

Met.O.987

The Marine Observer

*A quarterly journal of Maritime
Meteorology*



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January 1989

THE MARINE OBSERVER

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

Vol. 59

1989

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COVER PHOTOGRAPH of the *Fetu Moana* encountering South Pacific seas 450 n.mile south of cyclone 'Gavin' in March 1986, taken by Mr G.C. Grey, 2nd Officer.
Letters to the Editor, and books for review, should be sent to the Editor, The Marine Observer, Meteorological Office, Eastern Road, Bracknell, Berkshire RG12 2UR

LONDON: HER MAJESTY'S STATIONERY OFFICE

Editorial

Many events occurring around the world in the year past have shown how much our lives are ruled by the elements, and it is therefore difficult to decide on which subjects to report. It is no wonder that the weather is a topic of daily conversation, for its behaviour dictates so much of our actions and our feelings, and very often our futures, such that we ignore its vagaries at our cost. It will therefore come as no surprise to know that those responsible for analysing and forecasting the weather conditions are continually in need of the best possible help they can receive from around the globe.

To take a major disaster as an example: if hurricane 'Gilbert' had never been spawned in mid-Atlantic off the west African coast, many lives would not have been lost in the Caribbean islands and in Mexico, and thousands of people would not have had their homes and livelihood destroyed by gale and flood. As important to those who visit those countries only as tourists, hundreds of holidays would have been enjoyed rather than ruined by the fury of the storm. It seems appropriate that one of our articles in this edition concerns the forecasting of tropical cyclones, and as with hurricane Gilbert it is always the aim to try and reduce the suffering caused by these natural variations by giving useful warnings.

Such is the power of the human spirit that the will to overcome such calamities will usually bring us safely through to normality in time. Examples of success in defeating the elements abound. Our own Ocean Weather Ship *Cumulus* was sent last August to rescue two airmen who had ditched their small aircraft in the North Atlantic, after they had gone off course in adverse weather while *en route* from Greenland to the Faeroes. The operation was successful and the two survivors were landed in the Outer Hebrides, little the worse for their experience. In the realms of survival at sea there can be few better examples of man's success against the elements than William Bligh's forty-one day voyage in an open launch with 18 supporters, set adrift from the *Bounty* in April 1789. To commemorate the 200th anniversary of Bligh's remarkable feat of sailing 3,600 miles from Tofua, Tongan Islands, to Timor without a single loss of life, the William Bligh Trust was formed in 1987 to re-enact the voyage. Jasper Shackleton, of Liss in Hampshire, plans to sail an exact replica of Bligh's launch over the original route, starting in April this year. As he does not expect to be attacked by the natives so readily as were Bligh and his crew, thus setting them on the long route to a safe haven and deterring them from calling at any other dangerous islands *en route*, Shackleton does plan to break his voyage at such places as Fiji and Vanuatu on the way. Following a request received via the Royal Institute of Navigation for weather information on the route to be followed, the Met. Office Marine Advisory Service was pleased to be able to provide relevant data and publications. If only Bligh had been able to contact Metroute, he might have been able to shorten his voyage considerably!

The Marine Superintendent of the Met. Office, as the World Meteorological Organization (WMO) observer to the International Maritime Organization (IMO), has taken part in the long deliberations at IMO regarding the mode of radio communications to be adopted as part of the Global Maritime Distress and Safety System (GMDSS). The important provision of meteorological forecast and warning services under the Safety of Life at Sea Convention has changed little in style from the agreements reached in the late 1940s. In advance of the introduction of the GMDSS, which will *inter alia* dictate the mandatory radio

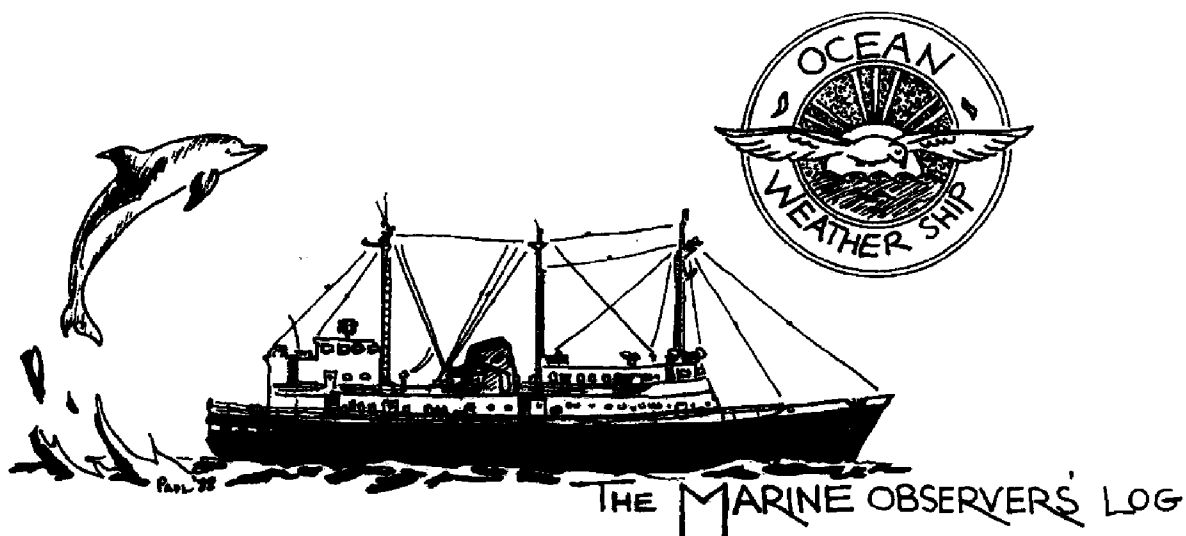
communications system for all IMO Convention ships over 300 tonnes after 1993, two new systems for the broadcast of Maritime Safety Information have been introduced in recent years: the NAVTEX system of IMO and satellite based systems with particular emphasis on the Enhanced Group Call system of INMARSAT. The discussions will continue, to try and ensure that technology and other developments in maritime communications bring about a rationalized system that will be both cost effective and of benefit to mariners on the high seas.

The Marine Division is often called upon to undertake unusual tasks when requested by outside organizations, but we were unable to find the required information recently when the police asked for the origins of a missing mercury barometer that was recovered and displayed in the 'treasure trove' on BBC TV's *Crime Watch* programme. However, a private enquirer received better fortune when we were able to locate supplies of non-standard barograph paper for a century-old instrument purchased in an antique shop.

With this first edition of 1989 we are pleased to introduce the first of a new set of four compositions at the head of *The Marine Observer's Log* section of the journal. The drawings are by Paul Hargreaves, a meteorologist who has served aboard O.W.S. *Cumulus* for the past two years having previously manned weather stations at airports, including Heathrow and Blackpool. Some of his talented work has already been published in *The Marine Observer* of April 1988, and he tells us that more of this artwork can be seen in mural form at a certain café restaurant in Blackpool, where clients may be able to obtain 10 per cent discount on production of any copy of this periodical! Mr Hargreaves is to be congratulated on providing updated versions of these headings, which have been in existence since the re-introduction of *The Marine Observer* after the Second World War, in 1947. This change marks the end of a forty-year period of continuous drawings by Commander C.H. Williams, who was Port Meteorological Officer in London from 1930 until his retirement in 1955, except during the war years and in his last year when he was appointed Deputy Marine Superintendent owing to the illness of the incumbent. Commander Williams produced many different sketches which were published in *The Marine Observer's Log*, as well as cartoons for the journal. His evocative drawings above the familiar initials C.H.W. also appear regularly in the *Journal of the Honourable Company of Master Mariners*. The new artwork therefore continues our tradition of publishing work by colleagues and friends of the Voluntary Observing Fleet.

The time has come to wish all present colleagues and friends continued health and happiness in 1989 and a healthy disposition towards cosmic and thalassic espionage.

J.F.T.H.



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.

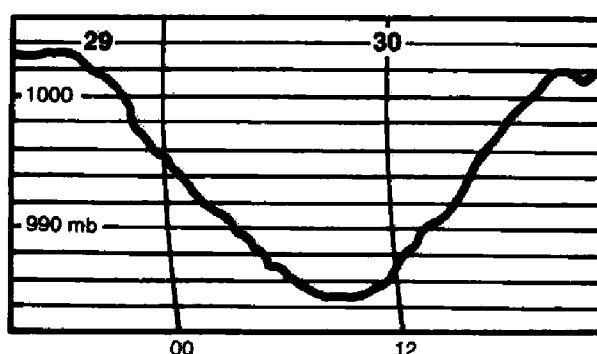
TROPICAL CYCLONE 'DOAZA'

Moçambique Channel

m.v. *British Esk*. Captain J.F. Thomson. Maputo to Mombasa. Observers: the Master, Mr P. Hebden, Chief Officer, Mr M.S. Prestt, 2nd Officer, Mr T.T. Latto, 3rd Officer and ship's company.

30 January 1988. Whilst on a course of 033° and at a speed of 11 knots, the passage of tropical cyclone Doaza was observed. The following is a summary of events up to 0700 GMT. There was moderate rain between 0205 and 0215, becoming light/moderate between 0225 and 0240, followed by light rain from 0250 to 0305. A violent squall was experienced from 0310 to 0315, with winds of S'ly, force 9 and visibility momentarily reduced to 0.5 n.mile by rain. The sea and swell were confused at 0330, the wind remaining S'ly, force 8-9. Another violent squall occurred at 0345, seas remained confused with both easterly and southerly swells present. The rain eased at 0355, but the pressure continued to fall steadily, reading 990.7 mb at 0400. Ten minutes later the rain stopped. There was more moderate/heavy rain at 0425, when the visibility was reduced temporarily to 1 n.mile. Twenty minutes later, the wind was gusting to force 10 at times, and at 0515 the pressure reading was 989.3 mb, falling, and 988.1 mb at 0640. The barograph trace shows the storm's pressure changes.

At 0700 the vessel began sending hourly observations in plain language to Durban Radio/Met Pretoria:



Time (GMT)	Position of ship	Wind Dir'n Force	Sea Direction and state	Swell Direction and state	Pressure (mb)	Dry bulb (°C)
0700	22° 49'S, 36° 35'E	210 10	210 V. rough	180 V. heavy	987.6	26.7
0800	22° 42'S, 36° 38'E	220 10/11	220 V. rough	200 V. heavy	986.8	26.5
0900	22° 34'S, 36° 43'E	220 10/11	220 V. rough	200 V. heavy	987.0	26.8
1000	22° 25'S, 36° 49'E	230 10/11	230 V. rough	200 V. heavy	987.4	26.8
1100	22° 17'S, 36° 55'E	225 10	225 V. rough	220 V. heavy	988.5	26.5
1200	22° 08'S, 37° 01'E	240 9	240 V. rough	230 V. heavy	989.5	26.0
1300	21° 57'S, 37° 09'E	255 8/9	255 Rough	235 Heavy	991.4	27.8
1400	21° 49'S, 37° 15'E	260 7/8	260 V. rough	240 Heavy	992.4	27.3
1500	21° 37'S, 37° 24'E	300 8	300 Rough	240 Heavy	994.0	28.5
1600	21° 26'S, 37° 32'E	310 8/9	310 V. rough	240 Heavy	996.2	28.1
1700	21° 14'S, 37° 40'E	320 8	320 Rough	240 Heavy	998.5	28.2

At 1800 the vessel was considered to be clearing the danger area, and the sending of hourly messages ceased. The Central Forecast Office in Pretoria subsequently contacted the ship with the message, 'Thank you very much for your regular obs. We want you to know that it is of great assistance and we appreciate it very much'.

Position of ship at 0600 GMT: 23° 00'S, 36° 30'E.

Note. Mr R.D. Whyman, of the Marine Climatology branch, Met. Office, comments:

'Doaza was first noted on the circumpolar charts at 1200 GMT on 23 January at 12.5°S, 64.5°E, roughly 900 n.mile east of the northern tip of Madagascar. Doaza moved on a west-south-west track at around 15 knots, crossing northern Madagascar on the 26th. On reaching the Moçambique Channel, Doaza's track curved south-westwards, more or less parallel with the African coast, which is where the *British Esk* encountered it as it passed to the east of the vessel. After clearing the Moçambique Channel, Doaza's track curved south-westwards, and by 1200 on 2 February, the storm had been downgraded to a depression centred some 200 n.mile east of Crozet Island.'

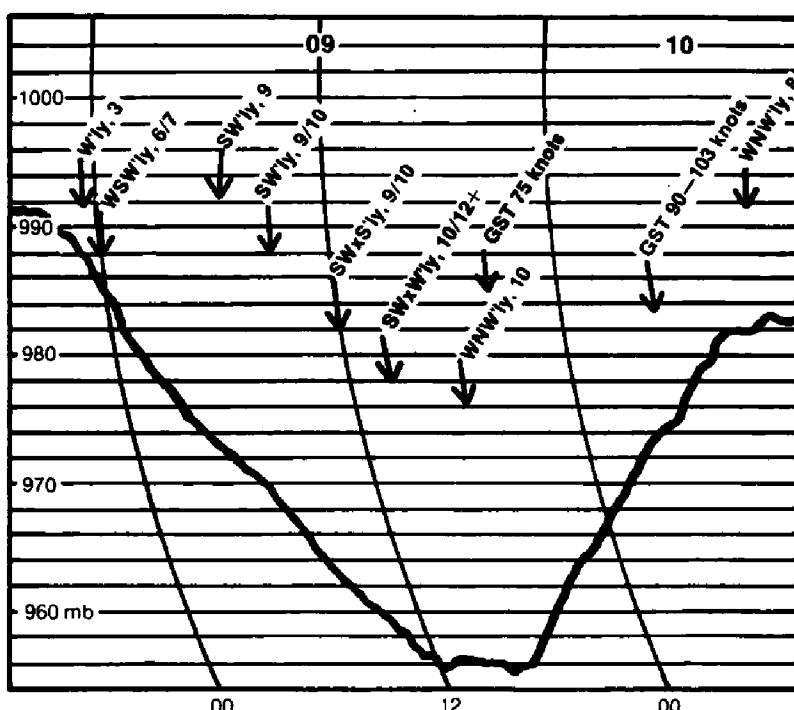
DEPRESSION

Firth of Clyde

m.v. Isle of Arran. Captain A.T. Ferrier. Ardrossan — Brodick ferry service. Observers: the Master, Mr J. Duncan, Chief Officer and Mr A.J.T. Gray, 2nd Officer.

9 February 1988. The following observations and comments were made during the passage of a very deep depression which affected the vessel on the above date. The barogram shows the associated pressure changes. All times are GMT.

- 8th 2200: Vessel at Brodick. Barograph trace commences an even downward fall from 991 mb.
 2330: Wind drops to Wly, force 3. Continuous heavy drizzle commences.
 9th 0000: Wind increases to WSWly force 6-7.
 0700: Wind gusts to 44 knots and backs SWly.
 0900: Vessel northbound to Gourrock. Wind SSWly, force 9, gusting to force 10.
 1200: Vessel southbound from Gourrock. Barograph registers 956 mb, pressure having fallen almost uniformly over 14 hours at the rate of 2.5 mb per hour. Wind SWxWly, force 9, gusting to force 10.



- 1430: Vessel all fast at Brodick. Pressure 953 mb, wind backing slightly to SWxWly, force 10, gusting to 70 knots.
 1525: Pressure 951.7 mb. Wind averages SWxWly, force 12. Ship's anemometer registers a huge gust of 83 knots.
 1612: Pressure reaches 951.5 mb, the minimum for the ship.
 1700: Barograph trace starts to rise steadily.
 1750: Wind backs to WNWly, force 10.
 1954: Gust of 75 knots noted for 4 seconds.
 2030-
 0000: Wind WNWly, force 9. Gusts over 65 knots, but gradually decreasing to 53 knots.
 10th 0001-
 0300: Wind between WNWly and NWxNly, from 15 knots to 70 knots..
 0505: Heavy rain throughout period, also heavy rain showers. Vessel experiences a vicious squall; an extreme gust of 90-103 knots is registered.
 0800: Wind WNWly, force 8.

The combination of wind (known to be subject to local variation owing to the physical geography of the area) and low pressure gave rise to an extra-high tide. From readings on the Ardrossan Harbour tide gauge, the normal mark should have been 8.4 m, whereas 9.8 m was read at 1551 on the 9th, causing severe flooding on some parts of the Ayrshire coast.

Position of ship: approximately 55° 37', 05° 00'W.

Note 1. Mr R.D. Whyman comments:

'The change in the pressure pattern was due to transition from a mobile westerly (zonal) flow to a more meridional flow (north-south or south-north) in the upper atmosphere. Depressions which were tracking across the U.K. in the mobile phase passed to the north in the meridional phase.'



Photo. supplied by A. M. Smith

Racing pigeon on board m.v. *Gas Enterprise* (See page 16.)



Photo. by P. Stevens

One of seven waterspouts observed from m.v. *Discovery Bay* between 0800 and 0845 LMT on 25 September 1984 while the ship was anchored off Livorno. As measured by sextant, the waterspout was 100 metres across, generated by clouds with a base at 1,600 feet. (See page 49.)

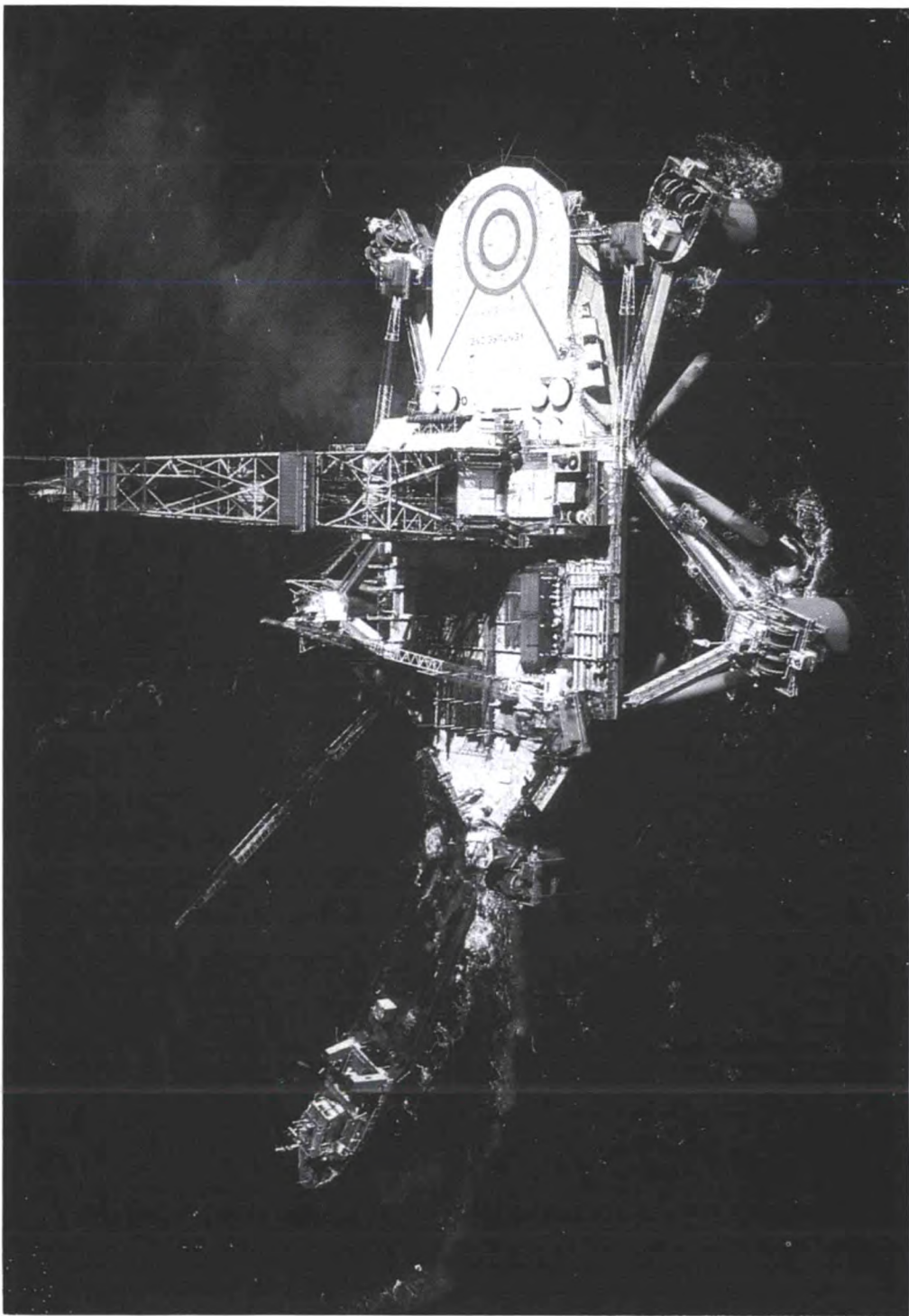


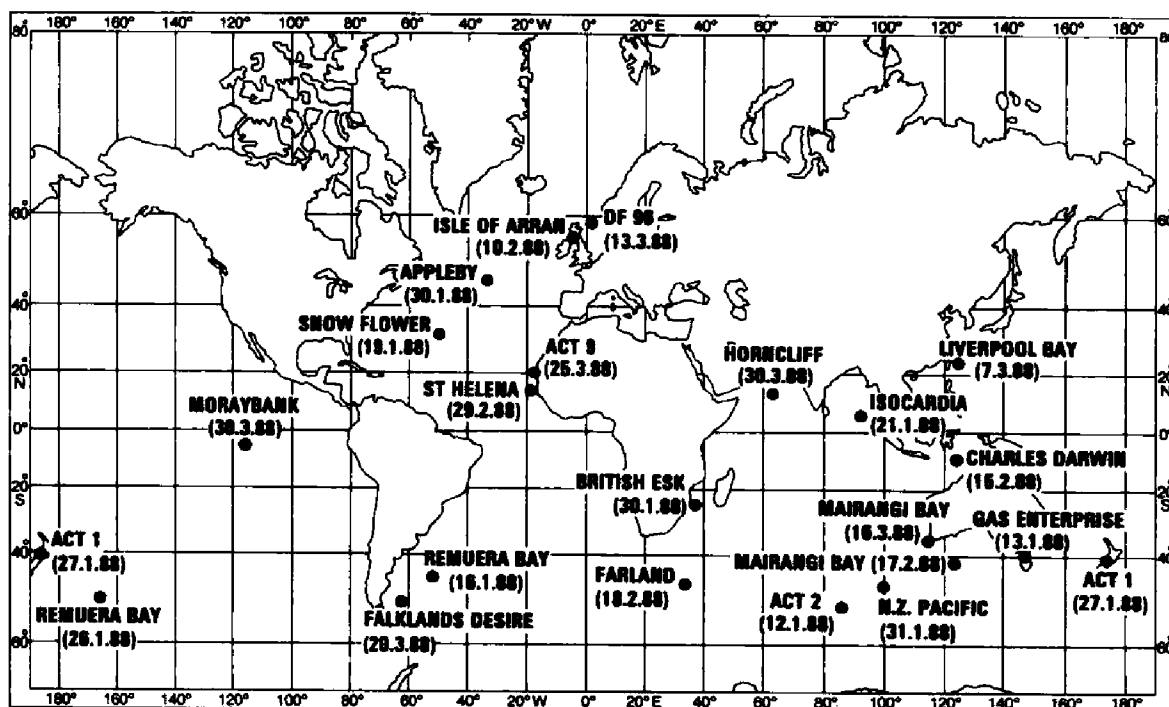
Photo. courtesy of Sonat Offshore Ltd

Sonat rig *DF-96* bearing its former name of *Venture One*. (See page 10.)

Note 2. The observers also asked about possible connections between severe weather and sunspots. These remarks were passed to Mr R.J. Livesey, Director of the Aurora Section of the British Astronomical Association, who commented:

'The connection between weather and the sunspot cycle is a difficult one to prove, and there are a number of statistical correlations, both true and false. For example, there was, for some years, a correlation between water levels in an African lake and sunspots which suddenly disappeared; and there is evidence that global rain belts appear to change position with the sunspots, leading to some areas which become wetter, and other latitude zones being drier at sunspot maximum. Some of the reported correlations relate to a 22-year sunspot cycle, not the 11-year one. The sun's magnetic field has a 22-year polarity cycle of one polarity distribution in one cycle, and the other polarity in the succeeding cycle.

'The weather is a very complicated heat engine about which it is difficult to be specific, especially for small areas of the globe. I once ran a statistical analysis on a long-term rain gauge at my home town of Kilmarnock in western Scotland, which *suggested* it might be wetter at sunspot maximum, but the difference was hardly statistically significant. All I can say is that various authorities suggest some connection between the sun's variable activity and the weather. Sunspots are only one of a number of phenomena resulting from the sun's internal magnetic activity; and in astronomy and geophysics, there are other solar-terrestrial links which relate to magnetism and ionic particles, hence aurora, magnetic storms and the like. Now whether these activities, which do not necessarily happen in step with the sunspots, affect the low atmosphere is a matter for debate. There are many unknowns which will keep the scientists arguing for years to come.'



Position of ships whose reports appear in *The Marine Observer's Log*.

DEPRESSION

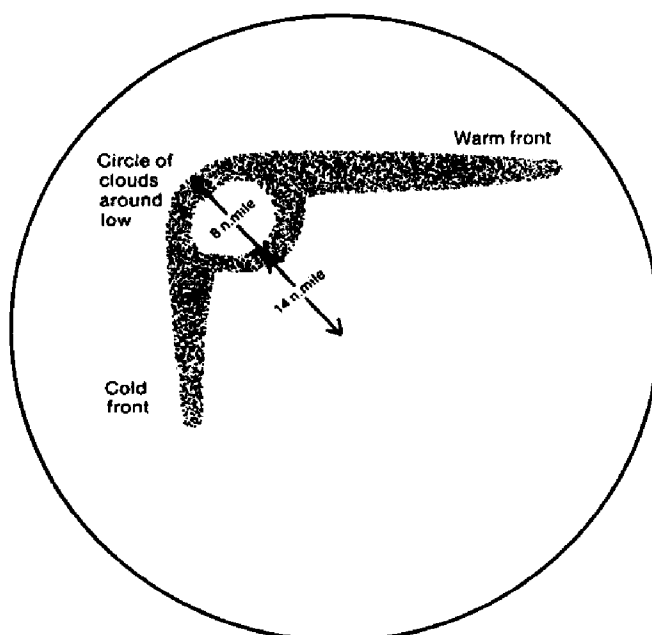
North Atlantic Ocean

m.v. *Appleby*. Captain J.E. Jennings. Immingham to Port Cartier. Observers: the Master, Mr B.F. Middleton, Chief Officer and Mr T.J. Preston, Extra 2nd Officer.

30 January 1988. Weather bulletins received whilst on passage indicated that a low pressure centre was located astern of the vessel, and was due to track close to its position. The wind at 2100 GMT was E'ly, force 9, with pressure falling

steadily. At 2230 the wind veered rapidly to S'y, decreasing to force 8, while the rain stopped. With the veering of the wind, the air temperature rose from 5° C to 13.5, and the barograph trace started to level slowly.

The passage of the clouds could be observed on the radar screen. At 2240 a ring of clouds was noted astern of the vessel; from this, a line of clouds appeared to extend due east, with a second line going due south as shown in the sketch. The whole system was tracking north-north-east.



The ring of clouds was taken to be the low's centre, and the lines of clouds to be fronts, or a front and an occlusion. The centre was 8 n.mile across and passed 14 n.mile astern of the vessel.

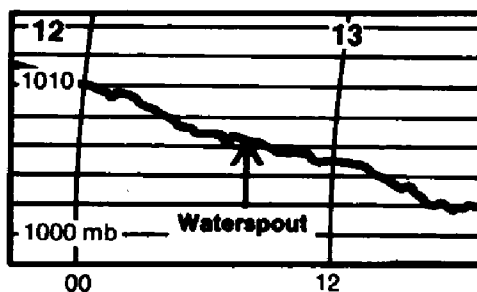
Position of ship: 47° 27'N, 32° 55'W.

WATERSPOUT

North Sea

Rig *Sonat DF-96*. Barge Engineer K. Ristola. Buchan oil field. Observers: Barge Engineer and watchkeepers.

13 March 1988. At about 0750 GMT a waterspout was observed some 6 n.mile east-south-east of the rig. At that time a showery trough was passing through and there was quite heavy cumulonimbus activity in the area. The barograph trace was marked as shown, to indicate the particular squall that produced the waterspout; it looked no different from the others, they were all generating heavy snow and/or hail showers.



The Barge Engineer was called to the helideck to see the phenomenon, and it was observed through binoculars. It was already growing in diameter and slowly disappearing; its duration from this point to its disappearance was three minutes. The waterspout was 1–2 n.mile ahead of the cumulonimbus, originating in a flat area of cloud not unlike stratocumulus, attached to the cumulonimbus and with a base at 1,000–1,500 feet. When first noticed by the other observers the clouds 'looked odd and then this thing shot up from the sea'. The total duration of the waterspout was about 5 minutes.

Initially, it had been almost black in colour, with very sharp edges, and after three minutes was clearly visible with the naked eye. Then it slowly grew in diameter to become a faint funnel about seven to ten times its original width before dissipating. The base of the funnel, where the water was being thrown about, did not grow in size however. The cumulonimbus tops were very high, some were checked using radar, measured elevation and simple trigonometry to give heights of 31,000 feet.

Position of rig: 58° 18'N, 00° 15'E.

Note 1. The formation of waterspouts requires a large difference between air and sea temperatures accompanied by instability in the lowest layers of the atmosphere.

In this instance the wind direction was NW'ly, and the airmass source was Arctic. Although the sea temperature would be at its lowest at this time of year, it was still much warmer than the air (1 °C), so suitably unstable conditions were created for the formation of the observed clouds and associated waterspout.

Note 2. A photograph of DF-96 appears opposite page 9.

ELECTRICAL STORM

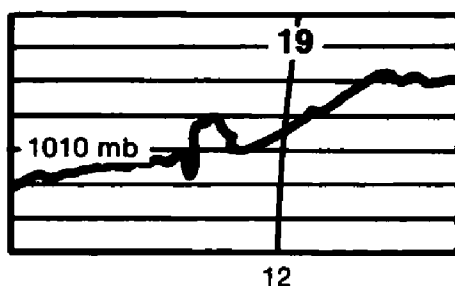
North Atlantic Ocean

m.v. *Snow Flower*. Captain M. Baker. Almirante to Bremerhaven. Observer: Mr A.W. Potter, 3rd Officer and members of ship's company.

18–19 January 1988. Throughout the daylight hours of the 18th the sky remained fairly clear with approximately 3–4 oktas of cumulus at 4,000 feet. Rain showers could be seen in the distance at about 7 n.mile. Inside these areas of rain, localized 'rainbows' could be seen in the shape of spheres, and were frequent phenomena. The showers were no longer apparent by 2000. At about 2100 the faint outline of lightning could be seen in the direction the ship's head, 060°. Flashes were frequent and continuous with an ever increasing intensity until 0130 on the 19th when forked lightning became visible. Although the main centre of lightning was bearing 060°, it covered an arc of 40°–60° either side of the ship's head. Associated with the appearance of the lightning forks was a significant increase in wind speed from force 5 to force 7, although no change in the direction was apparent. A great deal of energy could be seen in the sky, with frequent flashes of very bright lightning; however, no thunder was heard. The cloud cover was stratocumulus forming an annulus around the horizon, the centre of the sky remaining clear.

At 0200 the electric storm died suddenly with no decrease in wind velocity, and only occasional flashes of lightning being seen. These continued until 0330, bearing 000°, while sheet lightning bore 180°. By 0400 sheet lightning seemed to be overhead, and at 0415 the ship entered a moderate rain shower, the lightning was now no longer visible.

These conditions continued until 0710 when a rain squall passed, the trace of which is shown on the barogram, clearing at 0730; during this period the wind



increased to SSEly, force 9–10. At 0800 the wind died away to SEly, force 4, and until 0930 there were continuous lightning flashes all around the vessel, with thunder being heard; there was continuous light rain and drizzle throughout this period. By 1000 the rain had cleared and wind settled to SEly, force 6.

Position of ship at 0200 GMT on the 19th: 31°07'N, 49°06'W.

DUST

Eastern North Atlantic

R.M.S. *St Helena*. Captain R.H. Wyatt. Ascension Island to Tenerife. Observers: the Master, Mr D.N.R. Roberts, Chief Officer, Mr R. Young, 2nd Officer, Mr J.F. Harrison, 3rd Officer and a number of passengers.

29 February 1988. At 1600 GMT the vessel entered an area of discoloured water. The whole sea for as far as the eye could see was covered in 'slicks' or bands of reddish-brown material. These bands ran in an east/west direction, and were some 50–60 m wide. The material also extended down to a depth of approximately 2.5 m. This was assumed because as the vessel passed through the bands, the water churned up by the bow wave was a deeper shade of red-brown than that at the surface.

For a couple of days before this observation, reports had been heard that the Harmattan was blowing large quantities of sand out to sea off the Mauritanian–Senegalese coast, reducing visibility drastically. Upon arriving in the area, greatly reduced visibility had been expected, but instead, the bands as described had been found.

It was the general concensus of opinion that these bands were in fact the sand which had settled on the surface after the wind had dropped. They were still visible around the vessel at sunset, about 0920.

Weather conditions at the time were: dry bulb 25.0°C, sea 21.5, wind Nly, force 2, sea state smooth with a northerly swell of height 1 m.

Position of ship: 14°32'N, 18°18'W.

TIDE RIPS

Indian Ocean

m.v. *Isocardia*. Captain J.G. Pearce. Kawasaki to Umm Said. Observer: Mr P.J. Healy, 2nd Officer.

21 January 1988. At 0525 GMT a narrow band of 'white water' was sighted ahead. As the ship approached, this was seen to stretch from horizon to horizon. The ship's ARPA showed it to be stationary, but also plotted individual waves of all directions and speeds.

The vessel entered the tide rip at 0535; the area of the rip was estimated to be two ship's lengths (about 395 m) wide, and was very marked. The rip headed almost north/south, but curved on each side of the vessel towards the east. Inside the rip, the waves were about 1.5 m high, nearly all of white foam, and mainly 'headed' towards the east, although many were confused in direction. They were also very steep and gave collectively the appearance of a force 6 'chop' in shallow, harbour waters. At 0540 the vessel entered a second rip, which was much weaker. There was no change in sea temperature throughout the encounter.

At the time, the dry-bulb temperature was 29.0°C, sea 28.5, wind variable, force 1-2 and there was a north-easterly swell of moderate length.

Position of ship: 06° 11'N, 94° 28'E.

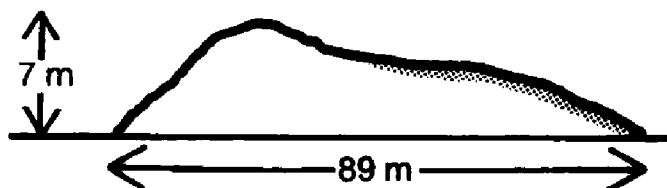
ICEBERGS

South Atlantic Ocean

m.v. *Remuera Bay*. Captain A.A. Railton. Lyttelton to Zeebrugge. Observers: the Master, Mr A.C.W. Lipscombe, 2nd Officer, Mr D.C. Collins-Williams, 3rd Officer and ship's company.

26 January 1988. During the day three icebergs were observed, and alterations of course were made in order to pass nearer to them. An 'all stations' broadcast was made by radio, and a message was also sent to the nearest Coast Radio Station — General Pacheco, Argentina. The positions which follow are those of the icebergs and not of the ship.

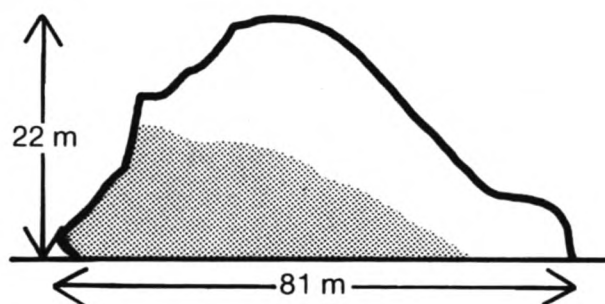
The first iceberg was seen at 1530 GMT at 43° 26'S, 50° 30'W. A small, but well-defined target appeared on the radar at a range of 8 n.mile, fine on the starboard bow. On visual inspection, a small iceberg was observed as a white mass upon the grey background of the horizon. It had the appearance of a large, white whale, see sketch (a). An alteration of course was made, and the ship passed



(a)

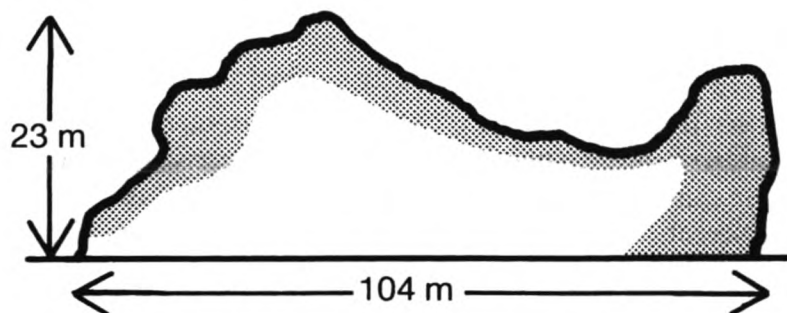
1.1 n.mile off the berg, whereupon sextant angles were taken, and it was determined that the dimensions were, length 89 m, height 7 m. The berg appeared a 'mushy' white colour, as if it was close to melting away. At this time the air temperature was 19.4°C, wet bulb 17.9, sea 19.0 and the wind was NW × W'ly, force 5. Visibility was about 8 n.mile owing to slight mist, and the sea was moderate with a low swell.

Soon after this observation, another radar target appeared at 1555 at a range of 18 n.mile on the port bow, in position 43° 18'S, 50° 31'W. Once the vessel was clear of the first berg, its course was altered towards the second one. It was seen visually at 9 n.mile, and appeared to be larger and more 'iceberg-shaped'. A crack was noted running the length of it. Passing 1.35 n.mile from the berg, sextant angles were obtained, and it was found that this one was 81 m long and 22 m high, see sketch (b).



(b)

The third berg was detected at 1910, in position 42° 25'S, 49° 50'W. It was detected by radar at 14 n.mile, and sighted visually at 13 n.mile. Again the ship's course was altered towards it; this one looked larger than the previous two. The iceberg was passed at 1.6 n.mile, and was a blueish-white colour. Sextant angles were taken and it was calculated that this berg was 104 m long and 23 m high, see



(c)

sketch (c). At this time the air temperature was 20.6, wet bulb 19.1, sea 19.0, and the wind was NW'ly force 4. The sea was slight with a low/medium swell.

Position of ship at 1200 GMT: 44° 24'S, 51° 18'W.

Position of ship at 1800 GMT: 42° 42'S, 50° 06'W.

CETACEA

Southern Indian Ocean

m.v. *New Zealand Pacific*. Captain R.A. Date. Rotterdam to Melbourne. Observers: the Master, Mr G.C. Grey, 2nd Officer, Mr M. Brown, A.B. and Mr R. Ogle, Supernumerary.

31 January 1988. At about 0630 GMT a school of approximately 20–30 porpoises/dolphins was sighted off the port bow, heading away from the vessel in roughly a north-easterly direction. Shortly after sighting them, they changed course and closed in on the port side of the ship, running parallel to it for a few minutes before once again heading off towards the north-east.

They were immediately noticeable for their very distinctive colouring of black with white undersides, with a sharp delineation between the two colours, some having white on the trailing upper edges of their flippers. One individual was totally black, and the school included several calves. Reference to *Whales and Dolphins of Australia and New Zealand* by Alan. N. Baker, led the observers to identify them as Spectacled Porpoises, an apparently rare species.

According to the book, Spectacled Porpoises are confined to the South America/Falkland Islands region, and (possibly) Kerguelen and the Auckland Islands. It may be of interest to note that the ship's position was about 1,200 n.mile east of Kerguelen Island and 1,000 n.mile south-south-west of Cape Leeuwin (Western Australia) at the time of this observation.

The sea temperature was 9.7°C, the weather was overcast with fog patches and the sea condition was calm with low, west-south-westerly and northerly swells.

Position of ship: 46° 41'S, 99° 30'E.

Note 1. Mr D.A. McBrearty, of the Dolphin Survey Project, comments:

'This is a very interesting observation in many ways. It is, as the observers say, an animal about which relatively little is known. Until the mid-1970's fewer than a dozen specimens had been reported. Since then much has been done, mainly by Natalie Goodall, an American living in Tierra del Fuego, who found most of the material. There is one sighting record from Kerguelen and another skull and sightings from the Auckland Islands, but I can find no record of a sighting of this porpoise so far from shore. All other *Phocoena* are regarded as being inshore animals.

'The Spectacled Porpoise (*Phocoena dioptrica*) reaches a maximum length of about 2 m which makes it the largest member of the genus. It has a smallish head, robust body contour and the triangular dorsal fin so typical of *Phocoena*. There are other cetaceans in the Southern Ocean which have a dramatic black-and-white colouring, but this porpoise is so distinctive that it should not be mistaken for any other. Notwithstanding that the observers did have a guide book to aid identification, I do feel that this was an occasion that cried out for a photograph and that the observers missed a great opportunity when they were in very fortunate circumstances.'

Note 2. The *New Zealand Pacific* is a New Zealand Selected Ship.

Savu Sea

R.R.S. *Charles Darwin*. Captain P.H.P. Maw. Tandjung Priok to Darwin. Observers: Mr A.R. Louch, 2nd Officer and members of ship's company.

15 February 1988. At 0430 GMT four large whales were seen, and the vessel closed to within 200 m of them before they sounded. Initially, they were heading south-west at about 3–4 knots, but sounded off the port bow. When obscured on the port quarter, they made off at 6–7 knots to the north-east. Could this have

been because a seismic reflection profile was being carried out using an airgun and a GLORIA unit? (the acronym stands for Geophysical Long-Range Inclined Asdic, the operating frequency of which was 6.0 kHz).

The most noticeable feature of the whales was their colouring, mainly grey/black with a lighter criss-cross pattern across the back behind the dorsal fin. This fin was fairly indistinct; similar to that of a Sperm Whale, it was a more knobbly fin than the pronounced curve of, for example, the Sei or Minke Whale. The blow-hole was seen to be towards the left side of the head, but not on the centre line, and on top of an obvious bulge. The whales' length was 'guestimated' to be about 10 m. On sounding, they did not throw up their flukes. It was considered that they might have been Humpback Whales.

Conditions at the time were: dry bulb 28.4°C, sea 29.9. The sea state was rippled, with a low, south-westerly swell.

Position of ship at 0600 GMT: 09° 54'S, 122° 48'E.

BIRDS

North Atlantic Ocean

m.v. Farland. Captain R.J.A. Copeland. Newport News to Redcar. Observers: the Master, Mr I.C. Gravatt, Chief Officer, Mr D.J. Vickery, 2nd Officer and Mr R.J. Inge, 3rd Officer.

18 February 1988. At about 1155 GMT the Chief Officer discovered a bird on deck, covered in oil and trying to fly but unable to. It was brought up to the bridge where he identified it as a Guillemot.

The bird was really in a messy state with oil covering it from head to toe, so the Third Officer made up a very, very mild solution of detergent, and slowly, methodically and patiently cleaned the bird which was clearly frightened by all the fuss being given to it. After 20 minutes or so, it was starting to look more like a bird again, so it was rinsed thoroughly in fresh water before being put in a box with a plate of sardines and some water. Sardines were given so that the bird would get oil back into itself to secrete onto its feathers, thus enabling it to go into the water. It was also given a bowl of bread soaked in water, but alas, it would not eat or drink anything offered. After it had rested in the box for a few hours, it started to get agitated when the crew used paint-scaling equipment which made a lot of noise. Eventually, at about 2000, the Mate took the bird to the bridge wing, and after a few minutes of hesitation it flew away and landed in the water. Hopefully it was alright and survived the North Atlantic.

Position of ship: 45° 56'N, 33° 00'W.

Note. Captain P.W.G. Chilman, of the Royal Naval Birdwatching Society, comments:

'You seem to have done the best with your oiled bird, they are very difficult to deal with. It is to be hoped that it recovered'.

Bass Strait

m.v. Gas Enterprise. Captain R. Friar. Port Bonython to Chiba. Observers: the Master, Mr A.M. Smith, 2nd Officer and ship's company.

13 January 1988. Whilst transitting the Bass Strait, south of Rodondo Island during the afternoon 12 noon to 4 p.m. watch a pigeon was observed strutting about the wheel-house. The bird was believed to be at least two years old, of

Australian ownership (determined from leg markings) and of the racing variety. On initial observation it was concluded that the bird was tired and had alighted on the ship for a rest, though why this was so could not be determined as land was barely 2 n.mile away. Weather at the time was fine with light, variable winds and light cloud.

The bird was obviously used to human contact as it was easily approached to within a few metres, but it would retreat to the bridge wing on foot if approached closer. However, the bird was reluctant to retreat further, settling for a suitably shaded spot on the starboard bridge wing. It was decided that due to its typical 'pigeon habits' it should remain outside and so was not allowed to re-enter the wheel-house. The observers' immediate reaction was to offer food and water to the bird, but the initial offering of pieces of bread were refused; it was later offered bean-sprout seeds and dried peas of which the latter it consumed with relish and in vast quantities during its time on board. All other food, e.g. rice grains was refused so it was fed daily quantities of dried peas with water.

During the next few days while the ship was relatively close to the east Australian coast, it was assumed the bird would depart for the mainland, but it was reluctant to do so. Instead, it settled into a routine of a restful life on the starboard bridge wing with the occasional daytime flight to settle on No. 4 tank gas mast-riser. Prior to sunset it would always return to the bridge wing to settle for the night on a small wooden stool or on the cable trunking, see photograph opposite page 8. It was noted that during the hours of darkness the bird was far more approachable and could in fact be touched and even picked up in the approved manner. This was believed to be due to the bird possibly being mesmerised by the lighted torch, as any approach during daylight caused a short retreat.

During the vessel's transit of the Solomon Islands and the Caroline Islands the pigeon remained on board and it was believed the bird would in fact remain on board all the way to Japan. However, once clear of the Caroline Islands the bird was showing greater signs of activity with regular flying circuits of the ship accompanied by frequent preening. On the evening of 24 January the bird was observed resting on No. 4 tank gas mast-riser and was nowhere to be seen the following morning. It was hopefully assumed that it had flown in the direction of Pagan Island or Agrihan Island in the Marianas some 70 n.mile distant to the west, or perhaps even alighted on another ship. Though this ship had no literature on the subject of such birds, it was believed that the pigeon was capable of such an unrested flight especially as the wind was ENE'ly during that particular night and the bird would have received some assistance.

The reason for its departure was not entirely clear though one theory put forward was that the temperature at the time was similar, about 23°C, to the temperature during the ship's passage through the Bass Strait and possibly confused the pigeon into believing it was closer to its original home. It was hoped by all on board that it made the journey to one of the islands or alighted on another ship as it had become a familiar sight during its 4,000 n.mile trip and its 12/13 days on board.

Position of ship on 13 January: 39° 16'S, 146° 23'E.

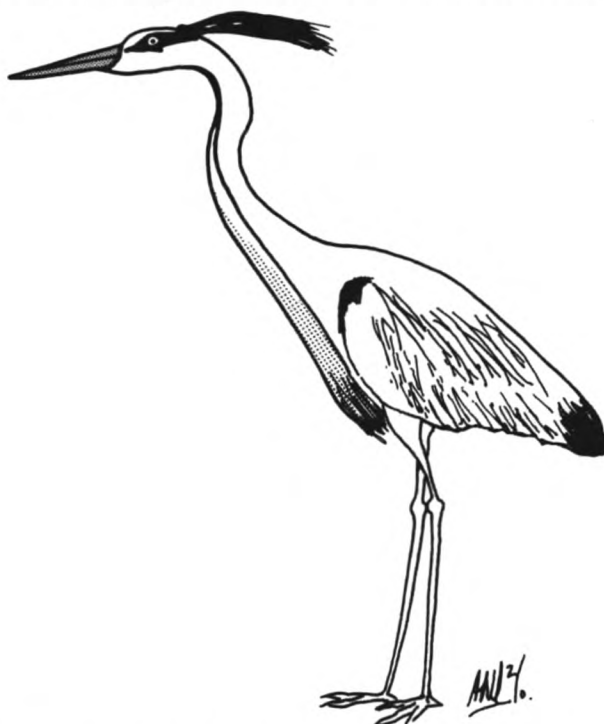
Note. Commander M.B. Casement, Chairman of the Naval Birdwatching Society, comments:

'The bird seems to have been in good health, and pigeons are capable of flying many hundreds of miles unaided. This one was clearly lazy and too fond of its food to resist generous hospitality.'

Western Pacific

m.v. *Liverpool Bay*. Captain R. Dinnie. Tokyo to Jeddah. Observers: the Master, Mr K.S. Hardy, 1st Officer and Mr A.M. Leech, 2nd Officer.

7 March 1988. At 0000 GMT a heron, shown in the sketch, alighted on board. It positioned itself on a third-level stack of containers situated some 152 m from the bridge, and the following details were noted (with possible inaccuracies



owing to the extreme distance). Standing approximately 0.5 m tall, it had a long, thin orange beak about 15 cm long; there was a jet black band around the eye and side of the head, and a tuft or crest of black feathers about 20 cm long extending back from the top of the head; the remainder of the head and also the breast was a whitish-grey colour, whilst the neck was long, thin and grey; the outer appearance of the wings was greyish-green with prominent black stripes, and the undersides were mainly white with approximately one-third at each tip being black. The tail feathers were also black and the bird's legs were possibly grey in colour.

Shortly after alighting, the heron flew off in a north-westerly direction towards the nearest land which was the Sakishima group of islands some 50 n.mile away. It returned at 0020 and settled in exactly the same position as before, remaining there. At 0100 the bird flew off again, initially in an easterly direction, then it returned and circled the vessel for about 30 minutes. It then alighted once again in the same position. The heron remained on board until approximately 0240 when it was noted to have disappeared.

Position of ship: 23° 30'N, 124° 40'E.

Note. Commander M.B. Casement comments:

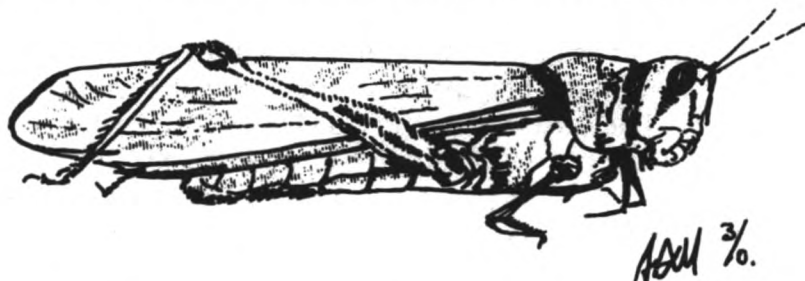
'This is a Grey Heron (*Ardea cinerea*). It is the same species as is found in the U.K., and is distributed widely throughout Europe, Africa and Asia. It is a well-known hitch hiker aboard ships off west Africa, in the Mediterranean Sea and Indian Ocean.'

LOCUSTS

Eastern North Atlantic

m.v. *ACT 8*. Captain R.M. Herring. Rotterdam to Adelaide. Observers: the Master, Mr J.J. Millar, 1st Officer, Mr D.G. Galbraith, 2nd Officer, Mr A.D. MacPherson, 3rd Officer and ship's company.

25 March 1988. At about 1000 GMT, large numbers of locusts, a single one of which is shown in the sketch, began to arrive on board the vessel. They appeared to be arriving in groups, and were of assorted colours ranging from yellow through grey to pink, with the latter being the most predominant colour.



The locusts stayed throughout most of the day, with the majority of them leaving around dusk. There were, however, several which remained on board for the journey to Adelaide; one of them, now preserved for posterity in formalin, survived for two weeks in the periscope from the compass binnacle.

Position of ship: 20° 00' N, 17° 48' W.

INSECTS

Caribbean Sea

m.v. *Horncliff*. Captain W.J.G. Jones. Fort de France to Moin, Costa Rica. Observers: Mr C.W. Watson, 3rd Officer and Mr R.J. Evans, Radio Officer.

30 March 1988. At 1500 GMT whilst drifting 140 n.mile south-west of Martinique, a small flying beetle, see sketch, was found on board. Being 15 mm



long and 7 mm wide, it had a yellow head, whereas its back was light grey mixed with a light coffee colour, with four black spots on the head area and four more on the wing cases. Underneath the wings, the beetle was a mustard colour. The underside of the body was coloured a dirty white, with two black spots just aft of the hind legs.

When captured, the insect squirted a strong, clear almond-smelling liquid.

Position of ship at 1200 GMT: 14° 00' N, 63° 00' W.

BIOLUMINESCENCE

Southern Ocean

m.v. *Mairangi Bay*. Captain J. Cosker. Rotterdam to Melbourne. Observers: Mr J.P. Meade, 3rd Officer and Mr D. MacLennan, Seaman.

17 February 1988. At 1240 GMT groups of bright-green luminescent sea creatures were seen coming along the side of the ship. The Aldis lamp was shone on them, and it could be clearly seen that they were squid, white in colour and about 30 cm long. A minute or two later, many small, very bright-orange coloured lights were seen in the water, and when the Aldis was directed towards a group of these orange flashes, it could be seen that they were shoals of small fish.

When the Aldis was directed on the squid, the luminescence would fade, but when directed onto the fish the brightness of luminescence increased to a spot of brilliant, orange light. The observers watched closely for 10 minutes and saw the occasional squid in among a shoal of fish (possibly feeding?). A Wandering Albatross which had been with the vessel for a couple of days seemed quite interested in the whole affair and would occasionally cross the beam of the Aldis lamp.

Weather conditions were: air temperature 14.0°C, wet bulb 12.4, sea 16.1, pressure 1025.8 mb, wind variable, force 2.

Position of ship: 40° 38'S, 122° 30'E.

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

'There are many species of luminous squid, but few which have been observed to luminesce spontaneously as in this report. Some of the squid caught commercially, particularly by the Japanese, are among the luminous species, and it may have been one of these (belonging to the family *Ommastrephidae*) which was involved. The orange spots were reflections from the eyes of the fish (probably Lanternfish) which have a brightly reflective layer, like those of a cat. The squid feed on these fish and would indeed have been hunting them at the time.'

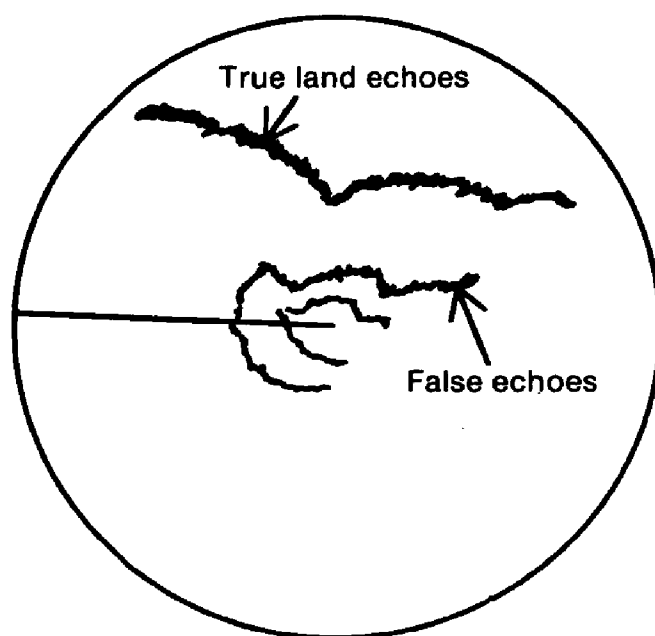
ABNORMAL REFRACTION

Southern Ocean

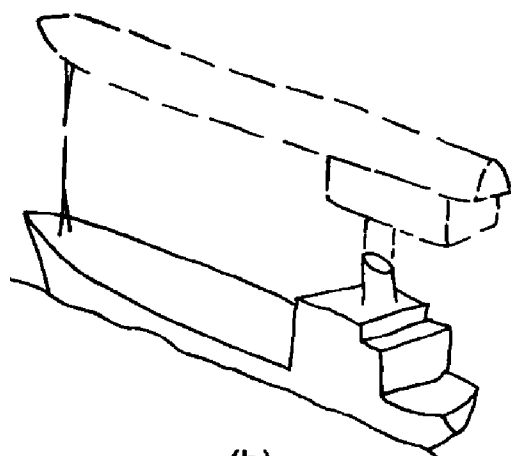
m.v. *Mairangi Bay*. Captain J. Cosker. Melbourne to Zeebrugge. Observers: the Master, Mr A.J. Wortley, 2nd Officer and Mrs J. Cosker.

16 March 1988. At about 0600 GMT whilst the ship was 16 n.mile from land, light haze appeared all around the horizon, although land and ships were visible at over 19 n.mile. It became difficult to determine whether the land observed was real or a reflected/refracted image a degree or so above the horizon. The ship's funnel smoke was noted to lie astern at a height of approximately 130 feet, right to the horizon.

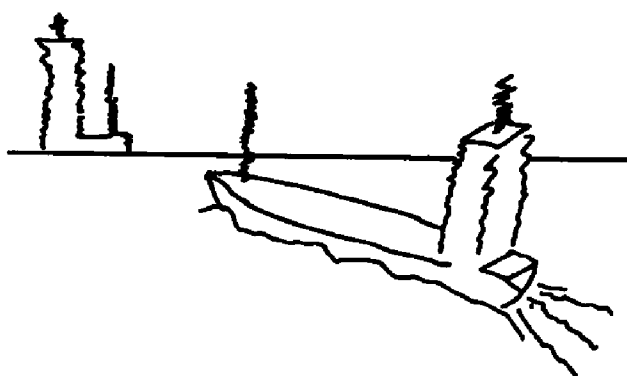
The radars, both 10- and 3-cm sets, showed pronounced false echoes at ranges of 5 n.mile and 3 n.mile from the centre, bearing a slight resemblance to the characteristics of the nearby coastline, see sketch (a). A ship at a distance of 15 n.mile had above it an interesting inverted image of itself, sketch (b), which lasted for about an hour. Several hours later, when it was 13 n.mile away, the



(a)



(b)



(c)

refraction appearance was as in sketch (c), with two ships visible. Both had normal hulls, but their superstructures, masts and funnels were stretched out.

Weather conditions at the time were: air temperature 23.2°C, wet bulb 19.9, pressure 1019 mb, wind NE'y, force 4.

Position of ship: 35° 20'S, 117° 00'E.

AURORA AUSTRALIS

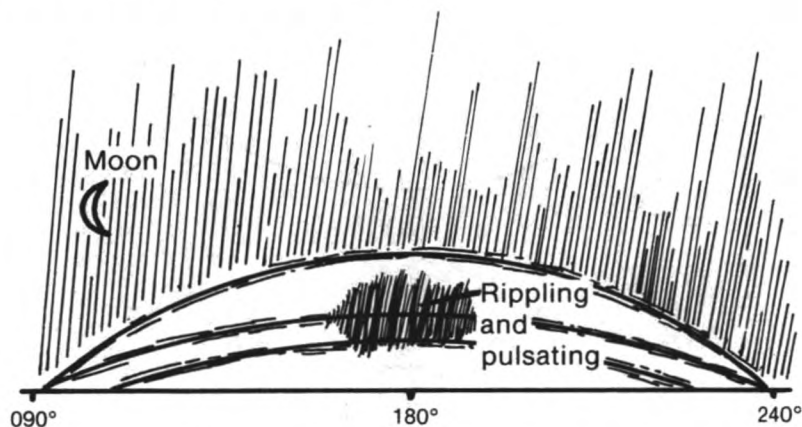
Southern Ocean

s.s. *ACT 2*. Captain M. Thwaite. Rotterdam to Melbourne. Observers: the Master, Mr J. Dibben, 2nd Officer and ship's company.

12/13 January 1988. At 1800 GMT a sector of white light could be seen in the southern sky, stretching from 090°–240°, and up to approximately 30° altitude

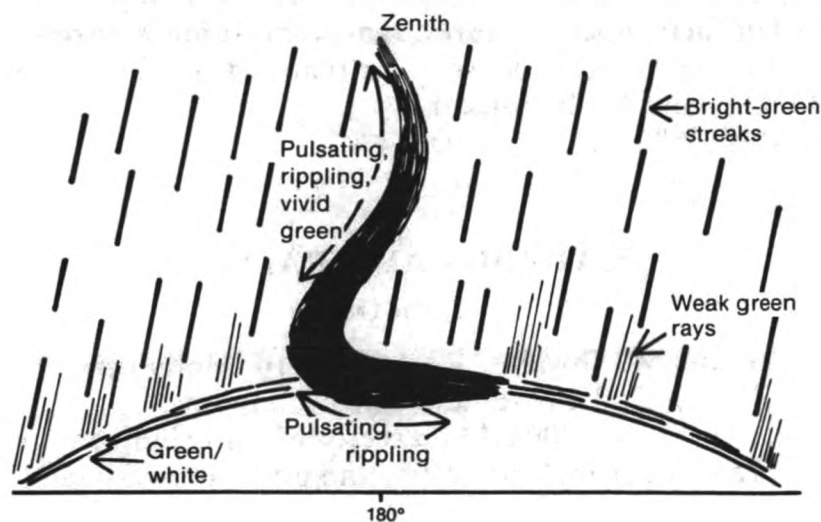
due south. This remained until 2030 when it suddenly broke into three distinct bands at altitudes of about 10° , 20° and 30° . Shortly afterwards rays began to form, radiating first from the upper band, then from the middle one, and finally from all three. They grew in number and intensity during the next 20 minutes, with some reaching to the zenith, and their main colours were white through to pale green.

At 2100 the middle band developed a bright-green patch bearing 180° . This developed further in depth and width, then began to ripple and pulsate. Suddenly, the colour became an intense green and then changed through orange to red to purple before dying away. Its duration was perhaps 90 seconds. The first sketch shows the effect seen at this point.



The display then faded away to white/green rays radiating from the middle band, the others having disappeared. At this stage it was noticed that almost the entire sky was covered with flickering rays of white light, almost like very high, fine cirrus, but constantly changing in appearance. This effect stretched almost to the northern horizon.

At 2115 rays again began to develop, turning to green and brightening also lengthening to the zenith; these quickly turned to green streaks. A swirl developed in the south and also stretched to the zenith, brightening all the time to a vivid green. This persisted for perhaps four or five minutes before suddenly changing colour and starting to pulsate and ripple along its length. It turned colour through orange/red to purple before dying away after about a minute; the appearance of the swirl is shown in the second sketch. The bright green streaks



were evident throughout, and covered the entire southern half of the sky, reaching right to the zenith.

The display to the south began to fade as the sky started to lighten, the rays in the south-west finally disappearing at about 2135. Wispy, white waves which were overhead and to the north remained as the light increased, until eventually fading in the north-west at 2150. These waves were difficult to describe, but their movement resembled sand being blown across a beach.

Position of ship: 50°00'S, 87°18'E.

SATELLITE RE-ENTRY

Eastern Pacific

m.v. *Moraybank*. Captain D.L. Jones. Balboa to Papeete. Observers: Mr S.J. Cole, 3rd Officer and Mr M. Roy, Quartermaster.

30 March 1988. At 2320 GMT an object was first sighted in the neighbourhood of Sirius (bearing 252°). It was initially thought to be a plane as it disappeared behind a large cumulus cloud, but when it reappeared, its nature was more clearly seen. The object consisted of six separate parts, each with a trail of a gold/green mixture which sparkled. These trails persisted for only a few seconds. Five of the objects were of approximately the same brightness as Rigel Kent (magnitude 0.1), but the sixth one, which was slightly behind the others, was brighter, being of roughly the same magnitude as Canopus (−0.9).

The path of the objects appeared shallow, 30° from the horizontal as seen from the ship, and disappeared around Sabik, bearing 105°. The duration of the event was 15 seconds; as this was quite a long time, it was assumed that the objects were part of a satellite re-entering the atmosphere and breaking up on doing so.

Position of ship: 06°37'S, 118°02'W.

Note. Mr H. Miles, Director of the Artificial Satellite Section, British Astronomical Association, comments:

'From the description given, the phenomena seen were without doubt associated with the decay of satellite debris, although the time of 15 seconds is felt to be rather short for such a long path across the sky, even if the objects did keep approximately 30° in altitude from the horizon. It has not been possible to identify the source of the debris.'

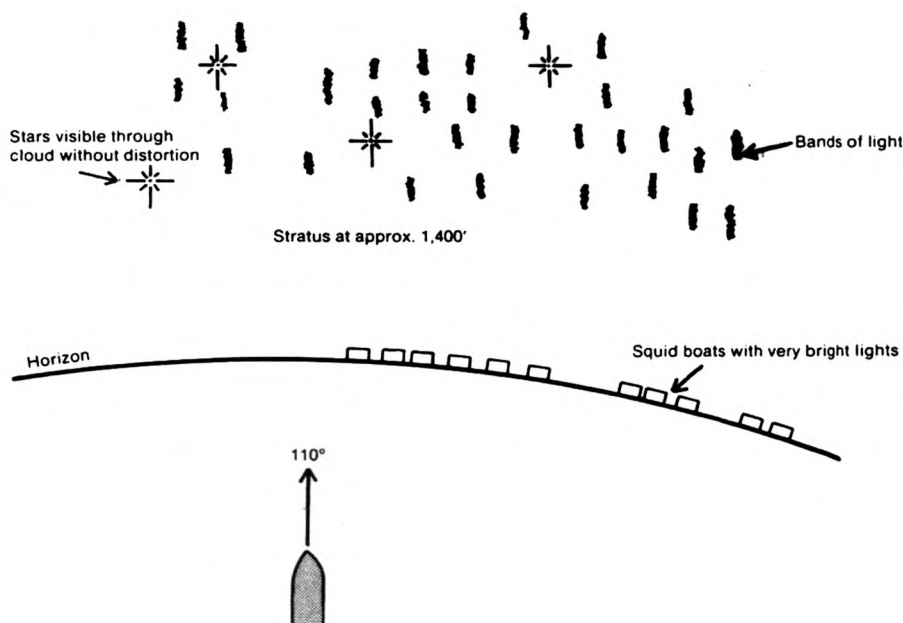
SHIPPING LIGHTS

Tasman Sea

s.s. *ACT I*. Captain J. Rowe. Botany Bay to Wellington. Observers: Mr A. Hillier, 2nd Officer and Mr W. McNicholl, SM1A.

27 January 1988. At 1221 GMT whilst approaching Cook Strait, New Zealand, approximately 30 strange lights were observed in the sky ahead of the vessel. They appeared to be small, vertical bands of diffuse light, as indicated in

the sketch. It was thought unlikely that the diffusion was caused by light passing through the cloud (stratus at about 1,400 feet) as stars were clearly identifiable with no distortion.



The observers concluded that the phenomenon must have been due to reflection of the very bright lights used by squid boats which were seen some 30 n.mile ahead of the vessel. The unusual thing about the sighting was the way individual bands of light were noticed instead of a general reflection *en masse*.

The phenomenon was maintained for about five minutes until the cloud dispersed. All the bands of light were of approximately equal lengths, and all lay parallel to each other as shown. Temperatures at the time were: air 20.1 °C, wet bulb 18.2.

Position of ship: 40°07'S, 172°14'E.

Note. Mr H. Miles, comments:

'The interesting letter from Captain Tully of the *Falklands Desire* [Letters to the Editor, this issue] describing the reflections from a large fleet of jiggers he saw on 4 May 1988 has very strong similarities with the above report. The meteorological conditions were obviously not the same, and so the observed phenomena would not be identical.'

UNIDENTIFIED LIGHT

Western South Pacific

m.v. *Remuera Bay*. Captain A.A. Railton. Lyttelton to Zeebrugge. Observers: Mr D.C. Collins-Williams and Mr C. Huson, SM1.

16 January 1988. At 1020 GMT whilst the ship was on a course of 102° at a speed of 19.5 knots the Third Officer was looking to starboard when the following phenomenon occurred. A bright beam of light caught his eye, and there



Captain J.O. Spence (left) receives his inscribed barograph from Captain G.V. Mackie, Marine Superintendent, at Bracknell on 14 September 1988. (See page 38).

CLOUD PHOTOGRAPH: ANALYSIS OF CLOUDS PRESENT (See page 49.)



1
3
3
4
5

2
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5

4
5
1
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4

1,2 — Cumulonimbus cells, without anvils (CL₃). 3,4 — Stratocumulus (CL₄) and cumulus fractus (CL₇), both associated with cumulonimbus.
5 — precipitation from both cells. These clouds were observed from m.v. *Graiglas* on 21 February 1988 in the Strait of Malacca.

in the sky was a source of extremely intense white light. It had the appearance of a planet about twice the size of Jupiter, and it grew larger to about four times that size before disappearing.

All of this happened in a split second; the watchkeeper, who was looking forward at the time, said he saw the main deck 'light up as if there had been a flash of lightning, only the light was a more bluish-white'. First impressions of the observation were that a star had 'exploded'. There were no trails of light, or any other phenomena in the vicinity of the occurrence, just the isolated bright white light enlarging and then vanishing.

The object bore 170° with an elevation of approximately 10° . The nearest star at the time with any reasonable magnitude was Rigil Kent, bearing 150° , elevation about 27° . After discussing the observation with the Master and fellow officers, the only explanation thought of was that an object had fallen back to Earth and had burnt up on entering the atmosphere, although the amount of light produced was phenomenal.

Weather conditions were: air temperature 10.2°C , wet bulb 8.3, pressure 983.6 mb. There were 3 oktas of cloud consisting of cumulus, with occasional passing rain showers, but still good visibility, and there was a following wind of force 5. The moon was not visible, and the sky was extremely clear, giving the stars a crisp, well-defined appearance.

Position of ship: $49^\circ 01'S$, $164^\circ 26'W$.

Note. Mr H. Miles comments:

'This was a line of sight observation of a fireball. By that, I mean that the object was travelling in the atmosphere in a direction which was in line approximately with the ship. It is fairly certain that the object burned up in the atmosphere, otherwise phenomena such as a sonic boom would have been recorded.'

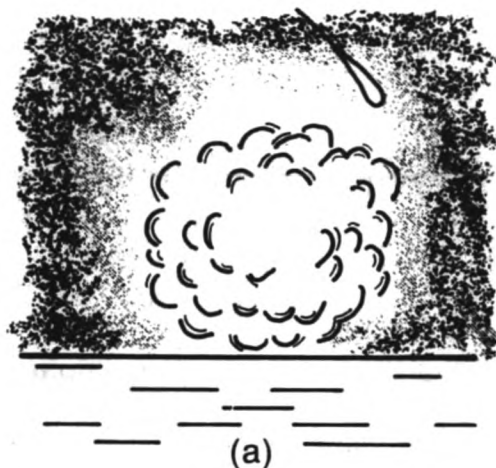
South Atlantic Ocean

m.v. *Falklands Desire*. Captain J.E. Jones. On patrol within 150 n.mile of the Falkland Islands. Observers: Mr F.F. Kuhn, 2nd Officer and Mr D.Hannah, A.B.

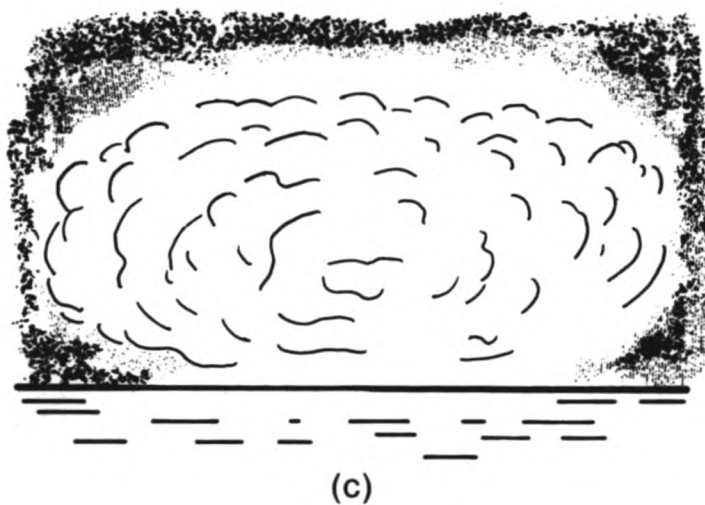
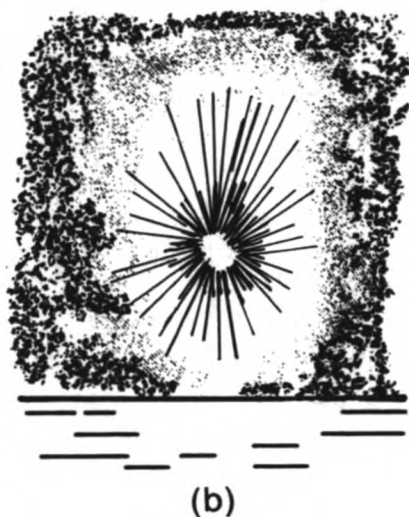
20 March 1988. Between 0517 GMT and 0550 GMT several flashes of light were noticed in the distant night sky. Each would occur singly for a split second, the closest time interval between flashes was about 60 seconds. The focal point of the flashes was in the same place, bearing 040° azimuth from the observers, and generally about 5° above the horizon, actually occurring between 2° and 8° altitude, and between 2° and 4° horizontal angle. There was no accompanying noise.

Mostly, their colour was a dull white/green, and apart from the first one, they were timed by the Satnav clock as follows:

No.	GMT	Remarks
1	0517	Dull, white flash.
2	05:17:30	Brighter, greenish flash, preceded by falling star trail. See sketch (a).
3	05:23:15	Duller flash.
4	05:24:15	Dull flash.
5	05:25:20	Flash.



- | | | |
|---|----------|-------------------------------------------------------------------------------------|
| 6 | 05:27:29 | Brightish green flash, more beamed and radiated. See sketch (b). |
| 7 | 05:32:30 | Dull flash. |
| 8 | 05:36:27 | Very bright green/white flash covering about 40° horizontal arc, 10°–15° elevation. |
| 9 | 05:49:51 | Even brighter flash covering the same area as No. 8. See sketch (c). |



Considering that there were no ships in that direction, and the unusual nature of the flashes, they appeared more mysterious. Military exercises were ruled out owing to the position, lack of shipping and noise, and the fact that the flashes originated from a focal point above the horizon.

Position of ship: 49° 18'S, 60° 23'W.

Note. Mr H. Miles comments:

'My first reaction was that the flashes would have been due to a reflection from high cloud of more distant lightning. This would certainly account for the fact that the source of the flashes appeared to be above the horizon and that there was no noise. Unfortunately, no meteorological conditions were given. However, I am rather reluctant to offer this as an explanation because I am sure the observers are fully experienced and would quickly recognise the source of the flashes as lightning. Nevertheless, freakish meteorological conditions may have produced unusual conditions which gave rise to an abnormal appearance to a more distant storm.'

'Bearing in mind the position of the vessel and the direction in which the flashes were seen, I cannot put forward any other explanation.'

Forecasting the tracks of tropical cyclones with the U.K. operational global model

By R.M. MORRIS AND C.D. HALL
(Meteorological Office, Bracknell)

Introduction

The forecasting of tropical cyclones is a particularly difficult problem. Meteorological processes on a wide variety of scales are important; the intensity of convection has a strong influence on the extreme conditions in the inner core region, while the structure of the large-scale flow in the tropics and its interaction with troughs in middle latitudes determine the often erratic movement of the whole system. In addition, tropical cyclones almost always occur in areas of poor data coverage where systematic errors in the analysis of the large-scale flow may be much larger than in middle latitudes. Global models in use today have not yet reached the stage of being able to tackle the short-range forecasting problem where position errors of some tens of kilometres over a period of 24 hours or less are important. However, they have sufficient resolution to represent the general structure of many mature systems and successful medium-range forecasts of their tracks have been obtained.

The Meteorological Office global operational model (described in Bell and Dickinson, 1987) has a horizontal resolution of around 200 km near the equator and analyses are routinely monitored by a team of forecasters in the Central Forecasting Office (CFO) at Bracknell. The CFO is a world area forecast centre (WAFC) and a regional area forecast centre (RAFC) under ICAO and also a RMC for Region VI of WMO. The analysis is carried out every 6 hours and the human role consists largely of two functions; the model's quality control of raw and processed data needs to be monitored carefully to ensure that good data are not rejected and that bad data are rejected. This often calls for a good deal of skill on the part of the forecasters. Satellite imagery offers the forecasters most scope to intervene in the model analysis especially in the middle and lower troposphere because temperature retrievals (SATEMS) are least accurate in areas of dense cloud. Although there is no unique relationship between cloud structure, as perceived by satellite imagery, and the middle tropospheric temperature and wind structure, there is a good deal that can be done to ensure consistency in the shape and pattern of the flow. Centres of low pressure can be identified fairly accurately too, and in particular, tropical cyclones can usually be pinpointed from the imagery.

Conversely there is less concern about the model analysis of the upper troposphere in cloudy areas within the tropics since the geostationary meteorological satellites are able to observe the cloud movements and thus fairly accurate wind vectors can be calculated for specific levels.

The above considerations influence the analysis strategy adopted in the CFO at Bracknell. There is a facility to introduce data generated by the human analyst (bogus data) when the model analysis is considered to be in error. The strategy for tropical cyclone analysis has four basic features:

- (a) The aim is to correct the position of the circulation centre or to create a circulation where none was present in the numerical analysis.
- (b) The aim is limited in that no attempt is made to model the detailed horizontal structure of tropical cyclones. However, the vertical structure is made consistent with the presence of a warm core.
- (c) The method is to insert bogus winds only with four positions located around the centre at each level. Usually the wind speeds will be symmetric about the centre but may be made slightly stronger in the direction of movement of the tropical cyclone if the speed of movement is significant. The bogus data are confined to the 850–500 mb layer.
- (d) The assumption is made that there is no phase displacement between the wind and temperature fields below 500 mb in a tropical cyclone and this implies that motion of the tropical cyclone is probably controlled largely by vorticity advection in the upper troposphere.

Figure 1 illustrates the analysis of typhoons Freda and Holly at 12 GMT 15 September 1987. The situation was unusual with two well-developed tropical

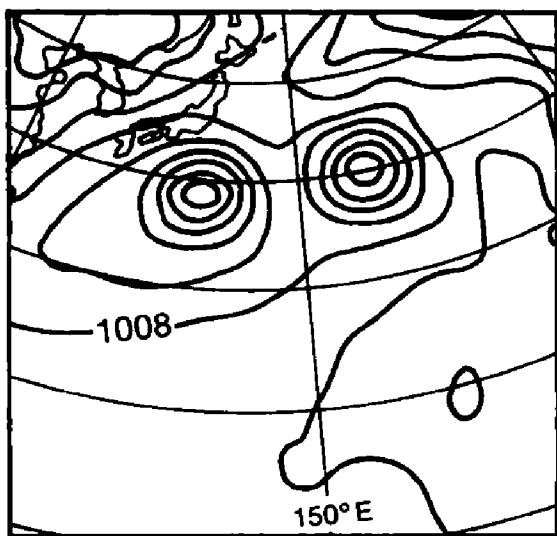


Figure 1(a). PMSL analysis North Pacific 12 GMT on 15 September 1987.

Figure 1(b). Surface wind analysis, same time as Figure 1(a).

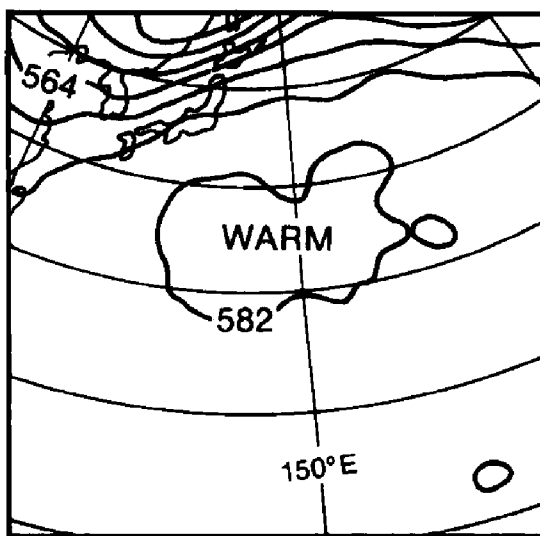
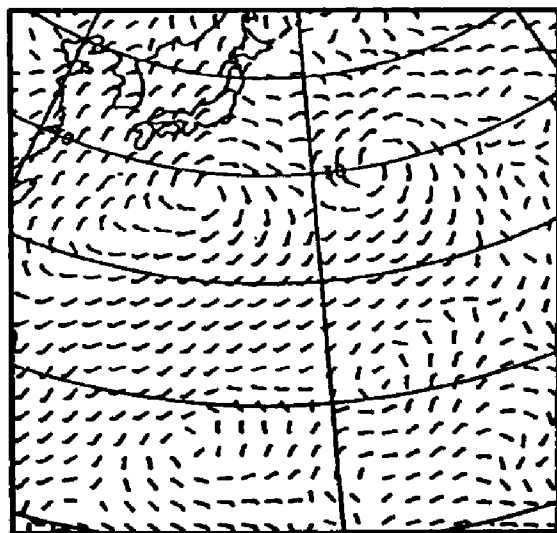
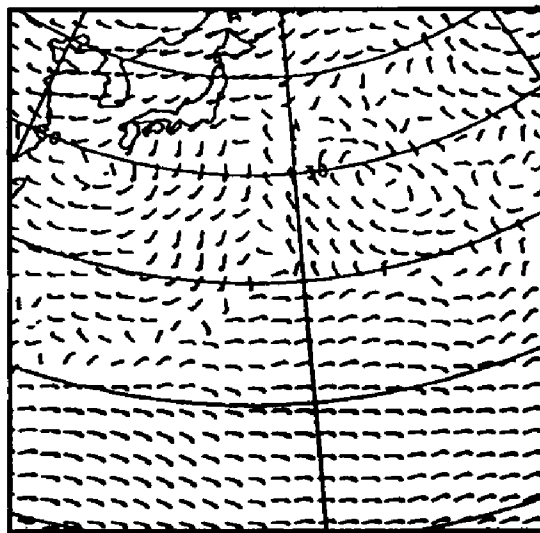


Figure 1(c). 1000–500 mb thickness, same time as Figure 1(a).

Figure 1(d). 250 mb wind analysis, same time as Figure 1(a).



cyclones in close proximity. It can be seen that both typhoons are warm-cored in the lower troposphere but there are different wind structures in the upper troposphere with a circulation above Holly and a more open wave type structure above Freda.

Verification of forecast tracks of tropical cyclones

In order to determine the overall accuracy of forecasts of tropical cyclones a verification programme was begun in 1986. The forecast positions were verified using the reports received regularly on the global telecommunication system from the major tropical forecasting centres. The reports give estimates of position and intensity at least every 6 hours based on satellite imagery and observations from regularly reporting stations as well as from additional sources such as reconnaissance flights. Verification was initially restricted to tropical cyclones in the North Atlantic and North Pacific Oceans for which the reported maximum wind speed was in excess of 50 knots. In this way weak systems which are often beyond the model's resolution were eliminated. The error in the position of the cyclone is estimated manually at a distance between the lowest pressure on the forecast mean-sea-level pressure chart and the reported position. Forecasts valid at T+24, T+48 and T+72 hours from 00 GMT analyses were verified in 1986 and this was extended to forecasts valid at T+96 and T+120 hours, in 1987.

The number of occasions when the reported maximum wind of tropical cyclones in the North Atlantic and North Pacific was in excess of 50 knots at 00 GMT was 169 in 1986 and 148 in 1987. The verification results are shown in Figure 2 together with the number of cases for each forecast period on which they are based. In general there seems to be useful skill in the forecast of cyclone position, especially at T+48 hours and beyond when forecasts based on persistence and climatology can lead to large errors (e.g. Ramage 1980). The

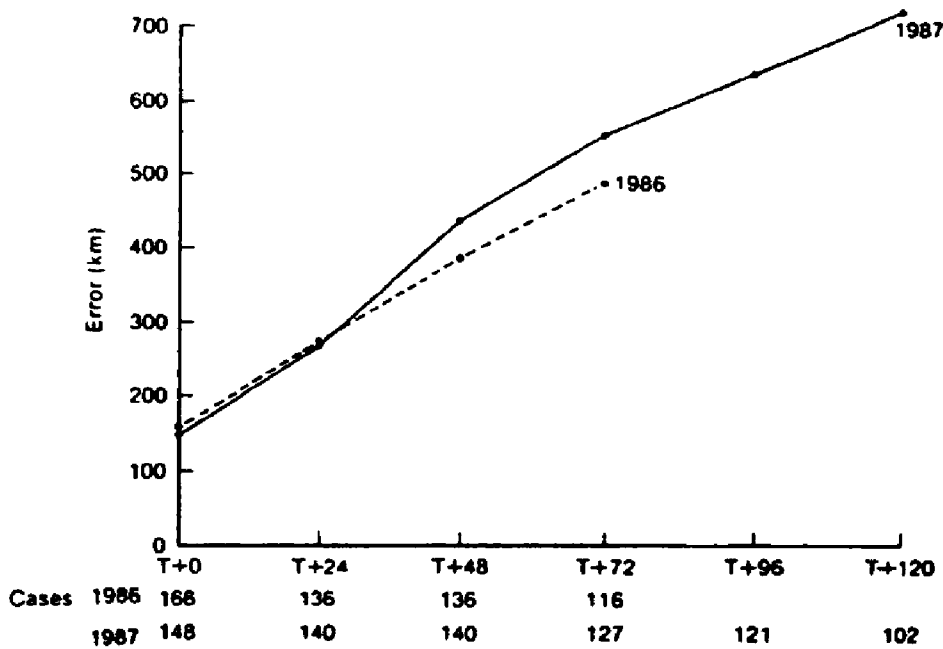


Figure 2. The mean position error of the analysed/forecast positions of tropical cyclones in the North Atlantic and North Pacific by the Meteorological Office operational global model in 1986 and 1987: 00 GMT runs only; reported winds \geq 50 knots.

tracks of some of these systems were particularly irregular and model guidance in these cases often has a great deal to offer. On several occasions it seems likely that poor analyses led to poor forecasts because even skilled forecasters cannot perform miracles for the analysis without satellite imagery and bulletins issued by regional centres in data sparse areas!

The 72-hour forecast tracks of most typhoons (reported winds exceeding 50 knots) for all 00 GMT operational runs of the model during the 1987 season are shown for each typhoon in Figure 3. [Lack of space prevents inclusion of every storm.] There appears to be no obvious bias in the model's track predictions. Some forecast tracks are too far to the right and some are too far to the left. There are some spectacular successes, however, especially during the acceleration phase when several of the storms were moving north or recurving.

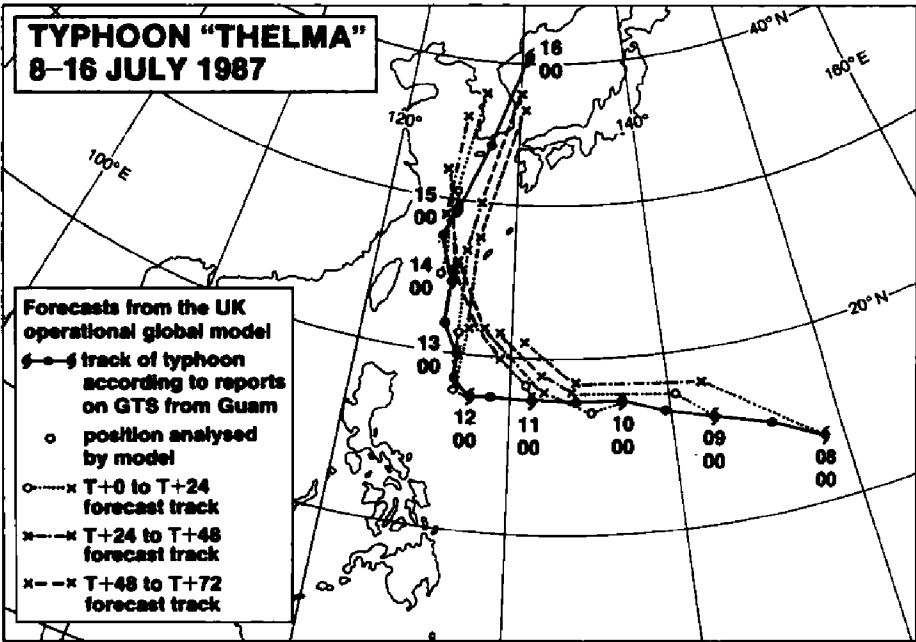
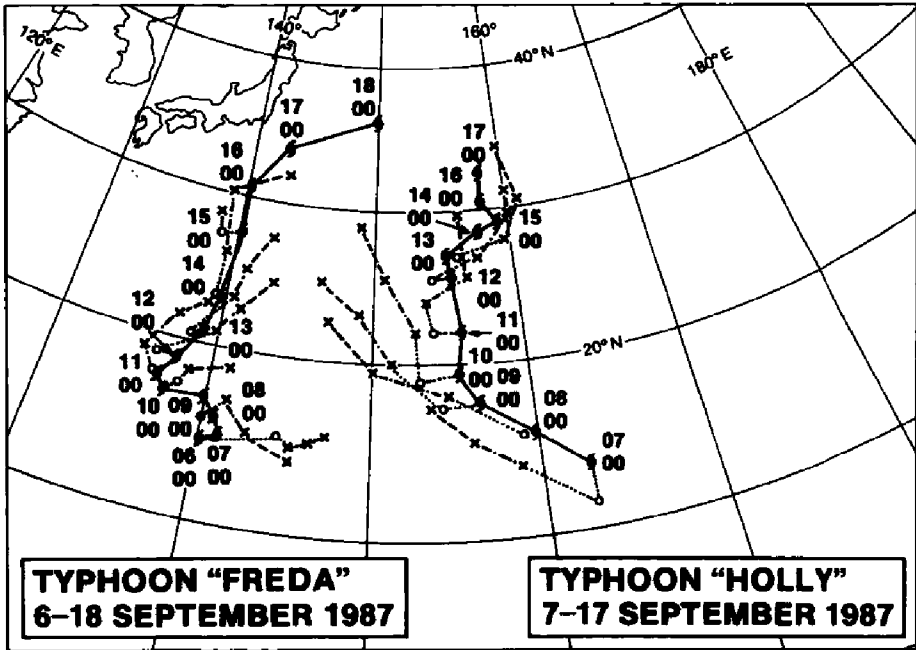


Figure 3(a).

Figure 3(b).



Many of the 120-hour forecasts correctly anticipated the development of a typhoon when none had been present at the starting time. An example is shown in Figure 4. At 00 GMT on 7 July 1987 there was a large area of low pressure centred near 12° N 150° E in the North-west Pacific (Figure 4a) though it was not until 03 GMT the following day that a tropical depression was first identified by the forecasting centre at Guam. During the next few days the system intensified to become typhoon Thelma and by 00 GMT 12 July (Figure 4b) maximum winds of 100 knots were estimated. Five-day forecasts of mean-sea-level pressure and surface winds valid at this time are shown in Figure 4c. The centre is about

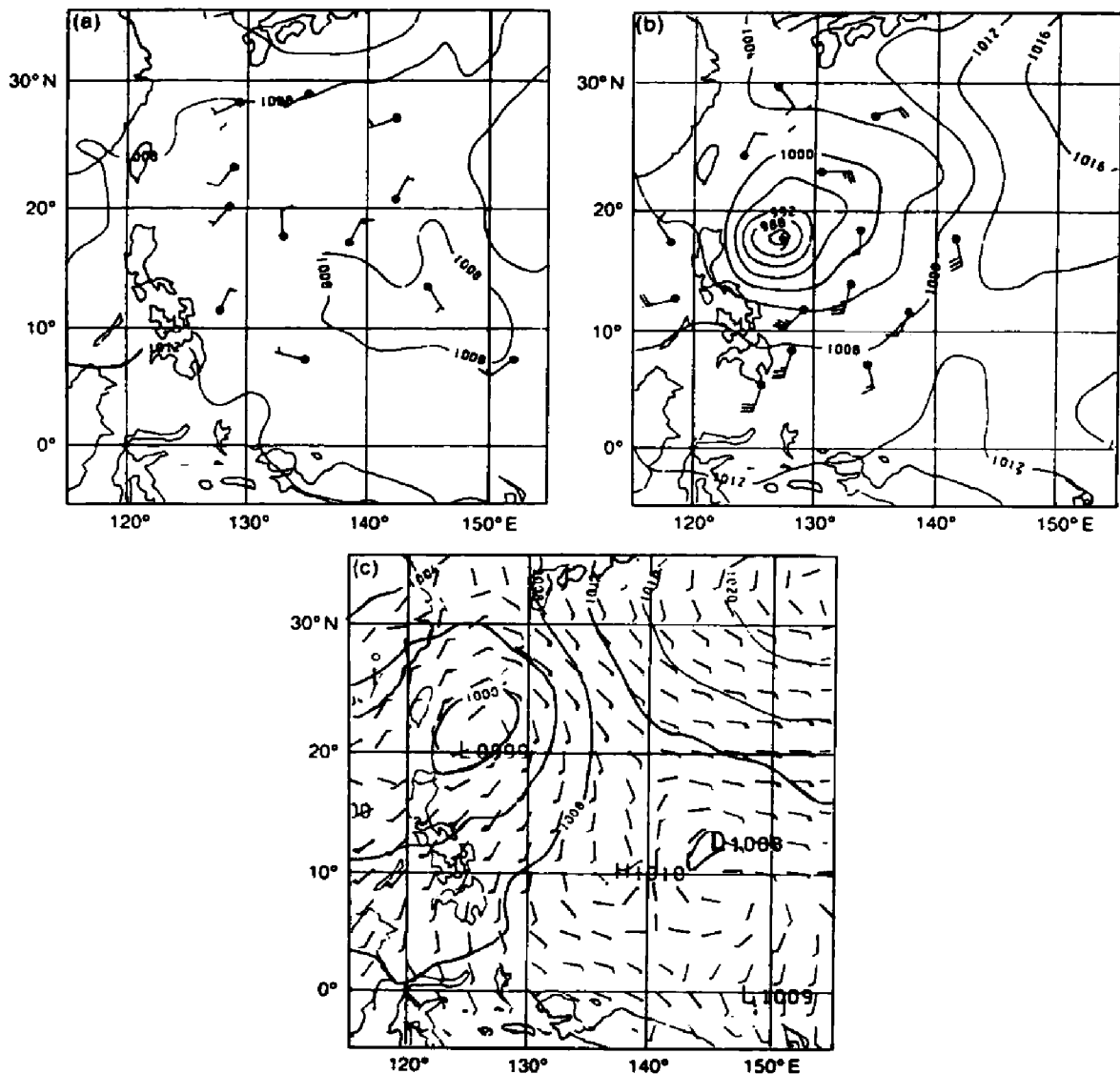



Figure 4(a). Model mean-sea-level pressure analysis and observed surface winds for 00 GMT on 7 July 1987. Figure 4(b) as (a), but for 00 GMT on 12 July 1987; the symbol  marks the reported centre of typhoon Thelma. Figure 4(c). The T+120 hours forecast mean-sea-level pressure and surface winds valid 00 GMT on 12 July 1987.

520 km to the north-west of the actual position and lacks the overall intensity of circulation, nevertheless, there is considerable forecasting skill at this time range considering no centre had been identified at the time of the initial analysis. The forecast tracks of typhoon Thelma from all 00 GMT operational runs of the model in the period 8–15 July are shown in Figure 3a. The recurving at 130° E and the eventual landfall over Korea are both well forecast.

The effect of bogus data — a case-study

At 12 GMT on 9 January 1987 an intensifying tropical cyclone was reported at 8°N 146°E and maximum winds of 40 knots were estimated. Very few data were available in the area either at 12 GMT or at previous hours, so the human analyst provided 12 bogus observations of mean-sea-level pressure and surface wind. In order to define a circulation in the lower troposphere bogus observations of wind were provided at three levels and at four locations around the reported centre (marked in Figure 5a). No attempt was made to specify the outflow at higher levels. The resulting analysis (Figure 5a) showed a plausible circulation in the wind field at 850 mb. In the absence of the bogus observations no circulation was evident (Figure 5b). By 12 GMT on 12 January the system had developed into

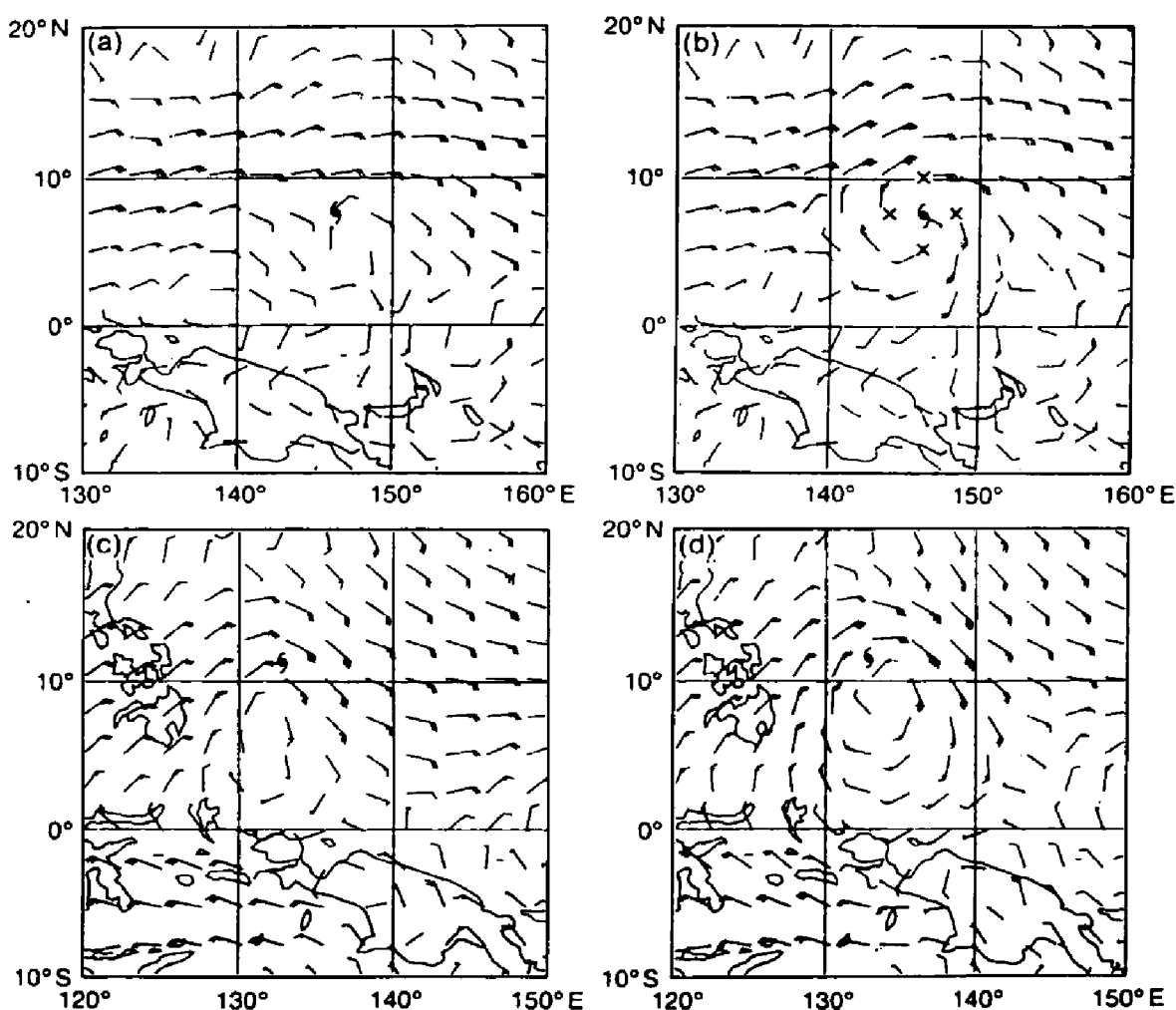



Figure 5(a). Model 850 mb wind analysis for 12 GMT on 9 January 1987; the symbol  marks the reported centre of typhoon Orchid. No bogus observations. Figure 5(b) as (a), but with bogus observations included (marked by crosses). Figure 5(c) as (a), but for T+72 hours forecast valid 12 GMT on 12 January 1987. Figure 5(d) as (b), but for T+72 hours forecast valid 12 GMT on 12 January 1987.

typhoon Orchid with reported position 11°N 133°E and maximum winds of 70 knots. T+72 hours forecasts from the two analyses are shown in Figures 5c and 5d, and it can be seen that the forecast circulation in the run which included the bogus observations is closer to the reported position of the typhoon.

Conclusions and prospects for the future

The Meteorological Office operational global model has shown considerable skill in predicting the movement of tropical cyclones in 1986 and 1987. Forecast errors are relatively large in the short time range compared with forecasts based solely on persistence and climatology but they grow slowly as the forecast period increases. The model appears most useful as a forecasting tool in the 2–5 day range. On some occasions there was a poor representation of the cyclone position in the model's initial state, largely as a result of the poor data coverage over the tropical oceans. Human analysts perform real-time monitoring of the quality of the model analyses and on many occasions have provided bogus observations to improve the representation of tropical cyclones. Case-studies show that the provision of such data can have a beneficial impact on forecasts.

Greater accuracy in the prediction of tropical cyclones by numerical methods will come through the introduction of higher-resolution models and better physical parametrization in the tropics; the Meteorological Office is planning to increase the resolution of its global model to twice the current resolution towards the end of 1988. However, it is also essential that the Meteorological Office receives as much local information as possible on the position of developing tropical cyclones in order to make the best use of the numerical model for the benefit of those at risk from one of nature's most ferocious phenomena.

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The Ocean Current section, Meteorological Office

By J.B. CLARK

(Meteorological Office, Bracknell)

The Ocean Current section forms part of the Marine Advisory Consultancy Service (MACS) located at the Met.Office headquarters in Bracknell. Its work consists of:

- (a) updating the ocean current information in Admiralty pilots and charts when required.
- (b) helping the Marine Enquiry section, MACS, with ocean current and allied enquiries.
- (c) inspection of relative data and comments included in meteorological logbooks from ships of the VOF.

Information update

The task of updating ocean current information in pilots and charts entails accessing the latest information from the Meteorological Office Main Marine Databank in the form of 'predominant current' maps and 'roses' for specified areas and periods, and comparing that with the material already in the pilot or chart to see what, if any, alterations are needed. Sometimes, publications, routine or otherwise, may be of invaluable help with this. For example, an article on the Florida current which appeared in a recent issue of the U.S. *Mariners' Weather Log* has helped greatly with updating the appropriate section in *Admiralty Pilot* No. 70 (West Indies Pilot, North Western part). At the time of writing (June 1988), the Ocean Current section is in touch with NOAA in Washington D.C. with regard to up-to-date information about the Yucatan Channel for the same volume.

When the first draft of a revision is complete it is dispatched to the Hydrographic Section at MOD Taunton for perusal. Occasionally, extra current information, including that derived from foreign pilots, may be to hand at MOD Taunton, in which case the revision is returned to Bracknell so that the fresh information may be checked and the revision amended if necessary. When the revision is deemed complete, publication is taken in hand by MOD Taunton.

Enquiries

The enquiries which reach the Ocean Current section may emanate direct from the customer or from the customer via the Marine Enquiry section or MOD Taunton. Late last summer [1987], with rising tension in the Persian Gulf, two enquiries, one direct from the Admiralty Research Establishment at Portland regarding currents in the Gulf itself, the other from the Sultanate of Oman Navy, via MOD Taunton, regarding those in the Gulf of Oman, arrived in the Ocean Current section. By using monthly and seasonal predominant current charts in conjunction with climatic data, the section was able to give the enquirers an idea of the local current systems and the mechanisms involved. Some enquiry work may involve other than surface currents. For example, recently, the Department of Biology, University of Newcastle upon Tyne, communicated that the surface currents in the tropical Atlantic Ocean could not fully account for the observed transport of fish larvae from (a) Brazil to the islands of Ascension and St Helena, (b) from Angola north of Mocamedes to St Helena and (c) between the two

islands themselves, and wished to know why this was so. Reference to other sources, notably the U.S.S.R. *World Ocean Atlases*, enabled the section to inform the enquirer that these apparent anomalies could be explained by sub-surface circulation at depths of between about 100 and 500 metres.

The many publications held in the National and Branch Meteorological Libraries can not only be very helpful in the updating of Admiralty pilots and charts, but can also aid enquiry work as in the case when a firm of naval architects in Genoa, Italy asked about the relationship between the the speeds of wind-induced ocean currents and those of the winds inducing them; the section was able to refer to the latest edition of *Meteorology for Mariners* which indicated that the ratio was approximately 1:40 with a small, usually neglected, variation with latitude.

Current data from ship logbooks

Additionally, the Ocean Current section receives copies of extracts containing ocean current observations from VOF ships' logbooks, and these are examined for any unusual current phenomena. Should such phenomena be found, an explanation (if possible) is communicated to the ship's Master, and this explanation may sometimes form the basis of an item in *The Marine Observer*. Current observations received in this manner are quality controlled in MACS (Shearman, 1983), those considered realistic being absorbed into the Meteorological Office Main Marine Databank. The Ocean Current section retains the copies for possible future use, whether answering enquiries or for updating Admiralty pilots and charts.

As can be seen from the foregoing descriptions, the Ocean Current section forms a very valuable part of the Marine Advisory Consultancy Service of the Meteorological Office.

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Portishead Update*

Introduction

PORTISHEAD RADIO is the long-range terrestrial coast station operated by British Telecom International (BTI). The communications complex known as Portishead Radio consists of a transmitting station near Rugby in the Midlands, a receiving station at Somerton and a control centre at Burnham-on-Sea, both in Somerset.

The first long-range coast station in the United Kingdom was opened for service by the General Post Office in 1920. The station, which was situated near Devizes, operated on long-waves and had a range of 1,500 miles. Additional transmitting equipment was installed in 1924, the same year in which a separate

* Reproduced from *Parliamentary Maritime Review* No. 2, April 1988 by permission of the Editor and the Marketing Manager of British Telecom International.

receiving station was built at Burnham-on-Sea. By 1929, expansion was such that a new transmitting station was built at Portishead, near Bristol, resulting in the closure of the Devizes station. The service continued to expand until 1939. During the Second World War, the station's main role was to broadcast to ships but it also received distress calls, enemy sighting reports and clandestine signals from Europe. The civilian staff was augmented by naval operators.

Since the war, the station has kept pace with technology and with customer demands, culminating in the present modern and efficient communications centre.

The facilities available at Portishead Radio are part of the range of maritime services operated by British Telecom meeting its requirement under condition 12 of its Licence, to provide two-way telecommunications service for seagoing vessels. Currently British Telecom is the only UK service provider. However the maritime communications market is highly competitive. Long-range radio services, similar to those provided by Portishead, are available from stations in many other countries. For example a ship in the Atlantic wanting a call to Germany can tune to over 20 stations in Europe alone. These services are normally run by Government controlled Telecommunications Administrations and are often subsidised. This has led to a general artificial depression of prices in this market with Portishead having to compete for its business primarily on its quality of service rather than price. The quality of service provided is perhaps best reflected by the fact that Portishead Radio is one of the world's busiest and best known long-range radio stations.

Long Range Maritime Communications

The frequencies used are in the high-frequency (short-wave) bands between 3 and 30 MHz. Long-distance communication is possible on these bands due to the effects of ionised layers surrounding the earth which act as reflectors of radio waves, enabling signals to zigzag between the layers and the earth over great distances with little loss of signal strength. Careful choice of frequency, taking into account distance and time of day or night, enables the main service area between longitudes 100° E and 80° W (approximately Singapore to Panama) to be covered 24 hours a day with access possible for lesser periods, dependent on position, from all parts of the world.

Portishead Radio broadcasts weather forecasts and navigational warnings on behalf of the Department of Transport. Close liaison is maintained with HM Coastguard Marine Rescue Co-ordination Centre at Falmouth for assistance with communication in cases of ocean distresses — mainly in the eastern North Atlantic but occasionally further away. Medical advice to seafarers — the 'MEDICO' service — is important and is provided by arrangement with the Royal Navy Hospital at Plymouth.

Radio Telegraphy Service

RADIO TELEGRAPHY, using Morse code, has been available since 1920 and still forms a major part of the station's business. Over 1,000 ships contacts per day are made by this method. Morse has survived in the maritime service longer than in other communications areas for several reasons:

- Current International regulations require the carriage of qualified Radio Officers, skilled in Morse transmission, on ships over 1,600 gross

registered tons engaged on international voyages. It is sensible to use the skills of the Radio Officer and the relatively simple and rugged equipment for sending and receiving commercial traffic.

- The amount of radio traffic generated by most ships is usually low, making it unnecessary to carry more sophisticated equipment.
- Shipping has been in depression for a prolonged period and some owners are reluctant to spend capital on new, sophisticated methods of communications when an existing system meets their perceived needs.

Although the method of sending and receiving Morse messages has remained largely unchanged for many years, much has been done to speed up handling at Portishead Radio. Radiotelegrams from ships are fed into automatic formatting and routing computers so that, within minutes of being received at Portishead Radio, they will be appearing on the addressee's telex machine whether located in the UK or elsewhere in the world. Computers route traffic electronically round the station and automatically produce and update traffic lists and provide billing information.

Delivery of messages from ships to the UK outside office hours is provided by the British Telecom VOICEBANK system. Portishead Radio will deposit messages in the ship owner's VOICEBANK address which can be accessed from any telephone by authorised company personnel. VOICEBANK can be coupled to British Telecom's RADIOPAGING facility which will alert the shipowner's duty representative that a message has been deposited in VOICEBANK. A reply can be sent to the ship by telephoning Portishead Radio and dictating a radiotelegram to one of the Radio Officers, giving owners, agents and managers rapid access at any time.

Radiotelex Service

By adding an error-correcting modem and teleprinter to the ship's basic radio station, direct connection to the national and international telex networks can be made through Portishead Radio. Direct or store-and-forward telex connections can be made automatically both to and from ships. The system is simple to operate and does not require a fully qualified Radio Officer. It can be fitted on all classes of ships, from yachts to supertankers. Transmission speed is much higher than Morse and the cost to the customer is less for the same message length. By advising the Portishead Radio computer of the frequencies it will be monitoring, a ship can ensure full 24-hour automatic receipt of its traffic.

A combination of responding to suggestions from customers and developing in-house initiatives has led British Telecom to improve the radiotelex service to provide a number of additional facilities. Copies of a radiotelex can be delivered simultaneously to any number of other telex addresses at reduced rates using the MULTITELEX facility. A database has been established which currently holds up-to-date Atlantic and Mediterranean weather forecasts, navigational warnings and propagational information. A RADIOTELEX LETTER service is available which allows crew members to have a message telexed to Portishead Radio and posted on from there. Vessels which are unable to use their transmitters, for example when loading oil at an offshore installation, when in port, or in a sensitive area such as the Arabian Gulf, can instruct the system before entering the sensitive area to make blind broadcasts of their traffic.

In order to familiarise ship and office personnel with the benefits and operation of the automatic radiotelex system, BTI is providing one-day training courses at Portishead Radio.

Radiotelephone Service

Voice connection into the national and international telephone networks is available allowing connection to virtually every telephone in the world. The service is used extensively for business and private calls.

Additional Services

Portishead Radio operates a maritime communications bureau which is especially useful for the shipowner outside office hours. Shore users within the UK can use the PHONETEX facility where a message telephoned to Portishead Radio will be delivered by terrestrial or satellite telex to the ship. If the ship is not fitted with telex, a PHONOGRAM will be transmitted to the ship as a radiotelegram. If the ship is not fitted for long-range communications, traffic will be routed to the nearest radio station able to communicate with the vessel. PHONETEX and PHONOGRAM messages can also be accepted for transmission to land-based addresses world-wide. For example, an owner diverting his ship to New Orleans may wish the message copied to his agents there with a further copy to his office telex machine in London.

British Telecom's Commitment

Almost uniquely amongst the world's coast stations, Portishead Radio is run on a commercial basis, the aim being to fund operations from customer revenue. With the reduction of the British merchant fleet, the consequent reduction of the number of British seafarers and the transfer to alternative, particularly satellite communications technology plus fierce competition from foreign radio stations, some traffic streams are in decline. However, British Telecom's continued commitment to the maritime community is demonstrated by replacing obsolescent message-handling equipment and ensuring that services are tailored to meet customers' changing communications requirements. As such, Portishead Radio has earned its reputation for reliability and quality of service, which is rightly expected from the world's largest long-range radio station.

PRESENTATION OF BAROGRAPH

Captain J.O. Spence made a special visit from his West Hartlepool home to receive his Long Service Award at Bracknell on 14 September 1988, having been unable to attend the main ceremony in May, as reported in the October edition of this journal. (See photograph opposite page 24.)

Captain G.V. Mackie, Marine Superintendent, had the pleasure of presenting the barograph to Captain Spence at the Eastern Road office of the Marine Division and the opportunity was also taken to show the visitor his first ever meteorological logbook, sent from Hain Steamship Company's *Tregenna* in May 1954. He also saw several older logs during a tour of the archives and the public reading room, and he gave an interesting résumé of the method of operating his present gas tanker command, m.v. *Havdrott* of Myhre Havtor Management, Oslo, formerly *Galpara* of P. & O. S.N. Co.

AURORA NOTES JANUARY TO MARCH 1988

By R.J. LIVESEY

(Director of the Aurora Section, British Astronomical Association)

As readers have come to expect, Table 1 summarizes marine observations received to date. Table 2 gives an indication of the level of auroral activity observed by land and by sea as reported by our network of professional and amateur skywatchers. We are always grateful for the time and trouble taken by ships' officers, meteorological officers, professional and amateur astronomers and members of the general public to observe and send in their reports.

Table 1 — Marine Aurora Observations January to March 1988

DATE	SHIP	GEOGRAPHIC POSITION	TIME (GMT)	FORMS IN SEQUENCE
13/14 Jan. ..	<i>Jura</i>	59° 20'N, 02° 48'W	0015-0400	RA, HA, pRR, HA, RR, HA, P, RR
14/15 ..	<i>Jura</i>	59° 02'N, 03° 35'W	1725-0745	RA, R ₃ A, RA, P, pRA, HA, P, pRA, m ₂ , HA, pRA
14/15 ..	<i>Cumulus</i>	55° 14'N, 05° 35'W	2335-0445	G, RR, HA, R ₃ RA
18/19 ..	<i>Cumulus</i>	57° 07'N, 19° 19'W	0445-0510	qN + meteors
20/21 ..	<i>Cumulus</i>	57° 00'N, 20° 10'W	0445	qN
26/27 ..	<i>Vigilant</i>	57° 20'N, 06° 48'W	0054-0113	pRA
12/13 Feb. ..	<i>Cumulus</i>	57° 00'N, 20° 20'W	2340-0200	qN
6/7 Mar. ..	<i>Canmar Venture</i>	47° 55'N, 60° 18'W	2300-0208	G, RA, G
25/26 ..	<i>Cumulus</i>	57° 02'N, 20° 06'W	0435-0500	qG
26/27 ..	<i>Cumulus</i>	57° 06'N, 19° 14'W	0425	qG

KEY: a = active, m = multiple, m₂, m₃ = 2 and 3 forms, p = pulsating, q = quiet, A = arc, G = glow, HA = homogeneous arc, N = unspecified form, P = patch, R₃ = long rays, RA = rayed arc, RR = ray structure.

The period was marked by two auroral storms neither of which were of the major type that reaches down into the tropics. That of the night of 14/15 January was seen by 31 observers mainly as the result of clear skies over the United Kingdom. In Figure 1 are plotted the auroral activities as seen at various geomagnetic latitudes in the region of the British Isles during the course of the night. For comparison, a tracing of the magnetogram made by Mr David Pettitt's fluxgate magnetometer at Carlisle is also shown. It will be seen how all-sky aurora conditions developed at geomagnetic latitude 61 degrees as the recording pen shot off the chart. NOAA at Boulder, Colorado, reported a severe magnetic storm on the American continent, but could not identify a particular cause on the sun. The planetary magnetic index K_p as reported by the Institute of Physics in Göttingen reached a value exceeding 7 by midnight of the 14th, corresponding with Mr Pettitt's magnetogram.

The second storm, on the night of 22/23 February was reported only by 15 observers, and did not appear to extend quite so far south, yet the Göttingen magnetic record showed this to be the longer of the two magnetic storms by time, but of the same magnitude. Boulder reported it to be a major to severe storm, and in this case identified the cause as a solar flare on 20 February at 0414 UT.

Auroral activity (Key for table 2 applies)

MAG. LAT.	14 JANUARY 1988						15 JANUARY 1988					
	UNIVERSAL TIME											
	1900	2000	2100	2200	2300	0000	0100	0200	0300	0400		
63						2	2	5	2	2	2	1
62	6			3	5	5	3			1		
61	4 5 3	5 5 4	5 2 5	6 5 3		2	7 5 3 4 5	4 5	5		5 5 5	1
60	3	3 2	2 1 1		1	1 1	1 1 3	1				
59	3 1 2 1 2	2 5 4 5 2		2		5 4	5 5 5 1	5 5	5			
58					1 1 1	5 5 2	2 3 5 2 4	5 2 4 2				
57			2	2 4 5								

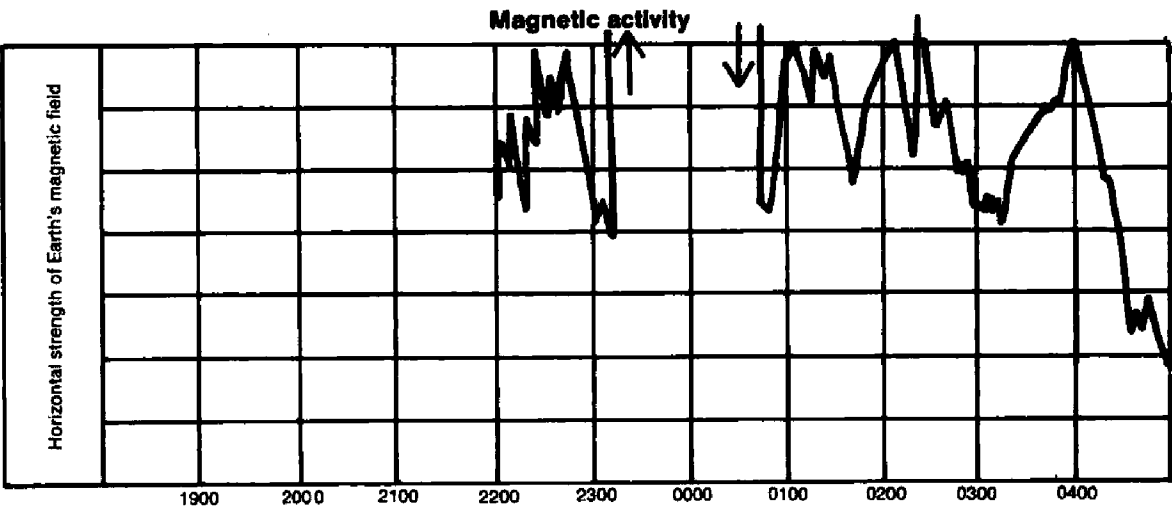


Figure 1. Comparison between the auroral activity observed at various geomagnetic latitudes in the British Isles with a magnetogram of changes in horizontal strength of the Earth's magnetic field as measured by Mr David Pettit on a home-made fluxgate magnetometer at Carlisle.

A lesser storm on the night of 6/7 January was seen by 9 observers, and was all-sky in Finland. NOAA at Boulder reported a minor high-latitude storm as a magnetic event, but identified it as being due to an extended coronal hole on the sun in addition to a flare.

The current sunspot cycle is building up and indications are that the rate of increase in sunspots is more rapid than in recent cycles. The increase in the frequency of magnetically disturbed periods is marked but fluctuating. We should expect to see more active, transient storm aurorae in this period. It is of interest to note that the planetary magnetic index K_p , which is an average of the degree of disturbance of the Earth's magnetic field in a period of three hours, exceeded the value of 5 at storm conditions only once in the first three months of 1987. In the first three months of 1988, there were 15 days on which the value of 5 was reached or exceeded. To indicate the degree of fluctuation in the solar effect

Table 2 — Principal auroral activity reported January to March 1988 in the North Atlantic region

DATE (NIGHT)	LOCATION AND NUMBER OF OBSERVERS	GEOMAGNETIC LATITUDE			MAXIMUM STORM ACTIVITY CODE*	TIME (GMT)
		LOWEST	HIGHEST	AT STORM PEAK		
4/5 Jan.	Scotland, Finland (3)	61	62	62	5	2300–2330
5/6	Finland (1)	62	—	—	5	Evening
6/7	Scotland, Finland (9)	59	62	61	7	1800–0025
7/8	Finland (1)	62	—	—	6	2015–0200
8/9	Finland (2)	60	61	60	5	Evening
10/11	Scotland, Finland (3)	61	62	62	5	2045
12/13	Finland (1)	62	—	—	5	Evening
13/14	Scotland (3)	61	62	62	5	2045–0400
14/15	Manitoba, Scotland, England, Finland, Ireland (31)	55	62	61	7	1725–0745
15/16	Scotland, Finland (5)	60	62	62	6	1745–2315
18/19	Scotland (4)	61	63	62	5	1845–2250
19/20	Orkney (1)	61	—	—	5	0248–0349
26/27	Scotland, Finland (2)	—	60	60	5	0054–0113
14/15 Feb.	Manitoba, Scotland (2)	59	61	59	5	2050–1022
17/18	Finland (2)	60	61	61	7	2030–2150
21/22	Finland (1)	61	—	—	7	2025–2200
22/23	Manitoba, Scotland, Finland (15)	59	61	59	7	1655–0450
26/27	Finland (1)	61	—	—	5	2025
6/7 Mar.	Scotland, Newfoundland (2)	59	61	61	5	2030–0208
25/26	Manitoba (1)	59	—	—	7	0437–0454
26/27	Ireland, Scotland, Finland (3)	55	59	55	5	2140–0148
27/28	Scotland (2)	59	61	61	7	2140–2232
30/31	Scotland (1)	59	—	—	5	2230–2245

*Storm Activity Code: 1 = Glow or patch, 2 = Homogeneous arc or band, 3 = Rayed arc or band, 4 = Ray bundles, 5 = Active moving or flaming storm, 6 = Coronal or half-sky, 7 = All-sky storm.

on the Earth’s magnetic field, from July to September 1987 the corresponding figure was 19 days, while from October to December, the figure was 12 days. Marine radio officers will no doubt be keeping an ear open to assess how the ionosphere is being affected by the solar activity.

In the present period it was of interest to note the observation of the aurora by the *Canmar Venture* when west of Newfoundland at the entrance to the Gulf of St Lawrence. Over the years we have received quite a number of reports from ships in this region, the Strait of Belle Isle and around Newfoundland. The reason quite simply is that owing to the Earth’s magnetic field being offset to the geographic axis, the aurora comes down to lower geographic latitudes in Canada and is more favourably placed for observation. In addition, there is the advantage of darker night conditions at the lower geographic latitudes, especially in summer. Our advice to any vessel in that region is to keep a weather eye open for aurora as you have a better chance of seeing activity here than if you were in U.K. home waters.

At the time of writing, no reports have been received of auroral sightings in the Southern Hemisphere. The Aurora Section of the Royal New Zealand Astronomical Society observed aurora on 2, 12, 15, 19, 22, 24 and 27 January, 16 and 18 February, and 8, 20 and 21 March. Most of these sightings were of glows and quiet aurorae. The most active events were those of 1/2 January between 1115 GMT and 1215 and 14/15 January between 1030 and 1315, when active ray structures featured. The reporting convention is that the evening of the first date and the morning of the second date are included. The problem with New Zealand aurorae is that they could be the tail of an aurora occurring in advance of New Zealand time, seen in America, or the start of an aurora to be seen later in Europe as the Earth rotates under the auroral oval. Greenwich Mean Time is used as the time base so that events can be correlated throughout the world. However, as the aurora can be seen at progressively later times as more westerly countries rotate under the auroral oval, it could become quite confusing were it not for the magnetic disturbance record assisting as a form of international clock.

The value of having a co-operative observer network was shown when a query was raised as to whether or not a particular observation made by a certain ship in the Tasman Sea was a genuine aurora or the sighting of lights from squid boats below the horizon. [Letters to the Editor, this issue, page 44.] In the past we have known the flares of an oil refinery below the horizon to cause a spurious aurora effect. In the case concerned we were able to show that six New Zealand observers recorded aurora at similar geomagnetic latitudes; there was a magnetic storm which caused the New Zealand event, followed by events in Europe and Canada. So no matter from where you are observing, please record and pass on your report, it will be used to build up a picture of events around the world. Good sailing.

From *The Marine Observer* 40 years ago

THE MERCHANT SEAMAN AS A METEOROLOGIST*

Oceanography and meteorology are allied subjects and both are of considerable interest to the seaman, for they concern the elements in which he sails and which can make his life comfortable or uncomfortable, safe, or dangerous. For scientific and practical purposes it is very desirable that oceanographers, meteorologists and seamen should get together and discuss problems of mutual interest.

This article is headed "The Merchant Seaman as a Meteorologist" because the major part of our knowledge on maritime meteorology is derived from observations voluntarily made at sea by the officers of merchant ships. Meteorological work is also done aboard naval ships, but the number of these and of ships of scientific expeditions is small compared with merchant ships.

The collection of organised meteorological observations at sea commenced

* Abstract of a paper read before the Challenger Society in London on 23 June 1948, by Commander C.E.N. Frankcom R.N.R., Marine Superintendent.

about the year 1853, and was largely brought about by the activities of Maury, an American naval officer, who realised the importance of comprehensive information concerning winds and currents, etc., for the economical running of sailing ships. An International Conference, at which his was the guiding spirit, was held in Brussels in 1853, and all the principal maritime countries agreed to co-operate internationally in obtaining observations from ships.

In 1854, largely as a result of the Brussels conference, the British Meteorological Office was opened as a Department of the Board of Trade, governed by a committee of the Board of Trade, Admiralty and Royal Society, under the direction of Admiral FitzRoy. Thus the original function of the Meteorological Office was to provide weather information for seamen. Under FitzRoy's guidance numerous ships were recruited for making voluntary meteorological observations at sea, and British ships have co-operated with the Meteorological Office in this way ever since.

In those early days there was no radio telegraphy, but the telegraph was in existence, and in 1861 the Meteorological Office began drawing weather charts and issuing forecasts, chiefly confined to gale warnings, for the benefit of shipping. These forecasts were not received with favour, perhaps owing to their inaccuracy, and they were discontinued. It was not until some years later that a regular forecasting service was introduced. In those days all ships kept a climatological record, i.e. they merely recorded the observations every four hours and sent in the logbooks to the Meteorological Office at the end of their voyages. From the data extracted from these, climatological atlases of all oceans were eventually compiled.

Towards the end of the nineteenth century, the activities of world meteorologists widened considerably and regular weather forecasting became a practicable proposition and the advent of radio in 1900 broadened its scope enormously. The technique of weather forecasting requires a number of widely distributed reporting stations from which synchronous reports of existing weather can be received, and the meteorologist in his search for clues as to the future behaviour of the weather realised that, to obtain a comprehensive picture, he had to know what the weather was at sea.

As a result of agreements brought about by the International Meteorological Organisation, arrangements were made for merchant ships to provide links in the chain of synchronous weather observations, whereby the meteorologist could draw his weather map. To do this, instead of merely "salting down" their observations in logbooks, they made the observations as before at regular intervals, but at the synoptic hours and then coded them and transmitted them by radio to appropriate shore stations and thence to the meteorological centres. At the same time, they also recorded the observations in logbooks, so that the meteorologists not only had the advantage of using their observations synoptically at the time, but also of making climatological use of them afterwards. The essential difference between the climatological and the synoptic type of observation is that the former are taken every four hours "ship time", whereas the latter are recorded every six hours G.M.T. These different systems of time-keeping raise technical difficulties when one endeavours to correlate observations of the two types, for it is obvious that the "ship's (apparent) time" changes as she moves in longitude. Owing to the relatively small diurnal ranges which occur at sea, however, the difficulties of correlation are not very serious, and it is quite practicable to make adjustments as necessary.

At a meeting of the International Meteorological Organisation in 1921, a scheme was drawn up whereby the maritime nations of the world agreed to provide, according to a pre-arranged formula, at least 1,000 Selected Ships—fitted with appropriate instruments for synoptic meteorological work in all oceans. Thus, at the outbreak of the last war in 1939, the United Kingdom had 360 Selected Ships.

It is an unfortunate fact that meteorology in war-time becomes a military secret, and as the technique of warfare advances the value of this information and consequently of its secrecy increases. Hence, during the 1914–18 war, and even more so during 1939–45, the radio transmission of weather information by merchant ships was not possible, nor, in fact, were they allowed to keep meteorological records for fear of their capture by the enemy. The result is that there are large gaps in our statistical knowledge of weather at sea during the war, apart from the information provided by naval ships.

After the last war was ended, the increase in demands for meteorological information, chiefly for aircraft, but also for shipping, commercial and other purposes, made it more than ever necessary that an adequate network of observations from the oceans should be obtained. At present we have no less than 495 Selected Ships, including twenty-six trawlers, who send reports from far northern waters. There are in addition eighty coasting vessels who report sea temperatures and five light vessels who send observations by radio telephony.

LETTERS TO THE EDITOR

Aurora or squid boat?

I write briefly concerning the report from m.v. *Botany Bay* under the heading AURORA AUSTRALIS in *The Marine Observer*, volume 58, number 299 (January 1988).

I have recently come across this report and read it with great interest. However, I would suggest that the effect described is probably not an aurora. The description is, in fact, a very good account of the light effect that sometimes occurs over fishing vessels that are 'jigging'—that is, fishing for squid using very powerful lights to attract the animals to the surface. Whilst the effect is fairly common if looked for, it sometimes becomes very pronounced and can be quite spectacular.

I have here a note made on 4 May 1988, when in 49° 30'S, 61° 02'W at 2300. Cloud cover was CM4, wind 320° force 3, barometer steady at 1019.0 mb with air temperature 9.1 °C, sea 8.7. Stars were visible through the lighter cloud elements and my ship was operating in darkened condition. In this instance the glow near the horizon was from a large fleet of jiggers at a distance of around 35 n.mile, whilst the vertical rays appeared above closer vessels, probably about 20 n-mile or less. At some time there were 20 very distinct and bright rays present, starting at various altitudes and extending upwards, some nearly to the zenith. The rays tended to appear very quickly but fade away slowly. The effect of the glow actually on the horizon was noted in this case as being not as bright as that at low altitudes above the horizon.

Whilst not wishing to be dogmatic, I would suggest that this is probably what was seen by *Botany Bay*. Her report does not give any weather conditions, and does not say whether a radar was operating. It is possible from a vessel of that size

that small fishing vessels might have been seen on radar at about 20 miles, although the conditions under which this phenomenon occur sometimes seem to be not the best for radar propagation.

G.J. Tully, Master, f.p.v. *Falklands Desire*.

I was most interested in the comments and notes relative to squid boats and probable misidentification with the aurora. This shows how difficult it can be to sort out real from spurious auroral observations.

The *Botany Bay* reported aurora between 0930 and 0948 GMT on 20 February 1987. On the same date, seven Northern Hemisphere observers from Canada to Finland reported aurora between 1800 and 0640 on the night of 20/21 February. No reports came in for the night of 19/20. However, on the night of 19/20, six New Zealand observers reported aurora between 0845 and 1014.

On the evening of the 19th there was a magnetic storm sudden commencement (SSC) when the Earth's magnetosphere was impacted by a shock wave travelling in the solar wind. A magnetic storm built up thereafter and the planetary magnetic index K_p reached a value of 5 by about 1200 on the 20th.

Further, the Radio Officer on the *Botany Bay* reported extra clarity on long-distance radio reception. I do not know which band of frequency he was working, but in certain frequencies, improvement of reception is not unusual at the beginning of a solar event.

As a consequence of the above, I would put my money on the *Botany Bay* having seen an aurora. This is a much more clear cut case than some isolated marine observations that you have sent me on occasion, when it was impossible to confirm auroral conditions.

R.J. Livesey, Director of the Aurora Section, BAA.

Personalities

(Readers are invited to notify the Editor of observing officers retiring from the Navigating and Radio Departments.)

OBITUARY — CAPTAIN W.C. CARRUTHERS died at sea on 23 August 1988 whilst outward bound from Tilbury towards Australia and New Zealand via Cape Town aboard his command, m.v. *Remuera Bay* of P. & O. Containers Ltd.

William Carruthers was born and educated in Stranraer, Scotland and received pre-sea training at H.M.S. *Conway* from 1952 to 1954. Before joining the Royal Mail Line in 1955 he served as Midshipman aboard H.M.S. *Vanguard*, the last of the British battleships. He was in the passenger and cargo ships of Royal Mail Line for 14 years until in 1969, when Furness Withy was the parent company, he was promoted Chief Officer in the Shaw Savill cruise liners *Northern Star* and *Southern Cross*. He later joined O.C.L. and was soon promoted to command, serving in many of the company's container ships, his last two years in the ship he most liked, *Remuera Bay*.

Captain Carruthers was a dedicated marine observer having 23 Excellent meteorological logbooks to his credit out of a total of 41 logs, and for his efforts

he received Excellent Awards in 1981, 1983, 1985, 1986 and 1987. His widow, Josephine Carruthers, was kind enough to write and tell us of her husband's passing due to natural causes at the age of 51, and to tell us of his keen application to meteorology. It is clear that he was a special type of person, admired by all who met him, and we offer our sympathy to his widow and married son of Kingston upon Hull.

OBITUARY — CAPTAIN A.T. FERRIER died suddenly at the age of 53 on 28 June 1988, having returned to his Paisley home from holiday in Spain to attend his mother's funeral the following day.

Alex Ferrier was one of the best known faces on the Isle of Arran ferry, having joined Caledonian MacBrayne in 1963 as Chief Officer and being promoted Master on the regular ferry service from Ardrossan in June 1974. In subsequent years he became very well known by the countless passengers and staff who sailed on the ferry to Brodick Bay on Arran, and by all accounts he was a man who gave one hundred per cent plus of his talents as a seaman, and was equally energetic and caring as a family man.

Born on 8 May 1935, Alexander Ferrier was a native of Houston, Renfrewshire, and it is understood that he served his apprenticeship with Constantine's. During his time with Caledonian MacBrayne he had a fine reputation for being one of that rare breed, a responsible and reasonable Union man, and his work in that connection earned him the respect of both his colleagues and Management.

Captain Ferrier contributed 20 meteorological logbooks during the four years that *Isle of Arran* was an observing ship, 8 of those logs being Excellent by assessment. Met Office Marine Superintendent Captain Gordon V. Mackie had the privilege of sailing with Alex Ferrier on his ship in April 1988, and particularly as he also hails from the same part of the world would like to extend the sympathy of all at Bracknell to his widow, son and daughter, on the loss of a husband, father and ardent supporter of the Voluntary Observing Fleet.

RETIREMENT — CAPTAIN D.I. MOORE retired from the sea on 31 May 1988, some 41 years after signing indentures with Andrew Weir and Son.

David Ian Moore was born in January 1930 and educated at Ainthorpe Grove School, Hull, from 1935 to 1943. He subsequently spent almost three years at the Trinity House Navigation School at Hull followed by a short spell assisting with chart corrections at B. Cooke and Son, the Navigation and Scientific Instrument Makers. His first Bank Line ship was *Maranbank* (ex *Samouse*) which he joined in May 1947 and 2½ years later, on promotion to Uncertificated Third Mate, he joined *Levernbank* from whence his first meteorological logbook of 45 emanated.

On obtaining his Second Mate's Certificate in December 1951 Captain Moore joined T. & J. Brocklebank of Liverpool and was appointed to the *Martand*. Soon after gaining his Master's Certificate in 1958 he was promoted to Chief Officer and carried on serving with Brocklebanks past the time, ten years later, when they merged with the Cunard Company and took their name. He received his first command, the *Scythia*, in November 1976, on charter to Salén of Sweden on world wide trading with refrigerated cargoes. After the sale of the fruit ships in 1983 he spent the remaining years on container ships chartered to ACT and ACL such as *Atlantic Star* and *ACT 6*, mainly on the U.S. to Australasia trade. His

final 3 logs came from the *ACT6*, and overall there were 12 marked as Excellent, for which Captain Moore received Excellent Awards in 1952, 1955 and 1984.

Captain Moore is married with one daughter and two sons, and we wish him the very best of good fortune in retirement, including his desire to be able to watch his favourite team, Hull City, on a more regular basis, as the new football season was due to start not long after he retired.

Book Reviews

The Antarctic Treaty Regime edited by Gillian D. Triggs. 235 mm × 155 mm, 239 pp., *illus.* The Press Syndicate of the University of Cambridge, The Pitt Building, Trumpington Street, Cambridge CB2 1RP. Price: £30.00.

This is another of the titles included in a series entitled *Studies in Polar Research*, the first having been reviewed in the July 1985 edition of this journal, being *The Antarctic Circumpolar Ocean* by George Deacon. The volume under review contains contributions which were originally prepared for the Conference on Antarctica, 'Whither Antarctica?', organized by the British Institute of International and Comparative Law and held in London in April 1985.

The six parts to the book cover the numerous aspects of the region which affect the aspirations of the nations with claims to areas of Antarctica: Australia, Argentina, Chile, France, New Zealand, Norway, South Africa, U.S.S.R., United Kingdom and U.S.A., to name the main participants; the final chapter raises the notion that the United Nations should have a leading role in the debate on the issue of sovereignty and administration. The subjects dealt with in detail include physical environment, scientific research, legal and environmental issues, minerals regulations and future policies. The fifteen contributors come from many of the interested countries, though most are members of U.K. bodies such as the British Antarctic Survey, Scott Polar Research Institute and Government departments.

Under the present Antarctic Treaty, all the territorial claims, some of which are overlapping, are literally frozen indefinitely. In the Antarctic continent the 'Cold War' does not exist, it is nuclear free and all bases of all countries are open to inspection. A major concern of Antarctic scientists is the conservation of this still largely unpolluted continent which could, however, be threatened if the Antarctic Treaty fails to develop.

Other titles in this series or upon a similar subject, published by the Cambridge University Press, include *Antarctica: the next Decade* by Sir Anthony Parsons, 164 pp., price £25.00 and *Antarctic Science* edited by D.W.H. Walton, 280 pp., price £25.00.

J.F.T.H.

The Ships Atlas, 1987 edition, published by Shipping Guides Ltd. 305 mm × 230 mm, 206 pp., *illus.* Shipping Guides Ltd, Shipping Guides House, 75 Bell Street, Reigate, Surrey, RH2 7AN. Price: £28.00 in U.K., £33 outside U.K. including air-speeded delivery.

The second edition of *The Ships Atlas* follows the format of the original, published in 1984, but with several additional detailed maps, including the main ship canals of the world, giving a total of 55 full page maps in colour, drawn to

Mercator's Projection. Also featured are world maps with major ports shown, another with winds and currents and a third providing load line and time zones. The alphabetical index following the maps includes position and brief details of size and facilities of the main ports.

Together with the distance tables covering ports on each map, as well as a selection of worldwide distances and steaming times at 16 knots, *The Ships Atlas* brings under one cloth cover all the information needed by shipowners, charterers and mariners of all sorts for preliminary passage planning. The two-tone maps are uncluttered by extraneous information, making them easy to refer to, and all known ports appear to have been included. However, the publishers would like to be advised of any corrections, amendments or additions of which readers become aware, thus helping to make it an accurate, made-to-measure user's guide. The publishers have also made good use of the information contained in their respected *Guide to Port Entry* (price £115.00) so extensively used aboard ships the world over.

J.F.T.H.

The Golden Wreck by Alexander McKee. 176 mm × 230 mm, 222 pp., illus., paperback. Hodder and Stoughton Ltd, Mill Road, Dunton Green, Sevenoaks, Kent TN13 2YA. Price: £7.95. Also available in hardback.

On Tuesday, 25 October 1859, a hurricane-force wind struck the western coasts of Britain. The damage exceeded anything in living memory, but among the 133 ships sunk, one disaster stood out. The steam clipper *Royal Charter*, the fastest and most famous ship on the Australian run, went down off Anglesey. This book, a 1986 update on a 1961 publication, tells not only of the ship and her sinking, but also of the exploration and recovery of some of the £350,000 of gold bullion that was on board, proceeds of the Australian gold rush being brought home by passengers and officials.

The *Royal Charter* was built on the River Dee in Flintshire in 1855 and, with her registered tonnage of 2,719 and length overall of 336 feet, 3 clipper masts and a single funnel, she had much of her appearance and performance in common with Brunel's *Great Britain*, now preserved in a Bristol dock. However, a length to breadth ratio of 7.0 gave her formidable speed. Mishap dogged her operations from her launching, when she at first refused to move, later grounded and received major repairs. She turned back to Plymouth on her maiden voyage, being too deeply loaded because of excess ballast. Triumph came at the end of the first voyage when Melbourne was reached in record time. Life aboard the *Royal Charter* was well chronicled by the Reverend Doctor W. Scoresby and it is from his journal and from other contemporary records that the author has produced a splendidly dramatic account of the events leading up to the disaster, rescue attempts and exploratory dives with their results in this century. He gives an enthralling account of the ship's near return to her home port of Liverpool, only to be broken into pieces on the rocks of Anglesey when within sight of the Point Lynas pilot cutter, with dire results; and the force 12 wind preventing any rescue attempts coming from seaborne craft. The people of the village of Moelfre did however manage to pull 41 survivors to safety despite their buffeting by 30- or 40-foot waves on the rocky shore, and relatives of some of these survivors have provided some of the material used to put this novel-type story together. Out of more than 500 men and women on the *Royal Charter* more than 460 perished as a result of the grounding. Many of the passengers never had a chance, as they had

time from the initial tragedy to load gold bars into their pockets, and so plummeted downwards on jumping into the foaming seas. The book follows the inquest and subsequent recovery of the remaining bodies trapped in the wreck. Search for the gold began in the year of the tragedy, but it was between 1960 and 1985 that much attention was paid to recovery of the remaining gold and many interesting artifacts.

The artwork is divided between contemporary drawings, maps and even a photograph, and present-day photographs of the wreck site, taken from different angles and in both monochrome and colour. There are also illustrations concerning the diving expeditions and certain other wrecks which had occurred in the area. The landscape photographs of the wreck site are too numerous to be of much interest to the uninvolved reader, and amount to so much padding in my opinion, spoiling what is otherwise an excellently produced narrative.

Of particular interest to the editors of this journal was the mention of Admiral FitzRoy's comments about the storm — 'a complete horizontal cyclone' — and the effect it had on FitzRoy's actions as the Superintendent of the Meteorological Department of the Board of Trade. The *Royal Charter* was wrecked only 5 years after the establishment of the original Met. Office, but as a result of this disaster FitzRoy printed synoptic charts of all the observations taken at that time and set about arranging for land stations to telegraph their weather to London, to foretell or 'forecast' as he termed it, the weather for a period ahead. This was carried into effect in 1860 and in the following year Admiral FitzRoy instituted a system of telegraphed and visual gale warnings to certain ports.

J.F.T.H.

Notices to Marine Observers

MORE PHOTOGRAPHS REQUESTED

We make no apologies for asking Masters, and Observing and Radio Officers, to encourage members of their ships' companies to provide us with copies of their favourite prints of natural events encountered at sea. All photographs and slides can be returned to the contributors, who will not necessarily be expected to send a report with their photographic efforts. All that is asked for are approximate positions, date, GMT or ship's time and brief details about the subject in the picture. Sketches and further details, including the names of the observers, will of course be welcome, and there is always the chance that one of the eager scientists who comment upon ships' reports, will have something to say. We cannot promise to publish every picture offered but we hope to augment the selection that is shown in *The Marine Observer*, with the help of marine observers. (See photographs opposite pages 8 and 25.)

Fleet Lists

UNITED KINGDOM

Amendments to the list published in the July 1988 edition of *The Marine Observer*. Information regarding these corrections is required by 30 September each year. Information for the July lists is required by 31 March each year.

NAME OF VESSEL	DATE OF RECRUITMENT	MASTER	OBSERVING OFFICERS	SENIOR RADIO OFFICER	OWNER/MANAGER
<i>A.E.S.</i>	19.8.88	H. Svendsen	T. Gjensen	—	Jeppesen Heaton Ltd
<i>American Senator</i>	21.6.88	M.R. Bell	M. Homavazir, M. Youd, K. Dessa	B. Menezes	Anglo European Ltd
<i>Arctic Corsair</i>	16.9.88	P. Wheeldon	A. Spence	A. Spence	Boyd Line Ltd
<i>Caribbean Universal</i>	—6.88				Gateway Shipping Ltd
<i>Cormorant Arrow</i>	14.6.88	J.M. Stanaway	W.P. Daniel, J.F. Taylor, T.R.H. Greig	D.H. Hibbert	Gearbulk Ltd
<i>Corystes</i>	24.3.88	J.R. French	B.A. Chapman	—	Ministry of Agriculture, Fisheries and Food
<i>Crisilla</i>	7.9.88	J. Nichols	A. Somerton, W. Wilson	—	J. Marr & Son Ltd
<i>Esso Fife</i>	13.8.88	S. McCollin	K. Milne, I. Halsall	D.C. Bullard	Esso Petroleum Co. Ltd
<i>Hill Cove</i>	14.3.88	T. Doyle	M. Wainman	—	J. Marr & Son Ltd
<i>Isle of Mull</i>	25.3.88	C.W. Billimore	R. Morrison, A. Colquhoun	—	Caledonian MacBrayne Ltd
<i>Larkfield</i>	22.3.88	M.G. Phipps	M.S. Phare, M. Pinks, M.F. Thyib	R.P.A. Jayatileke	Buries Markes (Ship Mgmt) Ltd
<i>Lincoln Universal</i>	12.4.88	T.W. Abbott	P. Williams, A. MacPherson, R.G. Crozier	D.P.J. Jones	Gateway Shipping Ltd
<i>Lough Foyle</i>	27.9.88	A. Niblock		—	Heyn Engineering & Shipping Services

<i>Maersk Navarin</i>	10.3.88	W. Frazer	J.L. Burton, J.W. Black, C.A. Nugent	—	British (I.O.M.) Ltd
<i>Maersk Navigator</i>	27.7.88			—	British (I.O.M.) Ltd
<i>Maersk Nestor</i>	26.8.88	T.J. Fitzearle	C.I. MacKay, R.J. Westwater, G.R. Joshua	—	British (I.O.M.) Ltd
<i>Mobil Acme</i>	4.5.88	G. Allely	I. Hockin, H. Murray, J. Hanghey	J. O'Sullivan	Mobil Shipping Co. Ltd
<i>Mobil Falcon</i>	13.4.88				Mobil Shipping Co. Ltd
<i>Mobil Petrel</i>	31.5.88				Mobil Shipping Co. Ltd
<i>New Forest</i>	26.2.88				P. & O. Bulk Shipping Ltd
<i>Nivaga II</i>	6.7.88	P. Sione	H. Iele, O. Panapa, A. Tapeva	—	Government of Tuvalu
<i>Nordic Link</i>	19.9.88	W. Barnes	W. Tennant, R. Jackson, A. Macpherson	—	Shiplink (U.K.) Ltd
<i>Ocean Goose</i>	3.8.88	D.A. Church			Captain D.A. Church
<i>Ocean Link</i>	23.5.88	B. Hansson	G. Edlund, D. Winblad, D. Friberg	L. Wodelius	Shiplink (U.K.) Co.
<i>Paquita</i>	28.3.88	I. Lawson	P. Crowle	—	Sanders Stevens & Co. Ltd
<i>Princefield</i>	5.4.88	R. Bosman	E.J. Coles, S. Butler	E.A.W.G.S. Egalla	Buries Markes (Ship Mgmt) Ltd
<i>Rizcun Atlantic</i>	22.3.88	X.C. Gomez	S. Tiwari, A.K. Ghatak, A.S. Chhabra	P.L. Sequerra	Wisebrough Shipping Co. Ltd
<i>Scirocco</i>	3.9.88	C.R. Thomas	C.I. Kitchen, J.I. Marin	A. Amyach	Denholm (I.O.M.) Ltd
<i>Scirocco Universal</i>	5.5.88	H.M. Jones	S.M.A. Akbar, D.P. Colley, K.M. Chester	N.S. Varty	C.I. Shipping Ltd
<i>Snowdon</i>	-5.88				P. & O. Bulk Shipping Ltd
<i>T.N.T. Lynx</i>	12.4.88	A. Alexander	J. Hughes	—	T.N.T. Sealion Ltd
<i>Tasman Universal</i>	6.4.88	M. Colley	C.J. Garner, S. O'Mahoney, A. Ross	D. Dale	Gateway Shipping Ltd
<i>Zenatia</i>	-8.88				Shell Tankers Ship Mgmt Ltd

The following Selected Ships have been deleted:

Astor, B.P. Vigour, B.P. Vision, Blue Excelsior, Capricorn, Clare, Earl Granville, Dahlia, Esso Warwickshire, Farland, Fort Dufferin, Fort Frontenac, Fort Resolution, Melton Challenger, Pomella, Starella, Taian, Willowbank.

BRITISH COMMONWEALTH

AUSTRALIA (Information dated 28.7.88)

The following Selected Ships have been recruited since the list published in the July 1988 edition of this journal:

Australian Advance, Iron Kembla, Iron Newcastle, Iron Prince, John Sanders, Miwashi Tabuk, Portland, Secdo B.P. 471, Zincmaster.

The following Selected Ships have been deleted:

Icebird, Melbourne Trader, Nella Dan, Sahiwal Express.

NEW ZEALAND (Information dated 1.8.88)

The following Selected Ships have been recruited since the list published in the July 1988 edition of this journal:

Tarihiko, Willwatch.

The following Selected Ships have been deleted:

Amaltal Explorer, Capricornia, Cormorant Arrow, Fetu Moana, Jebsen Tauranga, Pacific Ataawhai.



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