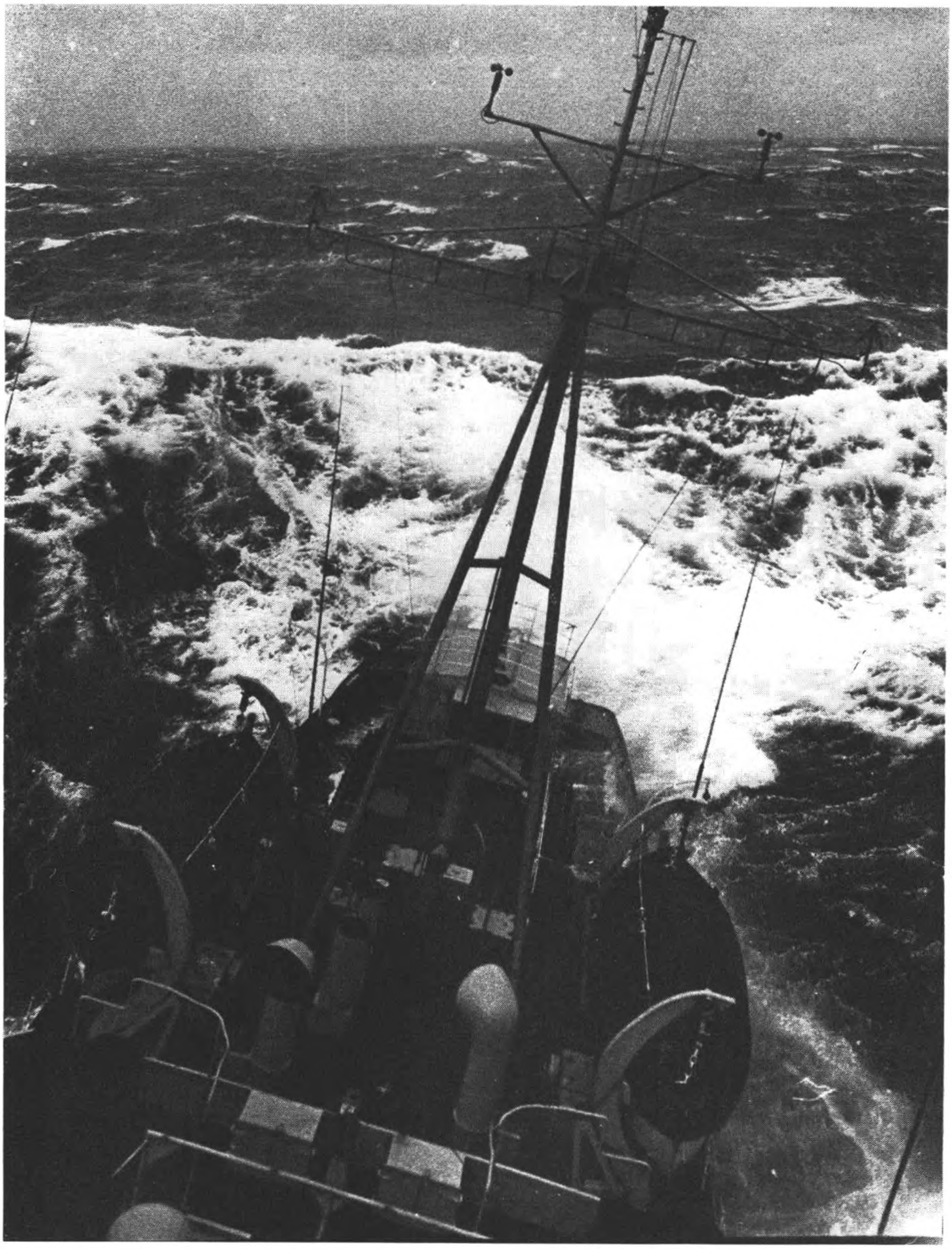


Photo by courtesy of R. H. Brass (formerly Electronics Officer aboard Weather Reporter)

Ocean Weather Ship at sea in rough weather, taken from the foremast. Note the two anemometers—each 8 ft from the topmast—the weather one being used for the wind record. The balloon shelter on the after deck has hydrogen cylinders outside, stored vertically.

(*Opposite page 25*)

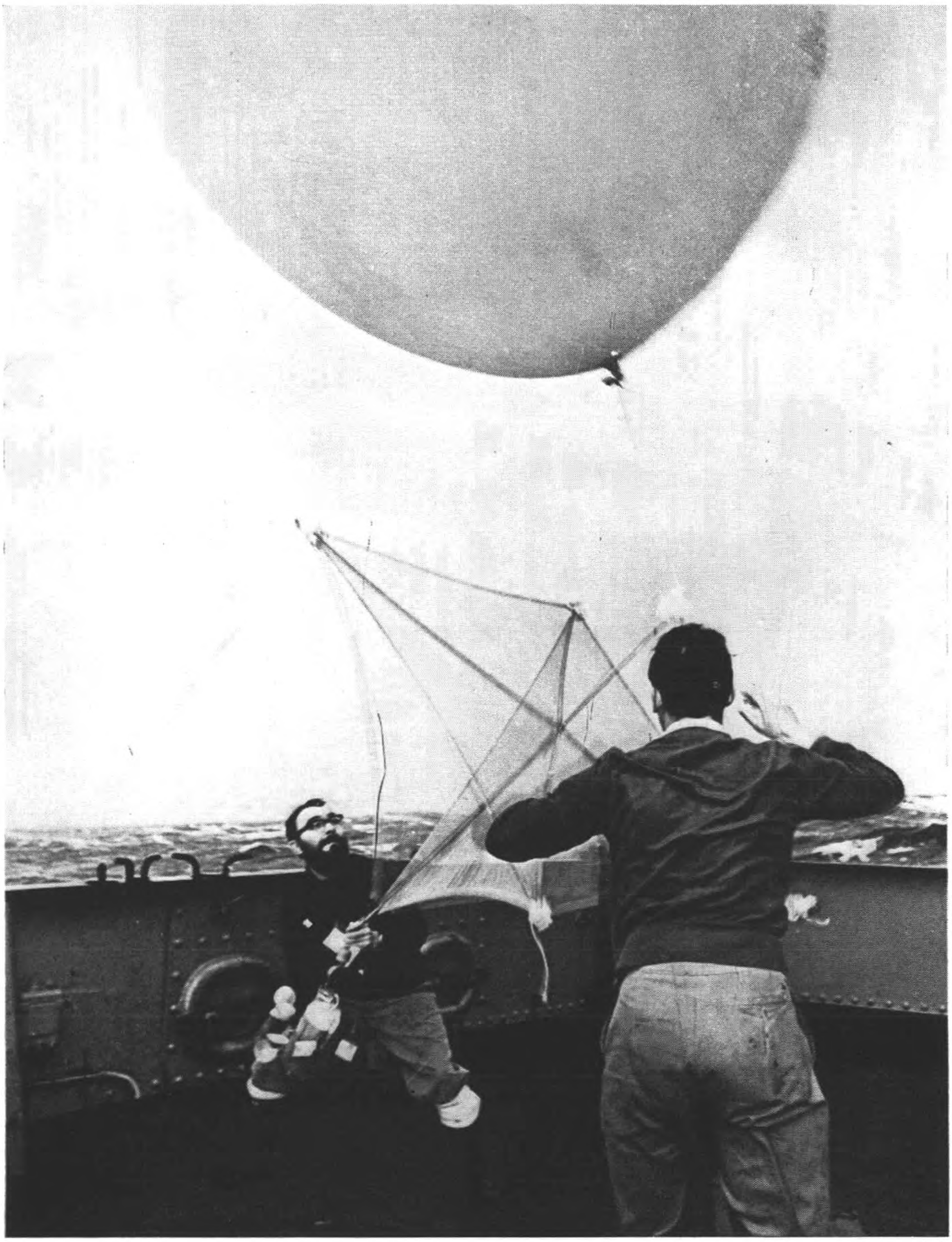


Photo by R. H. Brass

Aboard an Ocean Weather Ship: launching a meteorological balloon, with radar target for upper winds and radiosonde for temperature, humidity and pressure observations to a height of about 60,000 ft.

Table 1

Statistics of Routeings	1964	1965
1. Total number issued.	780	841
2. Total number valid for statistical evaluation.	746	800
(a) Number statistically invalid because the voyage was cancelled prior to or soon after sailing.	15	12
(b) Number statistically invalid because the unit deviated significantly from the recommended track for reasons other than weather, such as engineering casualties, new operational commitments, etc.	3	2
(c) Number statistically invalid because insufficient data or reports were received from the unit.	11	21
(d) Number statistically invalid for other reasons.	5	6
3. Number statistically valid which were diverted by the routeing activity.*	243	288
(a) Diverted primarily to improve conditions.	182	202
(b) Diverted primarily to maintain 100 mile separation from known ice.	15	12
(c) Diverted primarily to shorten the route.	46	74
4. Number which were not diverted by the routeing activity.	503	512
5. Number in which the unit, without receiving a diversion, altered course and/or speed due to adverse weather.	126	141
(a) Due to fog.	5	3
(b) Due to forecast error.	5	2
(c) Due to other reasons.	121	136
6. Number in which the unit did not, without receiving a diversion, change course and/or speed due to adverse weather.	620	661
7. Total number of diversions of all types issued.	267	327
(a) Total number of diversions issued to improve conditions.	205	237
(b) Total number of diversions issued to maintain 100 mile separation from known ice.	15	12
(c) Total number of diversions issued to shorten route.	48	78
8. Maximum number of diversions issued to any one route.	5	3

arrived on or ahead of scheduled steaming time, and 98·9% of units completed the voyage without any reported damage to ship or cargo due to en-route weather conditions.

With the recent addition of a CDC 3100 digital computer to the Facility, work has been started to computerize the after-the-fact evaluation of routes, using the analysed wave fields provided by the Fleet Numerical Weather Facility and ship performance curves provided by the Naval Oceanographic Office. It is expected that some progress will be made in the application of the computer to the ship routeing problem in fiscal year 1966.

Discussion

A questioner: It seems to me that the routeing service you were talking about is a little complicated; is there any difference between that and the commercial ones?

Captain Cummins: I wish I could be accurate about that but I rather suspect that the commercial ones have grown out of our military ones. They take advantage of the international dissemination of weather information and have developed an expert technique in weather routeing as a result of the experience that they have gained. Many of the people who have been assigned to this commercial routeing were formerly U.S. Navy Officers. Although I have been at sea and associated with ships for many years it has been mostly in the Navy; I have only been associated

* Some of these routes may have received more than one type of diversion, but the route is listed under the diversion considered most significant.

with commercial shipping for about six months. I have the same respect for the sea as a merchant seaman but have no experience of the economic aspect of shipping.

A questioner: Can you tell me if the statistics you have given us are generally available for study; I rather suspect some of it?

Captain Cummins: There is no objection to it being made freely available.

A questioner: Do many of the U.S. ships have facility for facsimile reception on board?

Captain Cummins: Only some of the MST ships have this equipment on board.

A questioner: Have you found that a ship fitted with facsimile gained any particular benefit from this equipment, in so far as routeing from the shore is concerned?

Captain Cummins: I can't say. I can say, however, that most of the masters of these ships nowadays do use the route they are given unless they have very good reason to change it.

A questioner: Is there any arrangement by which the various routeing authorities get together to ensure that routed ships don't converge in areas where shipping is dense? Is anything done to separate eastbound and westbound traffic in the North Atlantic?

Captain Cummins: I am sorry but I have no information about this.

Captain Britton (Director of the Meteorology and Oceanographic Services of the Navy): Facsimile has been used with success aboard certain ships of the Royal Navy during recent years. I strongly support the view that if a merchant ship is fitted with a facsimile receiver it would be valuable to the masters and officers of the ships to learn to do their own weather routeing. In the Royal Navy we are moving towards the use of facsimile for purposes other than receiving weather maps—for example we find it useful for reception of oceanographic data. The wave analyses and wave forecast maps issued by the U.S. authorities are, in my opinion, very valuable, for wave information is essential for weather routeing—whether this be done by the master of the ship or from the shore.

551.509.2:621.397:629.12

Weather Routeing of Merchant Ships by the Master

NOTES ON EXPERIENCES GAINED BY SUGAR LINE, LIMITED

By Captain F. D. Glover
(Marine Superintendent, Sugar Line, Ltd.)

For some two years now Sugar Line, the wholly-owned carrying company of Tate and Lyle Limited, has been experimenting with improved weather routeing of some of the company's vessels.

The fleet comprises twelve ships, ranging in size from just over 5,000 gross tons to just under 12,000 gross tons, trading mainly between the United Kingdom and the West Indies, between the United Kingdom and Canada, and between the West Indies and Canada. Only one of the vessels is capable of a speed in excess of 15 knots, the rest being relatively low-powered ships, and both loaded and ballast passages are made.

All masters have complete freedom as to which course to take and adjust their courses according to the weather they expect to experience. However, the meteorological information available to them from radio weather reports is considered insufficient to weather route effectively. Often, due to atmospherics, weather reports are not received at all. At other times atmospherics interfere with radio signals and make the accurate reception of the numerical codes difficult. Even then, to cover all the North Atlantic many reports are required and the decoding and plotting of these is a long and arduous job requiring considerable skill.

I say *all* the North Atlantic because to weather-route ships requires a knowledge of the whole of the North Atlantic weather system and its trends. It was decided, therefore, to look for ways and means of giving the master fuller and more up-to-date meteorological information and the only satisfactory way of providing this information appeared to be by using facsimile equipment to receive weather charts.

This equipment was in extensive use ashore and it was found that it could also be used aboard ship. Many of the countries bordering the North Atlantic make weather transmissions and it is possible therefore to receive regular and up-to-date weather charts aboard ship. With these charts the master can study his weather and watch the movement and development of depressions, then carefully plan ahead his best course, avoiding heavy seas and swells on the bow and keeping clear of steep pressure gradients.

Messrs. Muirhead and Company, manufacturers of facsimile equipment, supplied an eighteen-inch model and a Racal receiver to feed the radio signals into the facsimile receiver. The radio is required to have a great deal of stability and, once tuned to the station, must hold on to the signal during the whole of the transmission, which can take as long as twenty minutes.

The first installation was made early in 1964 in the fastest ship in the fleet and, as this is a bulk carrier with engines and bridge aft, precautions were taken to see that vibration did not affect the equipment, particularly in the ballast condition. However, experience has shown that neither the radio receiver nor the facsimile set is seriously affected by vibration, and eventually both were bolted directly to the table top in the chart room.

The first voyage to the West Indies was used as a shake-down trip, none of the officers or the radio officer having ever sailed with this equipment before. From the start it was intended that this set should be part of the navigational equipment of the ship and, as such, the navigating officers would operate it.

Even on the first trip, when everyone concerned was inexperienced, usable charts were obtained and were of assistance to the master. It might be pointed out here that one of the great benefits of receiving facsimile weather charts is that even under severe atmospheric conditions a chart is usually received, although parts of it may be dark and unreadable. As the picture is scribed horizontally this interference appears as lines across the chart, but it is usually possible to interpolate from that part of the picture received the part which is unreadable and, providing just one of the isobars can be identified, interpolation can be made to find out the value of the other isobars.

Steep pressure gradients show up particularly well and, as these are areas to be avoided if possible, this is especially valuable information. The charts are, of course, completely international and Russian, American, German, British, French, or any other country's charts, are equally useful.

It was thought originally that on courses from the United Kingdom to the West Indies, having Washington and Halifax on the beam and Bracknell either ahead or astern, several aerials were required. It was finally proved, however, that sophisticated aerial systems were not necessary and that initial difficulties were, in fact, due to the inexperience of the operators. A forty-foot length of aerial wire has been found to be all that is required.

It became apparent that to tune in a manual-tuning radio receiver took some time and interfered with watch-keeping duties. It was therefore decided to investigate the potential of a pre-tuned set. At the same time, as the eighteen-inch picture was large, a nine-inch facsimile receiver was also supplied to the ship. For several voyages it was possible to connect the manual-tuning radio receiver or the pre-tuned crystal receiver to either the eighteen-inch or the nine-inch facsimile receiver. It was found that with the pre-tuned set it was a simple matter to switch to the channel required and then make the final adjustment, the officer then returning to the bridge and leaving the machine to receive the picture on its own. Later experience shows, however, that a pre-tuned set should have the facility to off-tune up to 1·5 kc in order to avoid jamming by the numerous commercial stations on the American coast.

Using the three stations, Washington, Halifax and Bracknell, and also taking pictures from the Miami Weather Centre via New York, ten crystals were required. With these, adequate weather charts could be received at any time of the day or night and usually not more than six hours old. One great advantage of this method of weather routeing is that the master receiving a weather chart is able to verify that the weather at ship agrees with the charted weather and, if different, he can adjust his own forecast of the weather accordingly.

It was found that a nine-inch picture was adequate and, in fact, in many cases gave better definition than a larger picture, and a composite set, all in one cabinet, consisting of a Marconi pre-tuned crystal receiver and a Muirhead nine-inch facsimile receiver together with power packs, was developed and a prototype has been installed in the largest ship in the fleet. Whilst the Marconi receiver has facilities for fifty-one channels only seventeen channels are being used. These, however, cover the vessel for trading not only in the North Atlantic but also in the South Atlantic, the Indian Ocean, the Mediterranean, the Pacific and around the Australian coast. Nevertheless the North Atlantic still produces the most varied, fast moving and intense weather and offers the greatest scope for the weather routeing of ships.

A compact Cossor-Raytheon transistorized 15-channel ten-inch picture set is also under test on one of the Company's ships.

Whilst this facsimile equipment is normally used to avoid bad weather, this is not true in all cases. A good example is a ship which was homeward bound from Trinidad and started off on a great circle course and then, noticing a severe depression developing to the east, adjusted course more towards the Azores. After steaming for another day it was seen that the depression was beginning to move more rapidly in a north-easterly direction and so the course was again adjusted to a great circle one for the United Kingdom, the ship riding on the south-east edge of the depression with following seas.

Another case which helps to illustrate the usefulness of this equipment is that of another vessel, outward bound from the United Kingdom, which experienced a severe south-westerly gale in the entrance to the Channel. Without facsimile equipment the master would probably have shaped his course to the southward towards the Azores in order to avoid any bad weather, but with the facsimile equipment he was able to see that this was a single depression with none following up behind and, after a few hours of bad weather, the depression passed clear and he was able to continue his great circle course in good weather all the way.

The question of waves—both sea and swell waves—is very important in weather routeing, although all transmitting countries do not appear to appreciate this fully. The stations transmitting from the eastern seaboard of the American continent send out wave charts and, as it is very often the case that deep depressions leave a legacy of heavy swells behind them, this information is very helpful to a master when plotting his best course as, without it, he could steer into an area of high swells which would retard his progress and perhaps damage the ship.

Facsimile ice charts are also transmitted and have proved extremely worthwhile. They are particularly useful for ships bound to Canada when the ice is starting to spread southwards.

From all this you will note that ships in the North Atlantic can gain a great deal of benefit from these weather charts. When weather routeing it is absolutely essential, particularly when westbound, that the weather for the next four or five days ahead is accurately forecast by the master if he is to make the best courses possible. It is true that weather may develop more rapidly or more slowly than expected, but this usually shows up when comparing actual weather with the charts, and it is this ability to compare actual weather with forecast weather on the spot that makes this method of weather routeing suitable for our type of fleet. In the main, efficient weather routeing, particularly for low-powered vessels, depends on accurate long-range forecasts, frequently verified and amended as necessary.

During the sugar season the Company's vessels are regularly engaged in trading backwards and forwards to the West Indies, with a turn round at each end of forty-eight hours, and the masters remain in constant contact with the weather systems and their development. As at each end of the passage the ships are serving either the Company's plantations or refineries, accurate ETAs are essential and accuracy is improved by weather-chart reception on board ship.

In the hurricane season tropical revolving storms can be carefully watched and their progress followed after they re-curve and head across the Atlantic in a north-easterly direction. During last year, when hurricane 'Betsy' struck New Orleans, four of the Company's vessels were in the vicinity. The largest ship, with the Commodore Master, had the new combined installation for the first time and he spoke glowingly of his ability to track the hurricane at all stages of its development. In fact he was able to forecast its movement with a certain amount of accuracy. Another of the Company's vessels had a master who had been with Fax equipment for some time and he likewise reported that he was able to keep track of hurricane 'Betsy'. A third ship, proceeding down the American coast, had a master who had served for some time with Fax equipment, although this ship was without it, and he stated that he would have been happier to have had the benefit of these weather charts. The fourth ship had a master who had no Fax experience and was without the equipment and so had to rely solely on radio reports but as he was in port at the time the local radio stations gave him a very full and complete picture of the hurricane.

One other point which I would like to mention concerns meteorology in general and the younger officers today. It is felt that, with satellites and other modern innovations, meteorology has taken great strides forward but, as modern vessels are not so seriously disturbed by bad weather, meteorology amongst the junior officers is not practised as much, or as fully, as it should be. However, all the officers who have served with facsimile equipment have shown the greatest interest, not only in the equipment but in the charts received and the development of the weather and, by watching their superiors interpret this weather, have become better seamen and officers. Indeed, this greater awareness of meteorology in itself has improved the weather routeing of these ships fitted with facsimile equipment and again, when these officers are transferred to serve in other vessels not fitted, then their increased meteorological knowledge is put to good use on these vessels also.

Discussion

Captain Horn (Holland-America Line): Can Captain Glover say how the masters of the Sugar Line plan their route? Would they be able to get an appreciation of the weather they are likely to experience 48 hours ahead? This is quite a long period.

Captain Glover: Weather maps can be received in port and so masters can study the weather before sailing. In fact, with a quick turn-round, the master is never out of touch with the weather situation.

A questioner: In this discussion we are considering two different systems of weather routeing. One using the facsimile receiver whereby the master does his own weather routeing, consulting the meteorologist ashore when necessary, and the other in which the master has no such equipment aboard his ship but relies on a shore-based meteorological office to give him all the advice required. From your experience can you say which is the more practicable system?

Captain Glover: The trading pattern of our ships is such that the system I have described is suitable for our purpose. Nobody knows his ship or her behaviour in bad weather better than her master and if he knows the weather pattern ahead he can become quite an expert at routeing his own ship, as some of our masters are; and they don't use surface charts only but also make good use of some of the upper-air charts as well. One of our ships was bound from the West Indies in extremely bad weather and lost a lot of time and the ship herself was badly pooped during that passage. At the same time, homeward bound, within 300–400 miles of this ship, the master of another of our ships was using facsimile equipment and from his weather maps he was able to see the bad weather but was unable to warn the other ship because of communication difficulties and he himself made a very reasonable passage home. This was made possible because he knew the exact nature of the weather he was running into. I think that cases like this show that the £1,000–£1,500 which this equipment costs is money well spent.

A questioner: It has been stated that the information given on certain facsimile charts can be checked by radio reports of the weather being experienced by ships in the vicinity. Did Captain Glover say, in the case of his company's ships, if there are occasions when they provide such checks when there are several ships in the vicinity? Perhaps with co-operation between various shipping companies many such checks might be provided.

Captain Glover: This is very true and we do check our routes with other ships in the area. We have at present only three ships fitted with facsimile and these ships give to other ships of the fleet an estimate of the weather they are likely to experience and, in return, receive reports of actual weather being experienced by the other ships.

551.5:331:629.12

Mobil's Experience with Commercial Weather Routeing

By Captain H. Spicer

(Marine Superintendent, Mobil Shipping Co. Ltd.)

Introduction

The purpose of this talk is to provide you with information concerning Mobil's experience and the experience of the masters of our British Flag vessels with commercial weather routeing firms. You will see as we relate our experience with weather routeing that our masters are not 100% in favour of using this service, while we, as operators of a group of vessels, are convinced that masters should be encouraged to use weather routeing because of the potential financial benefits.

Background

In considering a course of action today we must, more than ever, examine the financial aspects of the problem. In other words what do we stand to gain or lose money-wise?

Those of you who are associated with the tanker business know there are several ways of computing the daily value of a vessel. For the purpose of this analysis we are using an historical AFRA (Average Freight Rate Assessment). The following is an hourly value of vessel time by vessel class:

95,000 tons-d.w.	£102
50,000 tons-d.w.	£54
30,000 tons-d.w.	£29
19,000 tons-d.w.	£21

We are not considering reduction of heavy weather damage in this analysis.

The cost of weather routeing, excluding radio-message charges, is as follows:

£54 for each trans-Pacific crossing
£41 for each trans-Atlantic crossing
£18 for each crossing South America to United States, except that the charge will be £41 in the hurricane season.

When you compare the cost of weather routeing with the hourly value of a

95,000 ton-d.w. tanker it is obvious that weather routeing only has to assist the master in saving a half-hour in vessel time to pay for the service for the trans-Pacific voyage. The master of the 95,000 ton-d.w. vessel who reported that he considered at least 12 hours was saved by weather routeing in a trans-Pacific voyage is saying, in effect, that the vessel saved £1,120.

Early in 1964 it was decided to experiment with weather routeing services in view of the obvious incentives. At the initial stages one vessel was selected for the test but when we, in London, became involved in the test we recommended that specific masters be selected rather than particular vessels. The reason we made this suggestion was our awareness that the success or failure of the experiment depended on the objectiveness of the masters concerned. All masters, be they average in performance or well above average, do not have the same objective approach in dealing with new innovations. We interviewed several masters and discussed weather routeing with them before we selected a certain few for the initial test of the programme.

The problem of conducting such an experiment in Mobil is rather more difficult than in those companies where vessels are on routine runs or are in a liner-type service. Our vessels trade world-wide and trans-oceanic crossing where weather routeing is available only occurs on a random basis. Even today there are some of our masters who have not had the opportunity to try using weather routeing. The majority of the reports from the masters using weather routeing on an experimental basis were favourable and it was decided to make the service available to all masters. It should be noted that the reports of the weather routeing companies showed that we were obtaining a saving, but we took the word of our masters as being more objective.

Fleet-Wide Implementation of the Programme

On 24th December 1964 a general directive was issued to all our vessels giving all masters the opportunity to use weather routeing at their own discretion. It is our firm belief that the master has the ultimate responsibility for the operation of his vessel. We provide guidance to the master to assist him in carrying out his duties but in no way do we detract from the fact that he has final responsibility for his vessel. That is why the masters were given the opportunity to use weather routeing at their discretion and were not told or ordered to use it.

Before proceeding with some of the pros and cons of weather routeing, as reported by our masters, some general factors will be brought to your attention. There are certain masters who prefer not to use weather routeing; in general they are relatively senior and are of above-average ability. They prefer to plot the weather maps themselves and, based on their years of experience, believe that they can plan their routes better than a weather specialist miles away on dry land.

Weather predictions, as you all know, are not 100% accurate. If we are to assume the predictions are 75% accurate, the master who happens to hit the 25% inaccuracy is not going to be particularly impressed with the routeing service. There are some instances where any reasonable route will take the vessel into some bad weather and the master of a vessel which is routed to the north may tend to think that his normal selection of a more southerly route would have been better.

The westward crossing of the N. Pacific seems to be more difficult than any of the other passages. A route that is often recommended for a westward passage is through Unimak Pass in the Aleutian Islands across the Bering Sea to a point near the coast of the U.S.S.R. at Kamchatka and thence on to destination. There is a general reluctance on the part of all masters to accept this routeing although one who used weather routeing on a northern route just south of the Aleutians reported an excellent passage weatherwise. Incidentally he is one of the masters who prefers to do his own routeing.

It appears to be the general consensus of the masters that weather routeing from

Venezuela to N.E. United States is not necessary except in the hurricane seasons.

Time does not permit me to read all the reports that I have received from our masters. Therefore, their written and verbal reports will be presented as a synopsis of the pros and cons of weather routeing.

The Pros

"The trans-Pacific route was 150 miles shorter than the one I had planned to use. The long-range forecast permitted a more planned and balanced maintenance programme. Tank cleaning and change of ballast could be programmed more successfully."

"It appears that the weather routeing people select the route that maximises safety and minimises transit with the emphasis on sea conditions rather than wind and current. Weather routeing should be encouraged as there might be long-term benefits rather than short-term benefits." (It is thought the master is referring here to better maintenance.)

"In regard to hurricane 'Dora', I am convinced that had action been taken according to the usual practice of mariners the vessel would have been placed into the hurricane. As it was, the vessel only experienced a swell and strong quarterly sea."

"In our easterly trans-Pacific crossing we either avoided the gales or passed through their right-hand semi-circle with all heavy weather taken from aft, a most favourable situation. I estimate a gain of at least 12 hours through following weather routeing. If it were practical to calculate a true gain, the amount of time saved would no doubt be considerably greater. Information supplied as to the formation of other depressions was hours ahead of any radio weather report."

"In regard to trans-Pacific crossings, as far as I can remember the greatest amount of time saved was 17 hours. We are better able to plan maintenance and tank cleaning. On a passage from San Pedro to the northern tip of Luzon our route was altered four times in ten days with the result that our passage was unmarked by heavy seas."

"I was favourably impressed with the Atlantic crossing but weather routeing is of limited advantage on short voyages between South America and N.E. U.S.A. We added 50 miles to our voyage but had finer weather than that reported by vessels further north where I probably would have been without weather routeing."

"Weather routeing is another aid to navigation. You can use it sometimes without any obvious advantages, then in one passage you might save thousands of pounds justifying the service for the times when the gains were not so obvious."

The Cons

"Fog for fifty hours and vessel operated mostly at half speed with a short period at dead slow speed."

"Reference Venezuela to N.E. U.S.A. route: I don't think weather routeing is necessary on these short passages as so little deviation can be allowed."

"In regard to trans-Pacific journey, the obvious advantages experienced from using this service during the easterly crossing were not apparent on this occasion going westward. However, the general weather pattern over the Pacific was bad and I do not wish to discredit weather routeing because I did not accept their primary recommended route north of the Aleutians."

"I have found that we receive excellent weather reports every 12 hours from Guam, Honolulu, Washington and Tokyo. I prefer to base my track across the Pacific on these weather reports."

"The first time I used this service trans-Pacific I was in fog for several days and had to operate at reduced speed. On southerly crossings from Balboa I find Honolulu more accurate. After all, the weather routeing authorities have to get the local weather information from Honolulu in order to make their plot. On one voyage it was indicated that their route was based on a report from a vessel. I was the only weather-reporting vessel in this very remote area. I prefer to do my own routeing, based on weather forecasts."

That concludes the extracts from our masters' reports.

Communications

Communications appear to be one of our major problems. The definition of communications that I prefer is 'the giving and receiving of information'. It has become apparent in the preparation of this talk that we have not been communicating with the firms who are providing the weather routeing service. I mean that both the ship and the shore staff have been receiving information but have not been giving sufficient feed-back to help the weather routeing authorities to do a better job. Incidentally my use of the words 'weather routeing' does not refer to any specific authority which provides this service. I believe with a little more communication or feed-back we can either clear up some of the problems we have in certain areas of the world or establish that weather routeing is of no assistance in these areas.

Conclusion

In conclusion, as a manager with responsibility for the deck operations and performance of 12 British Flag vessels, I am convinced that weather routeing is a profitable service to shipowners. The effectiveness of the service seems to vary and the westward crossing of the Pacific appears to be a particular problem area. With proper communications or feed-back to those providing the weather routeing service it is hoped that we will overcome these problems. Masters of our vessels will continue to be encouraged to use this service because of the potential financial benefits. A copy of this talk will be sent to all our masters in the hope that it will help to convince them of the advantages to be gained from using weather routeing.

Discussion

A questioner: Do you think that weather routeing is superior to using radio facsimile?

Captain Spicer: I have not made a comparative analysis of weather routeing with facsimile so I could not give a definite reply. However, in view of Captain Glover's talk, it appears worthwhile for us to give radio facsimile a trial to determine whether this equipment justifies the capital investment required.

Captain Wennink (*Shell International*): I am not opposed in principle to facsimile being used for the purpose of weather routeing but it needs some justification before deciding to incur this capital expense. After listening to these interesting lectures and discussions I envisage that one may consider installing facsimile in a ship with an objective master to see what results he gets. Some of our ships are already trying weather routeing from the shore and we have two ships fitted with facsimile in order to measure one system against the other. Captain Glover is in favour of the master doing his own routeing aided by facsimile and Captain Spicer is in favour of the other system; we in fact are trying out one system against the other before deciding which way to go. One thing to mention is that communication is one of the problems likely to be experienced. It is for this reason that we are now experimenting aboard some of our ships with the telex-over-radio system which might improve matters.

551.501.1:551.509.1:551.507.2

Revision of Ships' Meteorological Codes in 1968

BY LT.-CDR. L. B. PHILPOTT, D.S.C., R.D., R.N.R.
(Nautical Officer, Marine Branch, Meteorological Office)

Plus ça change, plus c'est la même chose. This old and somewhat overworked phrase comes to mind if one places the original ship's meteorological logbook of 1854 alongside that used today. The observations asked of voluntary observing ships in 1854 were, in that order: date and time, position, currents and sea surface temperature, magnetic variation, wind direction and force, pressure, dry and wet bulbs, cloud type and amount, weather and additional remarks. Today's book, as well we know, asks for date and time, position, wind direction and force, visibility, weather, pressure, dry and wet bulbs, cloud types and amount, sea temperature, sea waves, swell waves, ice, ice accretion, ocean currents and additional remarks, together with details of the despatch of a radio weather message.

In the 113 years that we have now 'been in business' there has therefore been but little basic change: magnetic variation naturally dropped out with the advance of science, the advent of survey ships etc., whilst waves and ice came in as these were found to be of practical use to shipmasters.

In the April 1966 number of *The Marine Observer* the Editorial mentioned that we were living in the Age of the Computer though it was emphasized that the computer, wonderful though the speed at which it can work may be, is not human; it cannot make decisions and the quality of its work depends solely on the quality of the data on which it is fed. Certain extra items of diet were visualized in order to aid its digestion and mention was also made of the possibility of its wanting to re-arrange the order of its menu, the fish before the soup as it were.

The requirements of the computer, as they apply to ships' meteorological observations, have now been worked out by the World Meteorological Organization with the result that certain changes will come into force internationally with the 0000 GMT observation on 1st January 1968.

None of these are very drastic, in any case they have been kept to the absolute minimum, and the new routine will no doubt be easily grasped. But any change is liable to confuse a busy officer if it is sprung on him unawares and we make no apology for giving what to many officers will seem an inordinately long notice. In some ships where, because of their remoteness from home, *The Marine Observer* is received months after issue and perhaps takes a long time to circulate amongst the observing officers, the notice will be more timely. Reminders will also be given in the April, July and October 1967 issues.

In order to accommodate these changes, small though they be, it has been necessary to revise the logbooks, both for Selected and Supplementary ships, the *Ships' Code and Decode Book* and also the Code Card. During this year (1967) all observing ships will be issued with the new editions. To obviate the possibility of using these books too early or of going back to the old ones after the new ones have been used, the colours of the new logbooks and the *Code and Decode Book* and the binder of the Code Card will be bright yellow (about the colour of the Admiralty List of Lights). The *Marine Observer's Guide* will also need a little amending but, as this is a loose leaf publication in any case, it will not be necessary to issue a fresh cover. Other publications such as the *Marine Observer's Handbook*, *Meteorology for Mariners* and the *State of Sea Card* will not need any amendment.

The yellow Code Card and *Code and Decode Book* will, of course, contain all the revised numerical tables but the amendments and additions to the actual code forms are given hereunder, together with the entire revised code.

Revised Ships' Code

$99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $YYGGi_w$ Nddff VVwwW PPPTT $N_hC_LhC_MC_H$ D_sv_sapp (7RRjj) $(8N_sCh_sh_s)$ $(9S_PS_Ps_ps_p)$ $(0T_sT_sT_dT_d)$ $(1T_wT_wT_wt_T)$ $(2I_sE_sE_sR_s)$ $(3P_wP_wH_wH_w)$ $(d_wd_wP_wH_wH_w)$ (ICE followed by plain language or by c_2 KD_ire).

Time and Position Groups

The old $YQL_aL_aL_a$ $L_oL_oL_oGG$ is now to become $99L_aL_aL_a$ $Q_cL_oL_oL_oL_o$ $YYGGi_w$.

The block number 99 enables the computer to identify the message as a ship's report; ships' officers will doubtless already know that all land station reports are identified by a block number.

The latitude is reported as before, i.e. in whole degrees and tenths.

Longitude now takes four figures, i.e. it is reported straight in degrees and tenths and the hundreds figure is now retained, when applicable. Where the longitude is less than 100° the first figure would, of course, be 0. This makes it unnecessary to divide the world into octants (the old Q) and the new code divides it into quadrants (Q_c). This also is easier for the computer to handle and for the observer.

YY in the third group of the new code replaces the old Y and is now the *Greenwich day of the month* (01–30 for September, April, June and November and so on as per the old rhyme) whereas Y was the day of the *week* (1 for Sunday, 2 for Monday and so on). GG has its old meaning, i_w is a wind indicator figure and is used to indicate the method by which the wind has been measured, e.g. 1 = estimated in metres per second, 2 = measured by anemometer in metres per second, 3 = estimated in knots, 4 = measured by anemometer in knots. It is reasonably certain that for many years to come, British Voluntary Observing Ships will continue to estimate their wind in knots (usually from the state of the sea) but i_w has been introduced to provide for observations from ships of countries which measure wind in metres per second and for ships provided with anemometers (H.M. ships, Ocean Weather ships, etc.) and its use will enable the computer to separate the various type of observations and to reduce them to a common denominator so that they may be 'married up' irrespective of the method used.

Wind, Visibility, Weather, Pressure, Air Temperature and Cloud

The next four groups, the old Nddff VVwwW PPPTT and $N_hC_LhC_MC_H$, remain unchanged.

Ship's Movement and Barometric Tendency

This group (D_sv_sapp) remains unchanged except that a new figure table provides for an increased range of speeds; this has obviously come about because of the increasing number of fast ships.

Additional Temperature Group

The next four groups of the old code also remain unchanged, but after the 'temperature group' $(0T_sT_sT_dT_d)$ now comes an entirely new group $1T_wT_wT_wt_T$. The figure 1 is a permanent indicator (like the figures 7, 8, 9 and 0 which started its four predecessors) and $T_wT_wT_w$ gives the actual sea temperature in degrees and tenths whilst t_T is the decimal point of the AIR temperature which has already been reported as a whole number in TT in a previous group. The object of this group is to enable the observer to send accurate 'direct reading' sea temperature and the decimal point of the air temperature. Both being to the decimal point, these will be more accurate for oceanographers and meteorologists. ***For the first few months, however, it is not intended that British ships shall use this group.***

This new group is followed by the ice accretion group ($2I_sE_sE_sR_s$) instead of by the wave groups as formerly. The ice accretion group remains unchanged and, as before, it may be substituted by the five-letter word ICING followed by a plain language statement.

Wave Groups

There is a slight variation in these groups: the indicator figure will now be 3 instead of 1 but, as before, the first of these groups ($3P_wP_wH_wH_w$) is for sea waves only. This particular group does not now provide for any direction because, by definition, sea waves are waves caused by the wind then blowing and their direction must therefore always be the same as that of the wind already reported (dd). Subsequent wave groups ($d_wd_wP_wH_wH_w$) are for swell waves and naturally provide for direction, as well as period and height.

Ice Group

The wave groups are followed by the ice group which is unchanged at the three-letter word ICE followed by c_2KD_1re.

It may seem odd to separate the Ice Accretion group from the Ice group but that is one of the computer's gastronomic quirks above referred to, say the joint between the soup and the fish.

It is perhaps not impertinent to conclude this preview of the new régime with a quotation from the Minutes of the First International Meteorological Conference which was held in Brussels in 1853 and which launched the whole system of voluntary observing at sea:

"In the compilation of this form the Conference has had carefully in view the customs of the service and the additional amount of attention which these duties will require, and it is believed that the labour necessary for the purpose, at least to the extent specified in the instructions for filling up the columns, is only such as can be performed under ordinary circumstances, and it looks forward with confidence to occasional enlarged contributions from zealous and intelligent labourers in the great cause of science."

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM JULY TO SEPTEMBER 1966

JULY

Canadian Arctic Archipelago. As in the previous month there were, over this area, very variable winds and temperatures, the latter ranging from as much as 5° above to 4° below average. The earlier clearance of ice in Amundsen's Gulf, Lancaster Sound and Prince Regent Inlet was maintained. Elsewhere the ice situation was very much as usual.

Baffin Bay. Winds early in the month were variable but later they settled down to a steady southerly over most of the area. The air was, on the whole, a couple of degrees cooler than normal and the sea, judging from the relatively few reports available, also on the cold side. In spite of this the ice deficit, noted previously, was still well marked, the ice edge being in some places 100 miles or so back on its usual position.

Hudson Bay, Foxe Basin and Hudson Strait. Here again winds were far from steady although over Hudson Bay itself there was a tendency for a mainly north-westerly stream. Air temperatures over all these seas were higher than usual and the water, certainly in the Hudson Strait, warmer than average. The ice pack was very much less extensive than normal, there being far

(Opposite page 36)

Photo by R. H. Brass

Reading the thermometers aboard an Ocean Weather Ship. One screen is carried each side of the bridge and also contains electrical resistance thermometers, connected to a recorder in the meteorological office, measuring wet- and dry-bulb temperatures.

(*Opposite page 37*)

Conference of Australian Port Meteorological Agents (*see* page 41)

more open water than one might expect in the south-east of the Foxe Basin and all over the Hudson Strait. Most of Hudson Bay, too, particularly the eastern half, was ice free.

Davis Strait. Extremely variable conditions in wind direction, air and sea temperatures were experienced here. From Cape Chidley northwards across the openings of the Hudson Strait, Frobisher Bay and Cumberland Sound there was much less pack than usual and on the eastern side of the Strait, from about 62° to 70°N (the northern limit of this area), the Greenland coast was ice free. Further south, however, a narrow belt of fairly open pack crept up the coast from Cape Farewell and by the end of the month was reported at 62°N, exceptionally far north for the time of year.

Labrador Sea and Great Bank. South-westerly winds, moderate generally but strong in the south, persisted throughout the period with the result that the air was relatively warm and the sea which, at the beginning of the month, was on the cool side also warmed up noticeably and was probably 3° above normal by the end. A narrow belt of pack-ice along the Labrador coast quickly melted and there were only scattered icebergs and growlers. It was, in fact, an extremely light month for these hazards.

Greenland Sea. Here there was quite a complex ice picture. During the first part of the month an abnormal south-westerly wind raised air temperatures and in most places—the area just north of Iceland being an exception—sea temperatures as well. Consequently the ice was loosened and leads, much wider than usual, opened up. Later in the month, however, normal circulation was restored and the usual north-easterlies north of 70°N were re-established. As a result the leads tended to close up again. In the Denmark Strait one effect of the variability of atmospheric and oceanographic conditions was that there was considerable mobility in the pack. Strings of ice floes stretched out from the Greenland coast towards Iceland and in some places reached out almost to the July extreme position. Further south near Cape Farewell fast ice disappeared and open pack was restricted in width.

Spitsbergen. Winds were strong but variable in direction and air temperatures were far from constant, being at some times 3° below normal, at others 2° above. The sea on the whole was cool. Nevertheless the remaining ice, just to the west of Svalbard, melted quite quickly leaving the whole area quite clear by the end of the month.

Barents Sea. Moderate to strong variable winds caused violent fluctuations in air temperatures which ranged from as much as 7° above normal to about 3° below. On average the sea was warm, in some places as much as 6° above the seasonal mean. The area covered by pack-ice was less than usual, especially to the south-east of Spitsbergen and south of Franz Josef Land. Curiously enough off the north-west of Novaya Zemlya the pack still remained in places where in late July it is usually clear.

AUGUST

Canadian Arctic Archipelago. Winds, once again, were very variable in direction but over the middle weeks of the period there was a tendency for those from the south to prevail. Air temperatures consequently tended to rise and in many places were as much as 3° above normal. An exception, however, was to be found just west of Banks Island where there was a relatively cool area. Generally speaking ice was less than usual although there were signs of some developing round the northern shore of Victoria and Banks Islands.

Baffin Bay. Southerly winds blowing at the end of July persisted and in some places became strong. Air temperatures, as a result, were higher than usual by amounts varying between 2 and 4°C. This relative warmth was not, however, universally reflected in sea temperatures which ranged from three or four degrees above normal in the south to four degrees below northwards of Lancaster Sound and in Smith Sound and Kane Basin. Ice coverage was very much as usual except off Baffin Island where the pack, fairly open, extended some 100 miles north of its normal limit. There appeared to be considerable mobility.

Hudson Bay. Over the western half winds were variable at first but later they settled down to northerly, which direction was characteristic also of those throughout the month over the eastern half of this sea. Curiously enough this predominantly northerly stream brought in warm air from the west of the continent and temperatures rose to as much as three to five degrees above average. Abnormally high sea temperatures were reported from ships in the area so it was not surprising that the broken pack, which had lingered on from July in a few places, quickly melted leaving the area completely ice free.

Foxe Basin and Hudson Strait. A warm, mainly southerly airstream raised temperatures four degrees higher than normal so that ice in the Basin was far less extensive than usual. There was none in the Strait.

Davis Strait. Wind directions oscillated considerably with the result that air and sea temperatures ranged from much higher than normal to several degrees below. Loose pack near and in the mouth of the Cumberland Sound persisted but drifted about with the currents. On the east side of the Strait the month started with more ice than usual between 60° and 62°N. This, however, melted during the period and had completely cleared by the end: a return, at last, to normal for this area. There were relatively few icebergs.

Labrador Sea. Mainly south-easterly winds were relatively cool and near the coast the sea, which started warm, rapidly cooled down to below average temperature. Very few icebergs were reported.

Great Bank. Here the winds persisted south-westerly and were strong at times. Only one isolated iceberg was reported, probably grounded, near Belle Isle Strait.

Greenland Sea. Near the coast, north-easterly winds, sometimes strong, were the rule but, surprisingly, air temperatures registered were mostly higher than usual. Further out the general direction was south-westerly but it was relatively not so warm. The sea was, on the whole, warmer than normal except for a small cooler-than-usual area in the Denmark Strait. Practically everywhere the ice edge was well back, the width of pack being in many places 100 miles narrower than usual. In the south, indeed, the ice had completely dispersed—unusual for August.

Spitsbergen. Winds in this area were extremely variable but both air and sea generally remained warm except for a very small area round about 79°N 2°E to which position the Greenland coast ice field just extended. There was no other ice.

Barents Sea. Over the northern half of the Barents Sea both air and sea were cooler than usual but, except for an area to the northwest of Novaya Zemlya, there was rather less than the normal amount of ice. Further south, with variable air temperatures but with warm, in places very warm seas, there was none.

SEPTEMBER

Canadian Arctic Archipelago. Over the northen half of this area winds were mainly moderate north-easterly with the result that temperature previously above, fell to about one degree below normal. Consequently there was much more fast ice than usual especially round Melville Island. Lancaster Sound further east, however, was clear. To the south light south-easterly winds prevailed, the air being perhaps two degrees warmer than average and, apart from an excess to the west and north of Banks Island, ice coverage was less than usual. This was particularly noticeable in the Gulf of Boothia which was quite ice free.

Baffin Bay. North of 75°N a strong north-easterly airstream lowered the temperature of both air and sea to the east of Devon and Ellesmere Islands but, curiously, there was still a deficiency of ice here. Over that part of the Bay between Baffin Island and the Greenland coast winds were mainly between easterly and southerly, and both sea and air were relatively warm. In most places there was, as expected at this time of the year, no ice. There was an exception, however, since an unusual persistence of pack off the Clyde River and Home Bay area lasted almost to the end of the month.

Hudson Bay. Winds, rather variable at first, settled down to steady north-westers and were quite strong in places. Temperatures over all but the extreme south-west were up to four degrees higher than normal and there were reports of sea temperatures in the middle of the Bay being as high as 10°C. There was no ice.

Foxe Basin. In spite of north-easterly winds the relatively high temperatures of August were largely maintained during September and ice cover was very much less than normal. By the end of the period, indeed, all pack had melted.

Hudson Strait. Air temperature here was, as a result of moderate south-easterly winds, well above normal as also was that of the sea. Ice pack had completely cleared while icebergs were few in number.

Davis Strait. As in the previous month, winds were variable at first but later they blew mainly from a southerly point, resulting in air and sea being generally warmer than usual. Icebergs were fewer than in most years.

Labrador Sea. Moderate north-easterly winds gave way, after a spell of westerlies, to moderate southerlies, the air being warmed up to about two degrees above normal. Along the coast there was a narrow strip of relatively cool sea particularly near Goose Bay, but further out in the Atlantic temperatures were higher than usual. There was, of course, no pack-ice and very few icebergs.

Great Bank. Moderate north-westerlies kept the air cool—by a degree or so below average—but the sea remained slightly warm, especially in the south. No ice was reported.

Greenland Sea. Strong winds followed the direction of the coast line, being northerly in the north and north-easterly south of Scoresby Sound. North of lat. 75°N air temperatures, higher than normal at the beginning of the month, fell to about two degrees below. Here the

Table 1. Icebergs sighted by aircraft and merchant ships within latitudes 40°N–65°N and longitudes 40°W–65°W

(This does not include growlers or radar targets)

Limits of Latitude and Longitude		Degrees North and West												
		66	64	62	60	58	56	54	52	50	48	46	44	42
Total number of bergs reported south of limit	June	> 972	> 966	> 924	> 888	> 863	> 791	> 497	> 68	21	4	1	0	0
Total number of bergs reported east of limit	June	> 972	> 970	> 957	> 873	> 820	> 249	> 97	> 42	> 7	> 1	> 1	> 1	> 1
Extreme southern limit	June	44° 11′N, 52° 26′W on 1.6.66												
Extreme eastern limit	June	63° 06′N, 41° 24′W on 16.6.66												

Limits of Latitude and Longitude		Degrees North and West												
		66	64	62	60	58	56	54	52	50	48	46	44	42
Total number of bergs reported south of limit	July August Sept. Total	> 93 > 499 > 96 > 688	> 93 > 484 > 94 > 671	> 82 > 400 > 34 > 516	> 60 > 104 > 3 > 167	> 52 7 2 > 61	> 52 7 2 > 61	> 19 3 2 > 24	12 2 0 14	1 0 0 1	1 0 0 1	1 0 0 1	0 0 0 0	0 0 0 0
Total number of bergs reported east of limit	July August Sept. Total	> 93 > 499 > 96 > 688	> 93 > 498 > 96 > 687	> 93 > 498 > 96 > 687	> 93 > 498 > 95 > 686	> 92 > 498 > 95 > 685	> 92 > 498 > 95 > 685	> 74 > 492 > 95 > 661	> 42 > 459 > 83 > 584	> 29 > 418 > 31 > 478	> 14 > 260 > 1 > 275	0 > 234 > 1 > 235	0 > 219 0 > 219	0 > 73 0 > 73
Extreme southern limit	July August Sept.	44° 35′N, 58° 34′W on 24.7.66 51° 19′N, 53° 14′W on 22.8.66 52° 54′N, 50° 10′W on 2.9.66												
Extreme eastern limit	July August Sept.	60° 06′N, 46° 12′W on 10.7.66 64° 00′N, 40° 00′W on 12.8.66 59° 54′N, 45° 48′W on 24.9.66												

> ('greater than') has been inserted where there is some doubt as to the actual number of icebergs at some of the sightings, but the true value is probably greater than the value given.

Extreme limits during the 3-month period are underlined.

ice pack rapidly increased and by the end of the period was probably 100 miles wider than usual but between 70° and 75°N the pack extended only about 60 miles further out than normally. Southwards as far as Cape Farewell, in spite of air and sea both being slightly warmer than usual, open pack was seen along the coast in several places, especially near Aputiteq, while glacier ice was reported from the Tingmiarmuit area near the southern tip of Greenland.

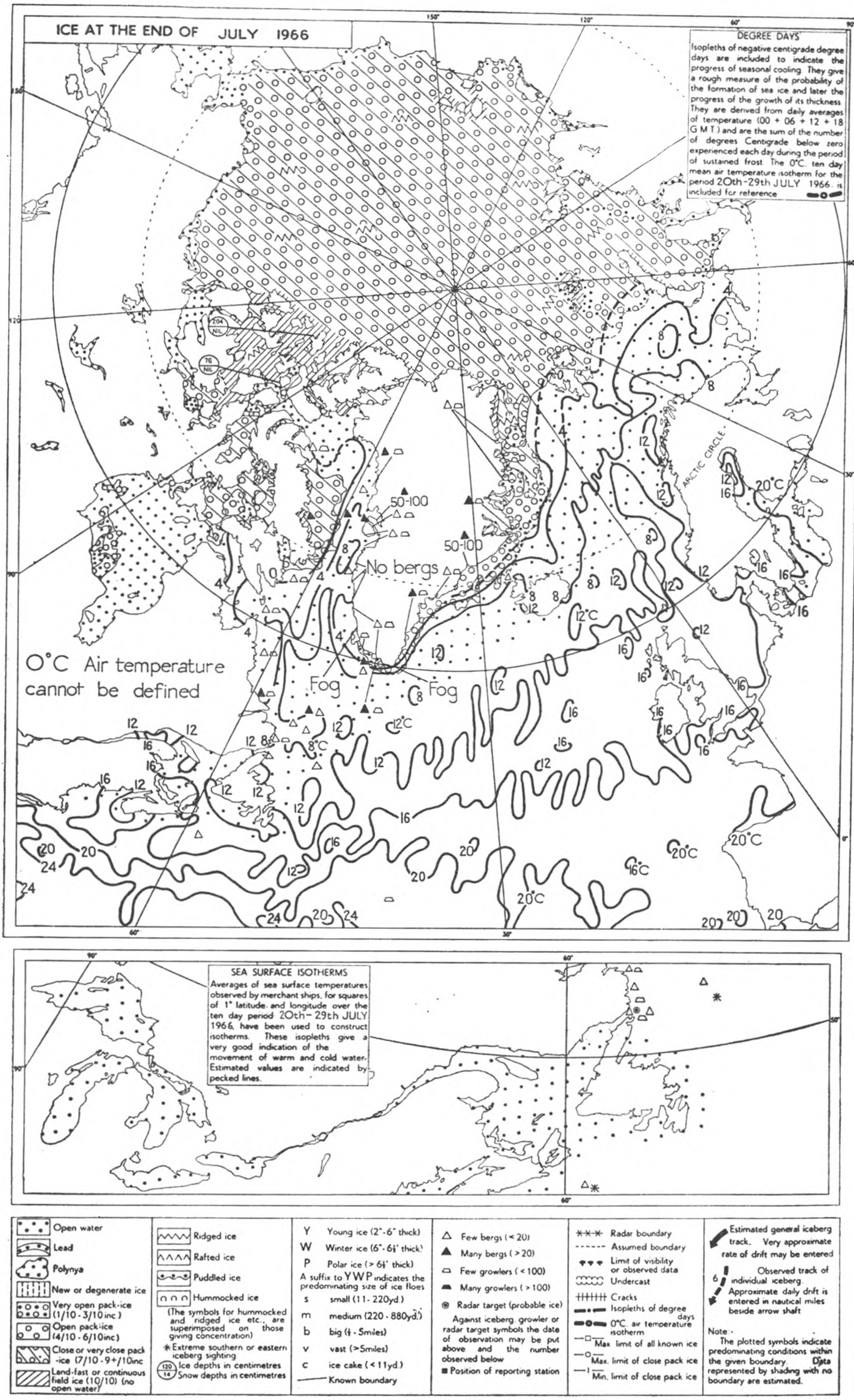
Spitsbergen. Strong north-easterly winds cooled the air two or three degrees below normal and, although the sea temperature was above average, there was a surfeit of ice to the north-west of the area, an extension, in fact, of the East Greenland pack.

Barents Sea. In the north of this area moderate northerly and very strong easterly winds continued the lowering of the air temperature so that in two areas, one to the east and south-east of Svalbard itself and the other off the north-west coast of Novaya Zemlya, the amount of close pack was greatly in excess of usual.

Baltic. Although it was far too early for any freezing in the Baltic, water conditions there during the month suggested that an interesting ice season lay ahead. Strong winds, at first blowing from the south-west, veered to the north-west and air temperatures fell generally to about two degrees below normal. Water temperatures on the surface moved roughly in step. At depth, however, extremely low values were recorded—at Finngrundet, for example, the average temperature of the sea down to 100 ft below surface was as much as three degrees lower than during the corresponding period in 1965 which, in fact, preceded an exceptionally heavy winter for ice.

N.B.M.

Note. The notes in this article are based on information plotted on ice charts each month,


ICE AT THE END OF JULY 1966
DEGREE DAYS
Isopleths of negative centigrade degree days are included to indicate the progress of seasonal cooling. They give a rough measure of the probability of the formation of sea ice and later the progress of the growth of its thickness. They are derived from daily averages of temperature (00 + 06 + 12 + 18 G.M.T.) and are the sum of the number of degrees Centigrade below zero experienced each day during the period of sustained frost. The 0°C. ten day mean air temperature isotherm for the period 20th-29th JULY 1966 is included for reference
0°C Air temperature cannot be defined
No bergs
50-100
Fog
ARCTIC CIRCLE
20°C
12°C
8°C
16°C
SEA SURFACE ISOTHERMS
Averages of sea surface temperatures observed by merchant ships, for squares of 1° latitude and longitude over the ten day period 20th-29th JULY 1966, have been used to construct isotherms. These isopleths give a very good indication of the movement of warm and cold water. Estimated values are indicated by pecked lines.
Open water
Lead
Polynya
New or degenerate ice
Very open pack-ice (1/10-3/10inc.)
Open pack-ice (4/10-6/10inc.)
Close or very close pack-ice (7/10-9+/10inc
Land-fast or continuous field ice (10/10) (no open water)
Ridged ice
Rafted ice
Puddled ice
Hummocked ice
(The symbols for hummocked and ridged ice etc., are superimposed on those giving concentration)
Extreme southern or eastern iceberg sighting
Ice depths in centimetres
Snow depths in centimetres
Y Young ice (2"-6" thick)
W Winter ice (6"-6½' thick)
P Polar ice (> 6½' thick)
A suffix to YWP indicates the predominating size of ice floes
s small (11-220yd.)
m medium (220-880yd.)
b big (½-5miles)
v vast (>5miles)
c ice cake (< 11yd.)
Known boundary
Few bergs (< 20)
Many bergs (> 20)
Few growlers (< 100)
Many growlers (> 100)
Radar target (probable ice)
Against iceberg, growler or radar target symbols the date of observation may be put above and the number observed below
Position of reporting station
Radar boundary
Assumed boundary
Limit of visibility or observed data
Undercast
Cracks
Isopleths of degree days
0°C. air temperature isotherm
Max. limit of all known ice
Max. limit of close pack ice
Min. limit of close pack ice
Estimated general iceberg track. Very approximate rate of drift may be entered
Observed track of individual iceberg. Approximate daily drift is entered in nautical miles beside arrow shaft
Note:-
The plotted symbols indicate predominating conditions within the given boundary. Data represented by shading with no boundary are estimated.

similar to the map shown opposite, but on a much larger scale (39 in × 27 in). They are available at the price of reproduction on application to the Director-General, Meteorological Office (Met.O.1), Eastern Road, Bracknell, Berks. Alternatively, they may be seen at any Port Meteorological Office or Merchant Navy Agency. Ice charts are also broadcast by facsimile.

AUSTRALIAN EXCELLENCE AWARDS

(From the Director of Meteorology, Australian Bureau of Meteorology)

The following ships and ships' officers were selected to receive Excellence Awards for 1965.

SHIPS AWARDS

1. m.v. *Carpentaria*, British India Line.
   For presentation at Perth.
2. m.v. *Port New Plymouth*, Port Line.
   For presentation at Melbourne.
3. m.v. *Shansi*, The China Navigation Co.
   For presentation at Sydney.

PERSONAL AWARDS

1.	Captain J. Raddatz	m.v. *Bass Trader*, Australian National Line.
2.	Captain W. G. Hinder	m.v. *Carpentaria*, British India Line.
3.	Captain A. Bradshaw	Western Australian State Ships.
4.	Captain J. B. Aldis	m.v. *Shansi*, The China Navigation Co.
5.	Mr. C. Beazley	2nd Officer, m.v. *Burwah*, Howard Smith Ltd.
6.	The Hon. J. D. Simon	3rd Officer, m.v. *Barpeta*, British India Line.
7.	Mr. P. Grainger	3rd Officer, m.v. *Shansi*, The China Navigation Co.
8.	Mr. D. Wright	Radio Officer, m.v. *Carpentaria*, British India Line.
9.	Mr. J. A. Colwell	Radio Officer, m.v. *Burwah*, Howard Smith Ltd.

CONFERENCE OF AUSTRALIAN PORT METEOROLOGICAL AGENTS

The first conference of Port Meteorological Agents to be held in Australia took place in Melbourne, 4th–8th July 1966.

During the conference the PMAs discussed with officers of the Commonwealth Bureau of Meteorology matters of mutual interest, and the conference concluded with a tour of the Melbourne PMA's office and port facilities.

The photograph opposite page 37 shows the three PMAs, Captain C. L. Wheeler (Sydney), Captain E. P. L. Wall (Melbourne) and Captain J. Watson (Fremantle) with members of the Bureau.

Book Reviews

Mostly Mischief, by H. W. Tilman. 8¾ in × 5¾ in, pp. 191, *illus.* Hollis & Carter Ltd., 9 Bow Street, London, W.C.2, 1966. Price: 30*s.*

This is the fourth of Major Tilman's fascinating volumes dealing with his adventures in his yacht *Mischief*, an ex-Bristol Channel pilot cutter built in 1906 and still making her proud way in waters which her builders and original owner, one who was styled Billy the Mischief, could hardly have dreamed that she would ever see.

Two of Major Tilman's previous books, *Mischief among the Penguins* and *Mischief in Greenland* were reviewed in the April 1962 and July 1964 numbers of *The Marine Observer* respectively. The present volume derives its name because it deals not only with the Greenland adventures which the author made in *Mischief* in the summers of 1963, 1964 and 1965, but also with a voyage which he made from

Sydney in the *Patanela*, a 63-ft steel schooner, to Heard Island as navigator in the southern summer of 1963–64.

Major Tilman is essentially a mountaineer and had no mean record as such between the wars. He still has an urge to climb the unclimbed and, because he likes to meet the challenge of the sea as well as that of the mountains, the virtually unknown coasts of Greenland and the Canadian Arctic are ideal regions in which to indulge his twin hobbies.

Part I of the book deals with the venture of the summer of 1963 to Baffin Bay with its objective of making the first ever crossing of Bylot Island which he accomplished on foot with one companion in 14 days.

Part II is concerned with a similar expedition in the summer of 1964 but this time to the mountains of East Greenland; on the outward passage a landing was made on the new volcanic island of Surtsey which had appeared off the SW coast of Iceland during the previous November. The 'fatiguing and not rewarding' ascent was made, 'two steps up and one step down', and the party of two finally peered into a crater which 'belched merely smoke and fumes instead of being the cauldron of molten, fiery lava that I had expected and hoped to see'. Less than a month after this visit Surtsey had resumed its eruption of lava.

One might think that one summer voyage of this nature each year would be enough for any man but Major Tilman's thirst for adventure is insatiable and in Part III we find him southward bound from Sydney in *Patanela*, as her navigator, for a visit to Kerguelen and Heard Island. One of the objects of this expedition was again to climb mountains but the author's contract required that he should remain by the ship though he did have the pleasure of renewing his acquaintance with the French settlement on Kerguelen Island whence he had taken *Mischief* in 1960 (*Mischief among the Penguins*).

In Part IV we are again in *Mischief* in the summer of 1965 for what the author terms 'the return engagement with East Greenland'. On this passage he again visited Surtsey to find that it was now a very substantial island, about 1½ miles long, a mile wide and 600 feet high, almost dormant but now with a diminutive neighbour about a mile to the eastward which was in full eruption.

With its dominant theme of long sea passages in small ships in little frequented waters, it is not surprising that meteorology and ice have no small part in *Mostly Mischief*. The ship has had many an encounter with gales and pack-ice, all described in the author's easy and inimitable style which might almost tempt the reader to believe that these voyages were no more hazardous than a trip from Tower Bridge to Margate. Throughout them he has always kept a meteorological logbook for us and though, not being fitted with a radio transmitter, no radio weather messages have been sent, our climatological records and punched cards have been considerably enriched thereby.

In reading this, as with all the other *Mischief* books, the reviewer found it easy to imagine himself back in the Elizabethan era for Major Tilman's ventures are of that age, ventures into the unknown without publicity and narrated without rhetoric. It is heartening too, to read of the numbers of younger Elizabethans who are only too eager to accompany him on his voyages, as he puts it '. . . voluntarily and almost painlessly, without any advertising or having to scratch round or solicit'.

'Because it is there', Leigh Mallory is reputed to have said when he was asked why he wanted to climb Everest. Major Tilman prefers to answer such a question in Stevenson's words, 'In the joy of the actors lies the sense of any action. That is the explanation, that the excuse'.

Currently with the writing of this review, Major Tilman is taking *Mischief* down to the South Shetland Islands, the sort of voyage which he once described as 'an intolerable deal of sea for one half pennyworth of mountain', and we shall look forward to another *Mischief* book in due course; without exception the reviewer has no hesitation in recommending them.

L. B. P.

Down to the Sea, by J. R. Dean. $5\frac{1}{2}$ in × $8\frac{3}{4}$ in, pp. 128, *illus*. Brown, Son and Ferguson Ltd., 52 Darnley Street, Glasgow, 1966. Price: 42*s*.

That there is a need for a book on Oceanography written in a semi-popular style cannot be denied. It is therefore a pity that this latest contribution to the literature should fall so far short of what might have been expected. In the first place the price is high. A more serious objection, however, is that in setting out to describe how this vital subject has developed in the past hundred years it succeeds in dealing only with a relatively narrow segment of the field.

As explained by Dr. Jacques Piccard in a lucid introduction (in French but with an English translation as an appendix) the author has recently been on the staff of the International Hydrographic Bureau in Monaco (he had served in the R.A.F.V.R. during the second world war, forecasting mainly for Coastal Command) where he seems to have acquired a somewhat limited outlook. In the opinion of the reviewer he places far too much emphasis on the work of the Bureau and particularly on that of its illustrious founder, Prince Albert I. In so doing he ignores the contribution of the Germans, Japanese, Americans and of his own countrymen. Whereas Prince Albert and the Piccards, father and son, are referred to frequently, other outstanding personalities in the world of oceanography, including some of the most highly esteemed, receive no mention at all. Much of the research in many world-famous oceanographic establishments is also passed over. The author completely ignores the observational work done by merchant ships and trawlers and omits any reference to the expanding interest in Antarctic waters.

There are, as well, some faults in detail. It is misleading to suggest, as is done in the chapter on Ocean Station Vessels, that a large proportion of these "ships' complement is necessarily engaged in maintaining watches on the international distress frequency . . ." or that these vessels communicate with one another by hydrophone. For many readers a simple explanation of the tephigram (naïvely expressed as a T-ϕ gram) is surely desirable in the paragraph on upper air soundings.

The final chapter on "Some resources of the sea" makes interesting reading, is highly thought-provoking and is quite the best section of the volume.

Overall, however, the book cannot be unreservedly recommended.

N. B. M.

The Principles of Navigation, by E. W. Anderson. $2\frac{3}{4}$ in × $5\frac{1}{2}$ in, pp. xiv + 612, *illus*., Hollis & Carter Ltd., 10 Earlham Street, London W.C.2, 1966. Price: 84*s*.

Wing Commander Anderson, President of the Institute of Navigation from 1959 to 1961 and a Gold Medallist of that Institute, who is the author of this book, was the Senior Navigator of the R.A.F. until his retirement in 1955. Since then he has devoted himself almost entirely to navigation, having been associated with companies manufacturing marine and air navigation equipment. He is therefore well qualified to write about the principles of navigation.

The preparation of this book must surely have been a monumental task, for almost every aspect of navigation, at sea, on land, in the air and in space, including the navigation of missiles, is dealt with in these 600 pages.

The book is divided into six parts and sixteen chapters. Part I, entitled 'The Background', begins with a discussion about the basic mathematics of navigation and navigational faults and errors and includes a brief definition of such terms as standard deviation, gaussian error and conic sections (e.g. hyperbola) and the use of the digital and analogue computer. The chapter on Environment discusses the world itself and its atmosphere and includes some brief notes about meteorology and ocean currents so far as they affect navigation. Finally there is a chapter dealing with craft in general (land vehicles, surface ships and submarines, aircraft, gliders, balloons, missiles and space craft); for each craft the propulsion, speed, steering and stability are dealt with.

Part II, entitled 'Instrumentation', opens with a chapter on control, including powered steering, display, and the use of gyroscopes in stabilization. The other two chapters in this part deal with the subject of 'heading', which includes some interesting and useful notes about the magnetic and gyro compass, and speed and its measurement respectively, in which the use of doppler and the inertial platform are among the subjects discussed.

In Part III—'Techniques'—the opening chapter deals with velocity and collision avoidance, and obviously includes some comments about relative motion and rule of the road, and is followed by an interesting chapter on dead reckoning. The final chapter, entitled 'The Route', includes a useful summary of various projections in use: a worked example of course and distance by rhumb line and great circle and some brief notes about optimum routeing.

Part IV is entitled 'Basic Aids'; its three chapters deal with various methods of position finding and the probable accuracy thereof, aural and visual aids to navigation and, finally, all aspects of astro-navigation, including some worked examples and a discussion of the relative merits of the marine sextant and bubble sextant.

Part V is entitled 'Electronic Aids' and its three chapters deal with radio and radar bearings, radio distance measurement and navigational uses of radar and sonar.

Part VI has a single chapter, 'Man and Machine', in which the author discusses direct control of craft, remote control and automatic control. It includes, for example, notes about the automatic helmsman, reception of facsimile maps and advice as to the best position for the radar display. The author infers that although complete automation is feasible in many respects in the air it is unlikely to prove worthwhile or practicable at sea, although there is little doubt that navigation of the ship "will be increasingly supported by automatic equipment".

The chapter is illustrated with adequate diagrams and concludes with a summary of its contents. At the end of each part is a comprehensive bibliography.

There is an excellent index which includes a list of contractions and abbreviations and their meanings, and a list of symbols and their meanings.

In this book the author has contrived to deal with so many aspects of navigation—on the earth, in the atmosphere and in space—that the result is somewhat unsatisfactory and disappointing from the viewpoint of the practical navigator; each item has necessarily to be treated so briefly that the result is rather in the nature of an orderly but condensed kaleidoscope of modern navigational practice. The preface tells us that the object of the book is to contribute "the exchange of ideas between the navigator and the scientist and the engineer . . . by painting a broad picture of navigation as a whole . . . attempting to suggest a common language appropriate to the study of navigation . . . in an order that may be acceptable to the seaman and the airman". The phraseology and mathematical treatment is such that it seems more appropriate to the expert or to the academic student than to the practical navigator—although the last-named might find it useful at times, rather as an encyclopaedia. Part V of the book—'Electronic Aids'—is particularly informative.

In the meteorological section there are a few errors. For example, the attempt to condense the Beaufort scale is not very successful; growlers are referred to as "sodden lumps of ice" and it is stated that "the forecaster may be aided by prognostic charts which show how weather situations have developed in the past". The symbols for warm and cold fronts in the index are erroneous.

These criticisms are relatively minor ones and do not detract from the fact that this book contains a mine of useful, condensed information which is not obtainable anywhere else in one book; there seems little doubt that any student of navigation should be able to derive some benefit from reading it.

C. E. N. F.

Personalities

RETIREMENT.—CAPTAIN E. W. DINGLE, M.B.E. has retired from the sea a few years before the normal age owing to indifferent health.

Edward Wallace Dingle was born at Blyth in 1907 of seafaring ancestry. His father, Captain Charles Dingle, was Master in Stephens Sutton and the British Tanker Company and will doubtless be remembered by many of the older generation of seafarers as the North-East-Coast Representative of the Navigators and General of which he was a founder member. Two uncles also were shipmasters and his grandfather had sailed as Mate with Captain Edward Hain, the founder of the Hain Line. The Dingles subsequently went into the shipowning business and operated sailing vessels from Fowey with an aunt, Mary Hayes, flying her house flag (a white H on a blue ground) in them and keeping the books. Their last and largest ship, the *Koh-i-Noor*, a barquentine of 800 tons, was lost off Aruba at the turn of the century in one of the very rare hurricanes which have affected that area. Young Dingle received his early training in H.M.S. *Conway* and in 1923 signed indentures with the Commonwealth and Dominion Line (later to be known as the Port Line) and joined their *Port Denison.*

He passed for 2nd Mate in 1928 and was appointed 4th Officer of the *Port Auckland.*

In 1935 he passed for Master.

During the second world war, Captain Dingle was 2nd Officer of the *Port Brisbane* when she was intercepted and sunk about 1,000 miles west of Fremantle by the German raider *Pinguin* on the night of 21st November 1940. His boat was the last to leave the sinking ship (as the officer of the Middle Watch he had the unpleasant experience of being in his bunk when the shelling commenced) and when he got to it, in addition to the 26 people already there, it also contained a number of cement defence slabs which had been blown off the radio cabin. This gave her very little freeboard which stood the survivors in good stead as the *Pinguin*'s searchlights passed above them several times in the trough of the swell. They were thus left alone whilst the remainder of the crew went away to captivity.

Their position was not very far from where the *Trevessa* had foundered in 1923 and, when the scene was again quiet, Captain Dingle decided that a repetition of that historic boat journey to Mauritius would at least be more practicable than attempting to sail back to Australia. Dividing his crew, therefore, between his own and two other lifeboats, abandoned but serviceable, course was eventually set accordingly. But at dusk on the first day H.M.A.S. *Canberra* hove in sight and took them aboard. A week later they landed in Fremantle and separated, most of them joining the transports as replacements. Dingle was appointed intermediate 3rd Officer of the *Queen Mary* and was on watch in her when the *Pinguin* made a signal which betrayed her position to H.M.S. *Cornwall* and led to her ultimate destruction. After the *Queen Mary*, Dingle went to the *Samblade* and saw service at the landings in the South of France and in Burma. He was awarded the M.B.E. and Lloyd's Medal.

Returning to the peace-time service of the Port Line, Captain Dingle was appointed to command the *Port Lincoln* in 1954.

His association with the Meteorological Office goes back to 1929 when he sent us his first meteorological logbook from the *Port Auckland*; altogether he has observed in 15 separate years and sent us 24 meteorological logbooks. He received Excellent Awards in 1955, 1956, 1962, 1963 and 1966.

We wish him improving health and happiness in his retirement.

L. B. P.

RETIREMENT.—CAPTAIN F. W. S. ROBERTS retired from the service of the Canadian Pacific Steamships at the end of July 1966.

Francis William Sutton Roberts was born in London of seafaring stock. His father, when serving with Messrs. Scrutton at St. Lucia in 1902, had been appointed to command the *Roddam* after the historic earthquake at Martinique, and subsequently served as Master with Messrs. John Holt's of Liverpool. One great-grandfather was styled 'Mate of a ship' in 1858 and was presumed drowned and another, Richard Jones, was press-ganged into the Navy before Trafalgar and retired as Chief Coastguard at Amlwch.

Captain Roberts was trained in H.M.S. *Conway* and joined the Canadian Pacific's *Bosworth* in January 1923. He passed for 2nd Mate in 1926 and was appointed 5th Officer of the *Minnedosa.* From 1927 to 1930 he was 3rd and 2nd Mate in the Gulf Line of Sunderland trading to the west coast of South America. He passed for Master in 1930 and joined the Royal Naval Reserve as a probationary Sub-Lieutenant, subsequently carrying out the usual peace-time training. He returned to the Canadian Pacific in 1932 and remained with them until the outbreak of the second world war when he was called up for service in the Royal Navy. He served in the Northern Patrol in H.M.S. *Cilicia*, then in the *Vindictive* on West African and Western Mediterranean stations. He saw service in the North African, Sicilian and Italian campaigns and in 1944 was appointed navigator of the *Montclare* which became flag ship of the Fleet Train of the British Pacific fleet. He took part in the re-occupation of Hong Kong after the Japanese surrender.

On returning to the Canadian Pacific in 1946 he was appointed 1st Officer of the *Empress of Australia* and in her took the first consignment of returning planters to Malaya; she was also the first troopship to enter Kure and subsequently brought out the last troops from Haifa before the setting up of the State of Israel.

Captain Roberts was appointed to his first command, the *Beaverlake* in 1953 and in the spring of 1965 was appointed Commodore of the Company.

We received his first meteorological logbook in August 1923 when he was a Cadet in the *Montrose* and has sent us meteorological logbooks or forms in 24 separate years. In 1964 he received the special award of a barograph for long and zealous voluntary observing at sea.

We wish him health and happiness in his retirement.

L. B. P.

RETIREMENT.—COMMODORE B. A. ROGERS, O.B.E., D.S.C., R.D. retired from the British India S.N. Co. Ltd. last August after 44 years' service with the Company.

Benjamin Andrew Rogers went to sea in 1922 and served his time in the Cadet ships *Carpentaria* and *Wangaratta.* He passed for 2nd Mate in 1926 and was promoted to 4th Officer.

As an officer of the permanent Royal Naval Reserve, he was called up on the outbreak of the second world war for service in the Royal Navy and was awarded the D.S.C. for sinking a U-boat off the Lizard in March 1944 when in command of the frigate *Loch Fada.* He now holds the rank of Commander on the Retired List of the Royal Naval Reserve.

After the war he returned to the B.I.'s service and spent nearly nine years in the Cadet Training Ship *Chindwara*, which vessel he was promoted to command in 1950. He subsequently commanded the troopships *Dilwara* and *Dunera* and remained in the latter when, in 1961, she was converted from trooping duties to be the first of the popular educational cruise ships. He returned to trooping duties for a brief period in 1962 and then resumed educational cruising with his appointment to command the *Devonia* in February 1963. He remained in her until the *Nevasa* was converted to be largest of the Company's three educational cruise ships in October 1965 and flew his Commodore's flag in her until his retirement.

He was awarded the O.B.E. in Queen's Birthday Honours in 1963.

Commodore Rogers's association with the Meteorological Office goes back to 1932 when he sent us his first meteorological logbook from the *Masula*; since then he has, in 18 years of voluntary observing, sent us 39 meteorological logbooks, a large proportion of them being assessed Excellent. He received Excellent Awards in 1953, 1954, 1957, 1958, 1959, 1960 and 1964.

We wish him health and happiness in his retirement.

L. B. P.

Notice to Mariners

WEATHER PRESENTATION ON BBC TELEVISION

Mariners will be interested to know that since 15th October the BBC Television Centre in London has been equipped with a facsimile receiver connected by landline to the Meteorological Office Headquarters at Bracknell and manned continuously by a weatherman throughout the period that BBC television programmes are on the air. The purpose of this innovation is to present weather forecasts to the general viewer in non-technical terms. The television programmes are regarded as complementary to the BBC sound broadcasts.

Previously weather presentation on BBC television had been done by a member of the Meteorological Office staff from the London Weather Centre in the early evening, following the news magazine programme. Chart and forecast preparation was done partly at the London Weather Centre and partly at the Television Centre. While at the Television Centre the weatherman relied on telephone and telex for up-to-date information.

The early afternoon broadcast starts with the non-technical presentation of national weather for the rest of the day, illustrated by charts with simple international symbols to indicate the weather expected. This is followed by a more technical discussion of the outlook prospects, illustrated by an Atlantic chart showing isobars and fronts. The second routine broadcast in the early evening is a brief presentation of significant weather for the next 24 hours. The presentation at approximately 2250 follows the pattern of the early afternoon broadcast. A forecast of coastal waters is included in this bulletin for the benefit of mariners and yachtsmen.

The weatherman at the Television Centre will be on hand to give non-scheduled broadcasts at programme junctions when exceptional weather conditions such as widespread fog, severe gales and heavy snowfall require special warning to be given to those concerned. The facsimile arrangement will, to this extent, benefit mariners.

Fleet Lists

Corrections to the list published in the July 1966 number of *The Marine Observer*

Information regarding these corrections is required by 20th October each year. Information for the July lists is required by 20th April each year.

GREAT BRITAIN (Information dated 14.10.66)

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

Name of Vessel	Captain	Owner/Manager
Arctic Hunter	P. Garner	Boyd Line Ltd.
Grebe	C. Johnston	General Steam Nav. Co. Ltd.
Juno	T. Murphy	Bristol Steam Nav. Co. Ltd.
Oredian	G. V. Spong	Houlder Bros. & Co. Ltd.
Oreosa	D. S. Craven	Houlder Bros. & Co. Ltd.
Pointer	R. Bruce	Burns & Laird Lines Ltd.
Sandringham Queen	A. Flett	Comber, Longstaff & Co. Ltd.
Wandsworth	W. Purvis	S. E. Gas Board

The following vessels have been deleted:

Alderney Coast, Clarebrook, Iberian Coast, Jade, Sappho, Shell Director, Silvio.

GREAT BRITAIN (*contd.*)

The following ships have been recruited as Selected Ships:

NAME OF VESSEL	DATE OF RECRUITMENT	CAPTAIN	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
Amastra	19.8.66	W. Irvine	B. L. A. Dawes, D. Spargo, R. G. Stollery	—. Jackson	Shell Tankers (U.K.) Ltd.
Benedict	26.4.66	E. Griffiths	P. F. Lamb, J. M. Brierley, R. D. King	J. Thompson	Booth S.S. Co. Ltd.
California Star	15.4.66	W. Askew	T. Grahamshaw, T. Black, L. M. Dunn		Blue Star Line Ltd.
City of Winchester	30.4.66	—. Sweeney	D. J. Baird, P. Kimber, D. C. Butcher	D. A. Holmes	Ellerman Lines Ltd.
Clan Ramsay	14.6.66	A. M. Kennedy	R. S. Grant, A. R. McIntyre, R. V. Hanks	P. Hammond	Clan Line Steamers Ltd.
Colina	1.4.66	W. Joyce	K. M. R. Skinner, R. McLaughlan, W. R. Clegg	E. G. McKay	Donaldson Line Ltd.
Cortona	19.4.66	S. P. Ewing	A. G. S. Milchie, R. F. Muir, R. Donaldson	D. C. Keith	Donaldson Line Ltd.
Cotswold	4.5.66	J. M. Downard	D. J. Daniel, C. A. Hatcher, J. Ashbridge	S. J. Beasy	Hain-Nourse Ltd.
Coventry City	4.10.66	D. Hine	M. T. Donnellan, R. F. MacLeod, —. Bell	R. D. Bateman	Bibby Line Ltd.
Elysia	9.5.66	W. MacVicar, M.B.E.	A. Brydon, A. Hutcheon, J. Swan	H. Dunning	Anchor Line Ltd.
Floristan	3.6.66	J. D. Cain	R. W. Lorains, N. Bray	B. Webster	F. C. Strick & Co. Ltd.
Geestcape	6.9.66	D. G. Powell	L. Heywood-Jones, J. Milner, K. Waters	S. F. Teare	Geest Industries Ltd.
Ingleton	23.3.66	C. C. Brown	C. Thompson, T. Newton, K. Corcoran	T. W. Reid	Chapman and Willan Ltd.
Karaghistan	4.5.66	H. D. Quick	J. Ridout, S. T. S. Household, J. W. Wighman	M. P. J. Davis	F. C. Strick & Co. Ltd.
Manchester Port	13.10.66	G. R. Thomson	F. Shepherd, P. Humphreys, J. Birkenhead	B. Bewley	Manchester Liners Ltd.
Orcoma	13.4.66	A. Lang	A. W. Hepburn, J. McCombie, J. Smith	C. Needham	Furness Withy & Co. Ltd.
Orna	27.4.66	H. B. Chambers	T. Cobbins, G. A. Thornton, N. F. Edwards	E. A. Rodgers	British India Steam Nav. Co. Ltd.
Port Auckland	23.3.66	A. S. McClounan	J. Williams, L. A. Taylor, D. J. Plume	S. Hutchinson	Port Line Ltd.
Port Burnie	31.3.66	I. H. North	M. F. Bennett, E. L. G. Nightingale, D. A. Brown	W. Hughes	Port Line Ltd.
Registan	2.8.66	L. Seddon	C. Simmons, J. Jackson, J. Brown	K. McGowan	F. C. Strick and Co. Ltd.
Ruysdael	21.9.66	J. Parsloe	G. D. Hopkins, A. Glover		Bolton Steam Shipping Co. Ltd.
St. Margaret	29.3.66	N. Oddy	J. Lancaster, J. P. Kosidowski, J. Lynch	B. Sweeney	Houlder Bros. & Co. Ltd.
Santona	9.9.66	A. T. Johnstone	J. M. Bryan, W. Shields, G. Cowie		Donaldson Line Ltd.
Sugar Exporter	27.7.66	S. Gorrell	M. S. W. Humphrey, B. E. Evans, J. Scott		Sugar Line Ltd.
Sugar Importer	6.5.66	J. R. L. Atkinson	J. F. Brooks, W. Cowan, K. Beavers	T. Milner	Sugar Line Ltd.
Theseus	19.8.66	—. Broomfield			A. Holt & Co.
Tourmaline	26.4.66	J. D. McKinley	J. D. Ramsey, J. MacInnes		Gem Line Ltd.
Westmorland	21.6.66	A. C. Davies	M. G. Bishop, I. Thomson, A. Dawkins, T. Maclaren	D. Byne	New Zealand Shipping Co. Ltd.

The following ships have been recruited as Supplementary Ships:

Lady Parkes	26.7.66	P. E. Craven	D. L. Verity	D. L. Verity	St. Andrews Steam Fishing Co. Ltd.
Marbella	15.6.66	C. H. G. Drever	J. McCarroll	J. McCarroll	J. Marr & Sons Ltd.
Ross Illustrious	27.9.66	R. Waller	R. Laing	R. Laing	Ross Trawlers Ltd.
Royal Arrow	27.8.66	E. A. K. Brewer	C. N. McCarthy, J. R. E. Enston		Mobil Shipping Co. Ltd.

The following Selected and Supplementary ships have been deleted:

Ariosto, Bravo, Cape Sable, Carlo, City of Manchester, Deseado, Flamenco, Glenroy, Gloucester, Hero, Lord Codrington, Ocean Monarch, Ringdove, Ross Leonis, Sugar Transporter, Tidecrest

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

SKIPPER	RADIO OPERATOR	TRAWLER OWNER/MANAGER
G. Atherton	S. Waterman	Hudson Bros. Trawlers Ltd.
W. E. Bilton	H. Scott	Ross Trawlers Ltd.
W. Brettell	C. Duplock	Newington Steam Fishing Co.
P. Crane	J. D. Lester	Ross Trawlers Ltd.
C. Cross	T. W. Grey	Newington Steam Fishing Co.
A. Denison	F. R. Mortlock	Ross Trawlers Ltd.
B. Denness	L. Bacon	Ross Trawlers Ltd.
G. Downs	D. Raywood	Boston Deep Sea Fisheries Ltd.
J. A. Gower	H. Scott	Ross Trawlers Ltd.
J. Kerr	J. Lester	Ross Trawlers Ltd.
J. Kersey	V. Hairsine	Boston Deep Sea Fisheries Ltd.
B. Lee	B. Dhanjal	Kingston Steam Trawling Co. Ltd.
P. McCarthy	G. V. Lane	Northern Trawlers Ltd.
W. March	J. Connaughton	Hellyer Bros. Ltd.
R. Taylor	C. Duplock	Ross Trawlers Ltd.
E. Wooldridge, Jnr.	B. E. K. Robinson	Newington Steam Fishing Co.

BRITISH COMMONWEALTH

CANADA (Information dated 17.10.66)

The following ships have been recruited as Selected Ships:
Brandal (Govt. of Canada)
Chusan (P. & O. Line)
Imperial Quebec (Imperial Oil Ltd.)

Deleted:
Acadia

The following ships have been recruited as Supplementary Ships:
Acadia (Govt. of Canada)
Lief Eiriksson (Govt. of Canada)
Queen of Prince Rupert (British Columbia Ferry Authority)

Deleted:
Abegweit, Alaska, Imperial Quebec

Canada has 33 ocean-going Auxiliary Ships and 41 Auxiliary Ships operating on the Great Lakes and St. Lawrence River.

INDIA (Information dated 2.9.66)

The following ships (formerly Supplementary Ships) have been recruited as Selected Ships:

Jaladhayna (Scindia S.N. Co. Ltd.)
State of Gujrat (Shipping Corporation of India Ltd.)

The following ships have been recruited as Supplementary Ships:

Gargi Jayanti (Jayanti Shipping Co. Ltd.)
Jalakala (Scindia S.N. Co. Ltd.)
State of Madhya Pradesh (Shipping Corporation of India Ltd.)
Vishva Kalyan (Shipping Corporation of India Ltd.)
Vishva Mahima (Shipping Corporation of India Ltd.)
Vishva Pratap (Shipping Corporation of India Ltd.)
Vishva Vir (Shipping Corporation of India Ltd.)
Ratna Manjushree (Ratnakar Shipping Co. Ltd.)

The following ships have been deleted:

Santhia, Jalapushpa, Jag Doot, Jag Jamna

HONG KONG (Information dated 13.9.66)

The following ships have been recruited:

Name of Vessel	Captain	Observing Officers	Senior Radio Officers	Owner/Manager
Hunan	B. G. D. Ward	C. R. Humphry, R. V. McKay, D. Nicholson, S. Jones	Chin Fook On	The China Navigation Co. Ltd.
Hallborg	A. Sjøberg	K. Digernes, Leif. O. Bang, A. Horsdal	Chan Siu-Ming	Norwegian Asia Line

The following ships have been deleted:
Sinkiang, *Szechuen*.

SINGAPORE (Information dated 22.10.66)

Name of Vessel	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Bidor	J. C. Pounder	Anthony Chan Eng Lock	S. Fernandez	Straits Steamship Co. Ltd.
Cable Enterprise	G. H. C. Reynolds	Peter R. Shaw, James M. Watson	George O'Brian	Boustead & Co. Ltd.
Hoi Houw	O. Utseth	L. Overa, A. Staalesen	Pieter Joubert	Boustead & Co. Ltd.
Kah Poh	S. J. Harvey	Ahmad bin Dollah, Mohd. Lanang	Adnan bin Amat	Ho Chiang Shipping Co Ltd.
Kario	Lam Tit Man	W. C. Coules, Ng Chuan Ming	Hoon Chia Loui	Guan Guan Shipping Ltd.
Katong	J. M. MacNaughton	B. Killham, Wong Choo Ee	Tan Chong Huan	Straits Steamship Co. Ltd.
Keningau	N. R. Murray	James Fong, Amat bin Matson	K. A. Menon	Straits Steamship Co. Ltd.
Kimanis	W. G. Bradshaw	R. E. Dyason	S. R. Bharucha	Straits Steamship Co. Ltd.
Kinabalu	H. W. Wilkinson	Colin T. Jewell	Lee Yeun Fatt	Straits Steamship Co. Ltd.
Kuda Mas	A. B. Durrant	Lee Chee Wan	Wong Lang Kuan	Guan Guan Ltd.
Kunak	R. E. Davies	W. Chua Ngiap Foo	P. V. Abraham	Straits Steamship Co. Ltd.
Perak	E. E. Fenwick	Jaffar bin Amat	R. C. Anwar	Straits Steamship Co. Ltd.
Perlis	A. Lockwood	Stanley Taye	Ismail bin Hj. Manat	Straits Steamship Co. Ltd.

The following vessel has been deleted: *Letong*.

Printed in England for Her Majesty's Stationery Office by
William Clowes and Sons Ltd., London and Beccles

Dd. 125603. K. 16. 1/67

METEOROLOGICAL OFFICE

Surface Current Charts of Western N. Pacific

This is one of a series of five atlases giving a world-wide coverage of the ocean current circulation, now reprinted with minor amendments.

The atlas, numbered Met.O. 485 and entitled Quarterly Surface Current Charts of the Western North Pacific Ocean, covers the area north of the equator to 60°N and westward of longitude 160°W. Monthly chartlets of the China Seas are also included.

The quarterly charts comprise:
(a) surface current roses;
(b) surface current, predominant directions and average rates;
(c) surface current vector means.

These charts have been compiled from observations of surface currents sent to the Meteorological Office by voluntary marine observers in British merchant ships (supplemented by observations extracted from certain foreign publications) and from observations made in H.M. ships forwarded by the Hydrographer of the Navy. The observations cover the period 1855 to 1939.

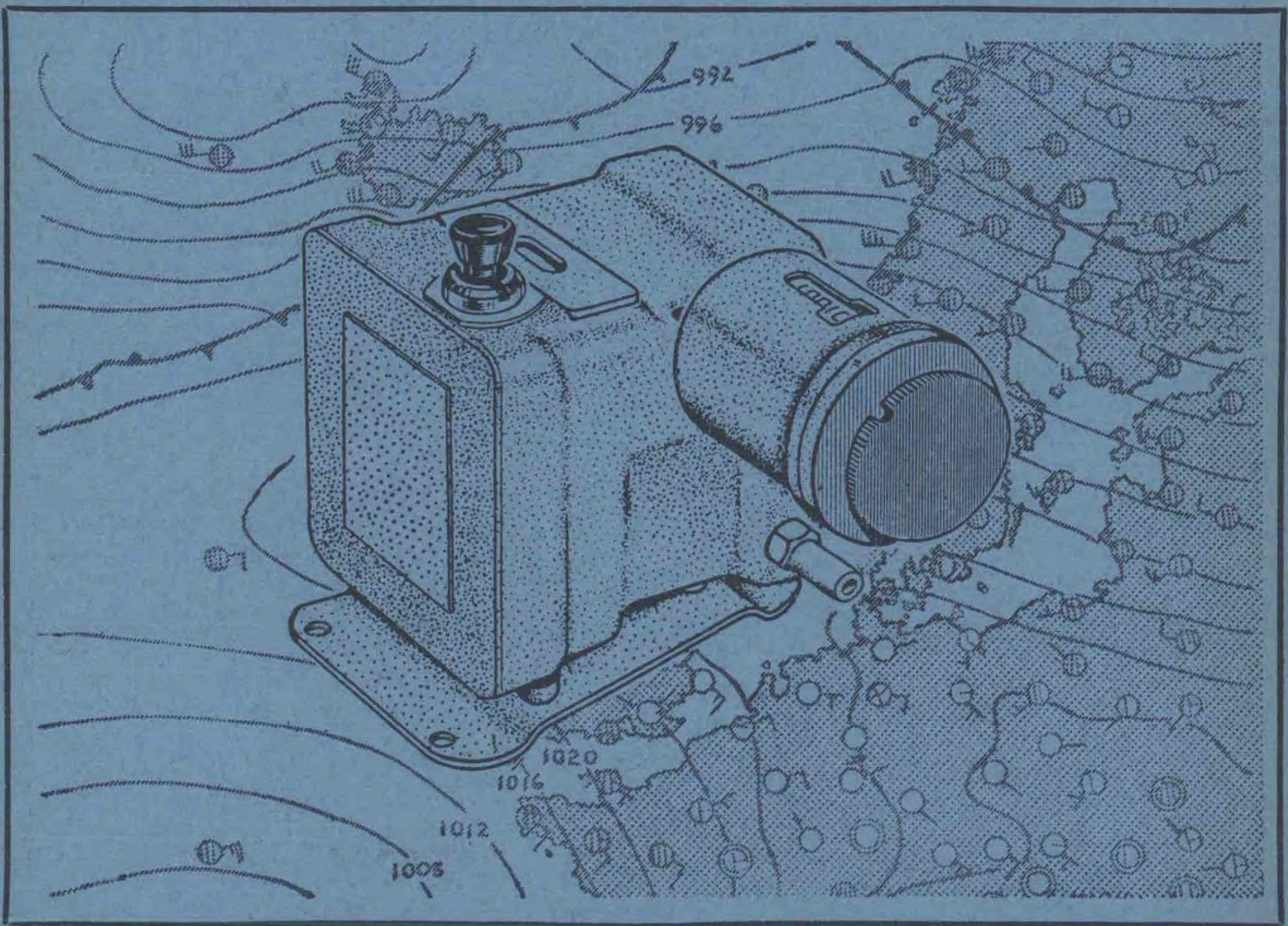
The atlas, which is available on free loan to U.K. voluntary observing ships from their Port Meteorological Officers, may be purchased from H.M. Stationery Office at 50s. net (by post 51s. 3d.).

Published by

HER MAJESTY'S STATIONERY OFFICE

and obtainable from the Government Bookshop at the addresses on title page (post orders to P.O. Box 569, London S.E.1), or through any bookseller.

MECHANISM PRECISION ANEROID BAROMETERS WITH DIGITAL READOUT FACILITATE WEATHER REPORTING



Large quantities of these instruments are being used by the METEOROLOGICAL OFFICE *for use in ships responsible for making official weather reports where their* ROBUSTNESS, PORTABILITY, *and* ACCURACY *under adverse conditions make them the ideal choice.*

RANGE: 900 to 1050 mb. DISCRIMINATION: 0·02 mb.
ACCURACY: At 20°C, ± 0·3 mb. At 5°C & 35°C, ± 0·5 mb. Max. change.

MECHANISM LIMITED

73-77 LANSDOWNE RD · CROYDON · SURREY · ENGLAND

Telephone · CROydon 3426–9 Telegrams · GYROMEC · CROYDON

S.O. Code No. 40-38-67-1