Met.O. 827

The Marine Observer

A quarterly journal of Maritime Meteorology

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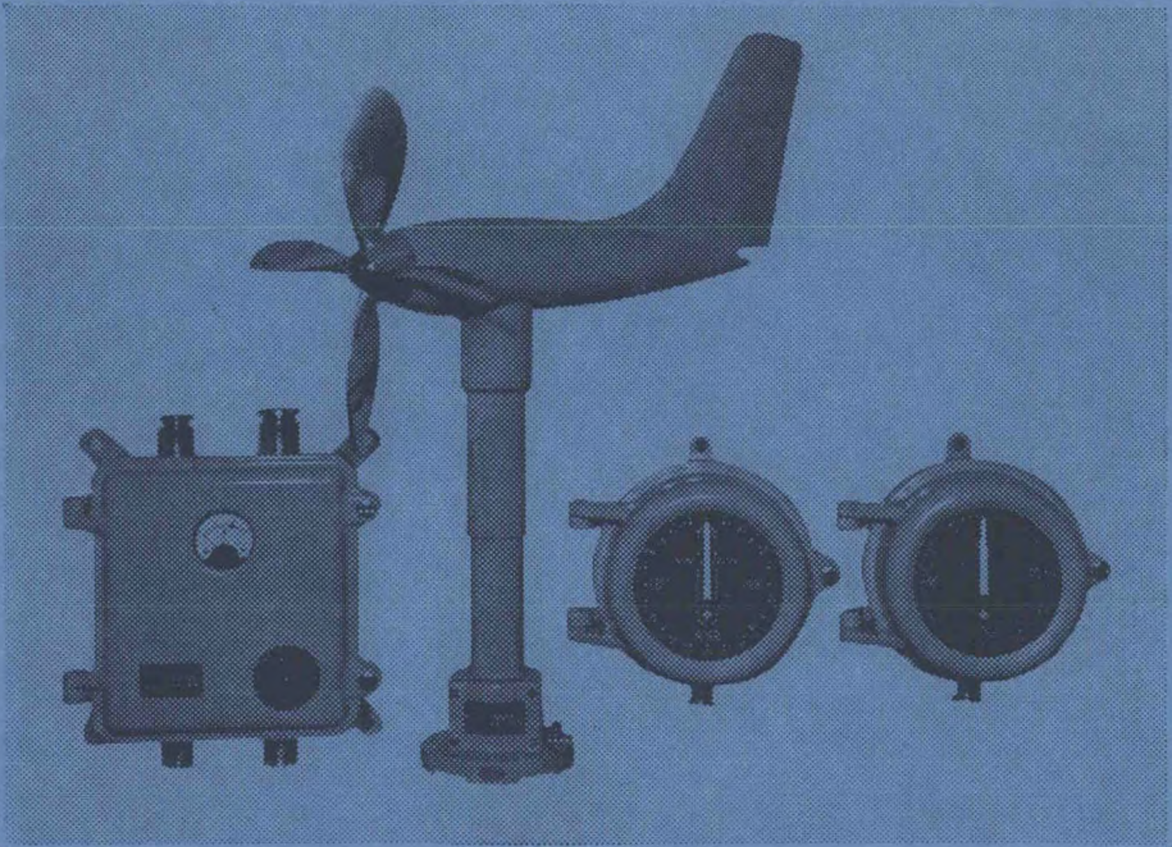

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A Quarterly Journal of Maritime Meteorology
prepared by the Marine Division of the
Meteorological Office

Vol. XL

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VOL. XL **No. 227** **JANUARY 1970**

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

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Editorial

No one who had access to a television set, a radio broadcast or a newspaper on 20th July 1969 can have failed to be impressed by the fact that two men had landed and walked on the moon. Apart from the organization, courage and technological ingenuity which made this possible, such an accurate piece of navigation amazed the writer and, no doubt, many another master mariner; as a former shipmate remarked, "It makes our 4-point bearing look pretty silly!"

Such an achievement has inevitably brought criticism; one has heard from various sources how the money and talent expended on space research might have been more usefully employed in aid to under-privileged nations, to medical research, to the hungry and homeless, etc. No doubt the same type of criticism was surreptitiously directed at Queen Hatshepsut when, some 4,000 years ago, from the coffers of a nation where poverty was rife, she fitted out a fleet to sail to the fabulous Land of Punt, possibly the Somalia of today; or against Prince Henry of Portugal (known to history as Henry the Navigator) who for some forty years in the fifteenth century must have spent fabulous sums, firstly on setting up his school of geography, astronomy and navigation at Point Sagres (which today might well be regarded as a fifteenth-century Cape Kennedy) and then sponsoring numerous expeditions in search of a route to the Indian Ocean, a dream which he never lived to see fulfilled because when he died in 1460 his captains had sailed down the African coast only as far as Sierra Leone; or against the Government of the day who, in 1714, set up a 'Board of Longitude' with powers to award £20,000 (no inconsiderable sum, especially in those days) to the person who could find a method of determining longitude within 30 miles. Time has shown how worth while was all the money spent on these and hundreds of other projects; assuredly these pioneers 'builded better than they knew' and their wildest dreams have been translated into reality.

Like the contemporaries of Queen Hatshepsut, of Henry the Navigator and of Harrison the chronometer maker, we are too near the event to appreciate all the consequences; some have compared the moon landing to the original emergence of life from the primordial ocean and said that it marks an entirely new stage in the process of evolution. Most of us are more concerned with events on the planet Earth.

A few weeks before the three citizens of the United States completed their 8-day, half-million-mile return voyage to the moon, four Englishmen and a team of huskies had made the longest sledge journey in the history of polar exploration, from Alaska to Spitsbergen, a distance of 3,620 miles. This journey, which passed almost unnoticed in this country, was the subject of another BBC television programme a bare fortnight after the lunar venture and the sharp contrast between the two was amazing. "It was", wrote the Producer in the *Radio Times*, "as if we were embarrassed at what seemed an out-dated, somewhat irrelevant gesture. Was there perhaps a feeling that, in this expensive age of space travel, all that we could run to was four sledges and a few husky dogs with which to make our epic journeys?" But, except for a break in the last week or so when speed of travel became an overriding consideration, a meteorological logbook was kept throughout this 408-day journey, which included a planned stop of some six months during the long polar night, and a sharp-eyed viewer of colour television on 2nd August could have seen the familiar yellow book of a 'Selected Ship' being written up. If this journey accomplished nothing else, the value of these records alone has made it well worth while because, even in these days on the treacherous, shifting-ice surfaces of those regions where lightness of equipment and extreme manœuvrability are vital, they could not have been secured in any other way.

Coming nearer home, the report of a Governmental Committee which was set up to examine the major factors affecting the safety of deep-sea trawlers was published in 1969. This Committee found that, just as the trans-Arctic journey was made in what has been termed a 'Stone Age manner', so the fishing industry had some surprising facets to show. The Committee's 88 recommendations were mainly concerned with the minimizing of accidents in trawlers, their design and construction, their equipment and working conditions, conditions of employment and training and management relations. But two of them, we know, having been working for them on and off for years, will be welcomed by every shipmaster and radio officer, whether deep sea or coastal, using home waters. They are, firstly, that "the BBC should make extra broadcasting time available for weather forecasts for shipping if the fishing industry, in consultation with the Meteorological Office, is able to present a strong case for extension of the existing service" and, secondly, that "the Board of Trade, the General Post Office and the Trawler Owners should jointly consider ways of easing peak-hour congestion at Wick and Humber Radio Stations".

Another recommendation was that "the Government should supply a support ship, on a permanent basis, to give trawlers meteorological, medical and technical assistance on the lines of the support provided by some other European countries to their fishing fleets". On page 24 of this issue is an article by Mr. D. P. Smith who was the meteorologist on the *Orsino* on the 'pilot voyage'.

And so we have come to the end of 1969 and another decade has begun. It cannot be denied that the march of man towards full knowledge of his environment, so marked in the past decade, has brought with it a terrifying capacity for wrecking the environment itself. The prophets of doom can only wring their hands over the predicament and precarious future of mankind. But the President of the British Association, likening these days to those of the Renaissance, summed it all up very nicely in his 1969 Presidential Address. He said that Bacon and those of the new science had dared, in spite of the melancholy reflections of the post-Renaissance era, to believe that it was not too late for humanity to be ambitious, yet also understood that it was too early to expect grand ambitions to be fulfilled. Today we were conscious that human history was only just beginning. We were, he pointed out, still beginners; "for that reason we may hope to improve. To deride the hope of progress is the ultimate fatuity, the last word in poverty of spirit and meanness of mind".

Francis Bacon, who was the inspiration of this Presidential Address, was the prime mover in the upsurge of understanding and optimism which succeeded the period of questioning, irresolution and despondency of the early seventeenth century when, as today, some were tempted to wonder if they had not gone too far. The cardinal principles of his philosophy were facts, observation and experiment; without them, he said, man could neither know nor do anything.

Experiment in the ways of climatological research or weather forecasting are the province of the meteorologist. But the facts and observation, without which he would be nearly helpless, are the province of the voluntary observer at sea. When he has come to terms with the weather, for it would be arrogant and heretical to believe that he will ever be able to control it, some future generation may look back over the years and say of the twentieth-century voluntary marine observers that, like Hatshepsut, Henry and Harrison, they 'builded better than they knew'.

In wishing, therefore, all voluntary observers health, serenity and good landfalls during 1970, may we quote from Francis Bacon's *New Atlantis*: "Our goal is the knowledge of causes and the secret motions of things; and the enlarging of the bounds of human empire, to the effecting of all things possible."

L. B. P.

January, February, March

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

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

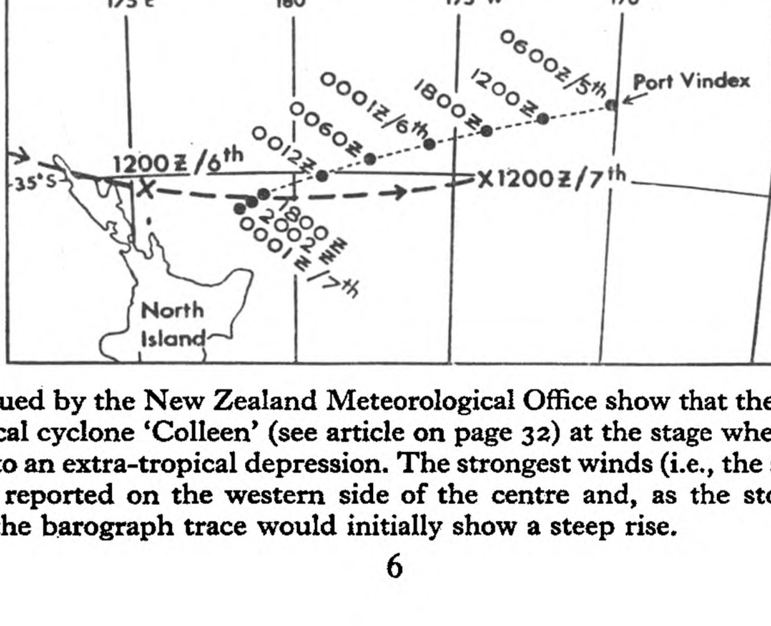
VIOLENT STORM

South Pacific Ocean

m.v. *Port Vindex.* Captain A. L. Smith. Panama to Auckland. Observers, the Master and all officers.

6th February 1969. At 2020 GMT the wind veered S'ly and increased from force 6 to force 10–11. This coincided with a sharp rise in pressure of 2·2 mb. Visibility was down to zero, due to driving spray and rain. The vessel hove to at 2100 with the wind S'E, force 12. Swell waves exceeded 15 ft in height. At 2130 the barograph showed a rise of 8·6 mb but half an hour later it steadied off. By 2220 the wind had decreased to force 9–10.

Position of ship: 35° 47'S, 178° 15'E.



Note. Charts issued by the New Zealand Meteorological Office show that the *Port Vindex* encountered tropical cyclone 'Colleen' (see article on page 32) at the stage when this storm was degenerating into an extra-tropical depression. The strongest winds (i.e., the steepest pressure gradients) were reported on the western side of the centre and, as the storm was moving at about 20 kt, the barograph trace would initially show a steep rise.

MOUNTAIN WAVES

Table Bay, Cape Town

m.v. *Port Lincoln.* Captain M. H. C. Twomey. Table Bay. Observer, Mr. R. W. Partridge, 2nd Officer.

6th January 1969. At 1700 GMT, whilst the vessel was manœuvring in Table Bay, a violent SSE'ly wind of force 12 was experienced, blowing from Table Mountain. Harbour Control, Cape Town reported winds of 68–70 m.p.h. at that time. This wind, combined with bush fires ashore, reduced visibility to 2 miles. Table Mountain was shrouded in orographic Cu clouds.

Position of ship: 33° 35′S, 18° 25′E.

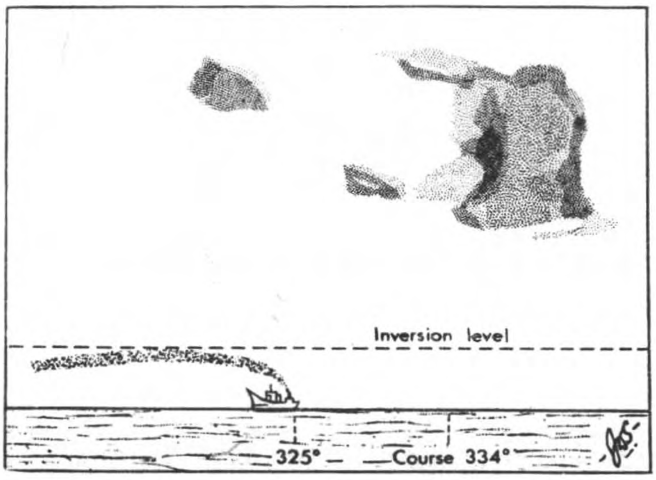
Note. A ridge of high pressure, associated with tight pressure gradients, prevailed over the area on 6th January, giving the strong winds and stable conditions necessary for violent mountain-wave effects. Occasionally the trough of the waves produced on the lee side of the mountain would strike the surface in the form of a violent gust. This is most probably the explanation of the above report.

TEMPERATURE INVERSION

North Atlantic Ocean

m.v. *Northumberland.* Captain R. G. Hollingdale. Durban to Hull. Observer, Mr. J. W. Spence, 2nd Officer.

16th March 1969. At 1420 GMT the tanker *Neverita* was observed 'blowing tubes'. Her dense, black smoke rose almost vertically, then levelled out and drifted slowly to the westward at the inversion level.



At *Northumberland* the wind was light and variable, sometimes calm, and the sea had a glossy appearance. A slight haze draped the horizon around the ship. Air temp. 78·8°F, wet bulb 75·8°, sea 77°. Cloud 1/8 Ci.

Neverita eventually completed her routine but the early smoke persisted, gradually dispersing at the inversion level.

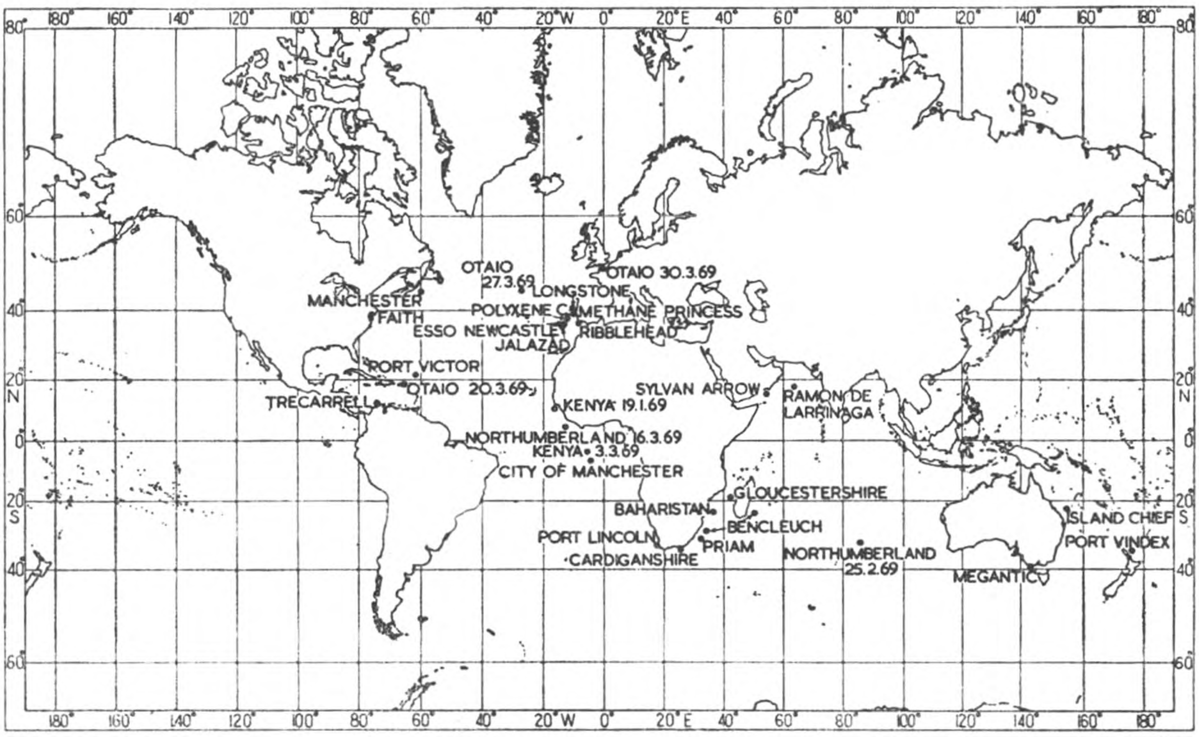
Position of ship: 04° 56′N, 13° 59′W.

DISCOLOURED WATER

Indian Ocean

s.s. *Bencleuch.* Captain R. K. Cowie. Dakar to Penang. Observers, Mr. B. W. Noble, Chief Officer, Mr. A. G. Thomas, 2nd Officer and Mr. P. Frewer, Cadet.

22nd February 1969. At 1210 GMT the vessel passed through long, thin patches of coloured matter floating on the sea surface. The width of the patches was from 10



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

to 15 ft but the limits of their length were not visible so no estimate can be given. The separation was from 500 yd to over a mile and all patches were orientated in the same direction, 320–140°, obliquely across the ship's course. The ship continued crossing these patches until 1430, the separation becoming wider as time progressed. The colour was predominantly light brown or buff with some patches having a bright-yellow streak down the centre. A slight, musty, wheat-flour odour was noticed. A sample was taken. Air temp. 80·0°F, sea 83·3°. Wind E'ly, force 1. Sea waves about 1 ft. Long swell, about 10 ft from SW. Course 065° at 15·8 kt.

Position of ship: 28° 22′S, 34° 56′E.

24th February 1969. Observers, Mr. A. G. Thomas, 2nd Officer and Mr. J. Allan, 3rd Officer.

At 0600 GMT the vessel passed through several patches of discoloured water roughly circular in shape. The patches were about 70 yd across and were much lighter in colour than the surrounding sea surface. Several large fish, sharks, porpoises or whales were seen in the vicinity along with numerous very small flying fish. There were additional patches of brown-coloured matter floating on the surface and the sea water sample was taken closer to one of these than the larger patches. Air temp. 84·0°F, sea 82·9°. Wind N'E, force 3. Slight SE'ly swell.

Position of ship: 23° 20′S, 50° 23′E.

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

"The two samples forwarded from the *Bencleuch* proved exceptionally interesting. Both were primarily *Trichodesmium erythraeum* blooms but both showed secondary features new to me.

"In the first, more southerly one it was a vigorous bloom superimposed on a senescent bloom of the single 'large' diatom *Rhizosolenia castracanei* with numerous free-floating chains of the endophytic parasite *Richelia intracillularis* which had probably helped to kill off the *Rhizosolenia* and were themselves sufficiently numerous to add significantly to the over-all colour effect of the *Trichodesmium.*

"In the second, off Madagascar, the *Trichodesmium* itself showed signs of being senescent, but was regenerating and there were fair numbers of an unusual plankton diatom which will, I think, prove to be *Chuniella Novae Amstelodamae* of Karsten, if that monstrous taxon is still accepted by the systematists."

off Portuguese East Africa

m.v. *Baharistan*. Captain J. Brown. Beira to Dakar. Observers, the Master and Mr. W. I. Skinner, 3rd Officer.

10th March 1969. At 0955 GMT bands of dun-coloured water, about 30 ft broad, were observed. They were lying in an 070–250° direction for a N–S distance of about 4 miles. The average distance apart of the bands was half a mile and they extended for approx. a quarter of a mile on either side of the ship. A sample was taken and, although clear, was treated with formalin. Air temp. 87·0°F, sea 82·2°.

Position of ship: 23° 45′S, 35° 42′E.

Note. Dr. Hart comments:

"The sample was most interesting since, after centrifuging a 10 ml aliquot, I found 161 filaments of *Trichodesmium erythraeum* and 138 smaller unicellular organisms, mainly diatoms. The latter are, of course, some two orders of magnitude smaller than a *Trichodesmium* filament so that the dominance of *Trichodesmium* was much more pronounced than the numbers alone would indicate. Here we have proof that an apparently clear sample may sometimes contain not less than 30,000 organisms per litre and reveal the identity of the dominant species in the area".

SUBMARINE EARTHQUAKE

Eastern North Atlantic

s.s. *Esso Newcastle*. Captain C. L. Thomas. Cape Town to Hamburg. Observers, the Master and all crew.

28th February 1969. At 0240 GMT I was shaken out of bed by a severe shuddering, vibrating and a rumbling noise with a feeling as if the ship was lifting out of the water. I immediately went on the bridge, by which time the engines had been put on stand-by and the engine room alarm had been sounded. My first reaction was that we had lost the propeller or broken a blade but the revs. counter showed normal revs. except that they had been eased in. The next thing that came to mind was that we had struck some underwater object. However, by this time the Chief Engineer had rung the bridge reporting everything normal in the engine room and asking if we had touched bottom. This was impossible as we were in 2,000 fm of water. The shuddering lasted 4–5 min and the engines were off stand-by at 0250. Soundings were taken of peaks, pump-rooms and double bottoms but showed nothing. Ullages of cargo tanks were checked where possible but these showed normal. I came to the conclusion that it must have been some underwater disturbance and this was confirmed by the 0700 BBC news which reported severe earth tremors in Spain, Portugal and Morocco in the early hours of the morning. The centre was stated to be out in the Atlantic, west of the Strait of Gibraltar. Scientists reported seismographic instruments destroyed and that it was the worst earth tremor recorded. Wind WNW, force 5. Visibility good. Sea, slight to moderate. Moderate swell.

Position of ship: 36° 31′N, 12° 33′W.

m.v. *Polyxene C*. Captain T. Kotsiotis. Bombay to Avonmouth. Observers, the Master and all crew.

28th February 1969. At 0240 GMT the vessel vibrated very strongly for about 3 min due to some unknown cause. This subjected the ship's engine to exceptional stress and, in view of the possibility of damage to the engine, hull and cargo, the speed was immediately reduced to a minimum. Gradually, the condition of the sea subsided to normal and all bilges and tanks, etc. were sounded but there was no evidence of any leakage. I was most anxious in regard to the possibility of shifting of cargo but all compartments had been filled to capacity and it was not possible to ascertain if any movement of cargo had taken place.

In the morning there was a BBC news transmission from which we learned that an earthquake had occurred in Portugal, Spain and Morocco and the centre of the earthquake was close to our position and coincided with the exact time of the ship's vibrations.

Position of ship: 38° 32'N, 11° 26'W.

m.v. *Jalazad*. Captain H. J. Mullan. Cherburg to Las Palmas. Observers, the Master, Mr. A. C. Batra, 2nd Officer and other members of the crew.

28th February 1969. At 0240 GMT, while the vessel was approx. 202° due west of Cape Spartel, violent shuddering vibrations were experienced for over 1 min. The vibrations were rather similar to those felt when a vessel runs aground. All the derricks and skeleton structures were seen to tremble violently and the Master and almost all the ship's crew were awakened by the noise. The engines were put to Stop and the echo-sounder was switched on but no soundings were obtained. The sea around the ship was searched for any floating obstructions with the aid of search-lights but nothing was seen. Twenty minutes later the engine was re-started and course resumed without any further incident. At 0240: Wind W'ly, force 5–6. Moderate sea with heavy swell. Course 197° at 13 kt.

Position of ship: 35° 47'N, 12° 36'W.

Similar reports were received from the following ships:
s.s. *Methane Princess* (Captain Bradley) in position 39° 16'N, 9° 50'W.
m.v. *Ribblehead* (Captain J. E. Riekstins) in position 36° 47'N, 8° 22'W.
m.v. *Longstone* (Captain J. Conn) in position 40° 17'N, 10° 57'W.

Note 1. Mr. J. H. Latter of the Institute of Geological Sciences, Edinburgh, comments:

"The earthquake on 28th February 1969 at 02h 40m 32s GMT was the greatest anywhere in the world since the Alaskan earthquake of 28th March 1964. Its magnitude was between 8 and 8¼ as against about 8½ for the Alaskan earthquake. The total seismic energy released would have been of the order of 5×10^{23} ergs (roughly equivalent to 20 million tons of TNT); a comparable figure for the Alaskan earthquake is $1{\cdot}2 \times 10^{24}$ ergs (equivalent to some 75 million tons of TNT). The energy released in a 'normal' atomic bomb is only 8×10^{20} ergs (some 37,000 tons of TNT).

"From world-wide seismic data the position of the earthquake was located at 36·0°N, 10·6°W by the U.S. Coast and Geodetic Survey and, using slightly different data, at 36·2°N, 10·5°W by the International Seismic Centre at Strasbourg. Its depth of focus was estimated as about 22 km below the surface (classed as a shallow earthquake).

"The earthquake was felt in France, Portugal, Morocco and the Canary Islands. Four people were killed (three in Morocco and one in Portugal) and 74 were injured. A minor tsunami (seismic sea wave) occurred, reaching a height of 1·2 m at Casablanca; as the earth-quake occurred beneath deep water, slightly off the edge of the continental shelf, this was smaller than it would have been had the earthquake occurred closer in to shore. The earth-quake was in the same general area as the Lisbon earthquake of 1755, perhaps the greatest historical earthquake, in terms of magnitude, which is known."

Note 2. Further reports on disturbances of both seismic and volcanic type will be sent to Mr. Latter who says:

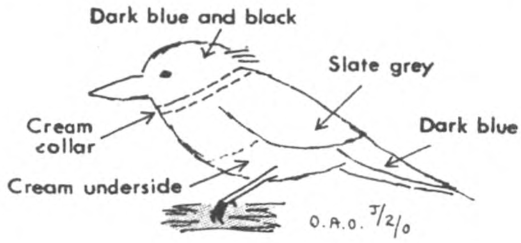
"Information on disturbances which can be attributed to submarine volcanic activity is often only obtainable from shipping, since such disturbances are usually not recorded by land-based seismic stations (they are often, however, picked up by sonar networks). We are endeavouring to collect all information on volcanic activity and have long suspected that much submarine activity goes unnoticed. Therefore any information that you can pass on to us regarding temperature changes, underwater detonations or luminous effects, or observed vapour emission, together with any reports of subaerial activity on remote island volcanoes, will be of very great interest."

BIRD

Coral Sea

m.v. *Island Chief*. Rabaul to Sydney. Observers, Mr. G. Grylls, 3rd Officer and Mr. O. A. Overland, Junior 2nd Officer.

6th February 1969. During the course of the morning a small bird was seen aboard the vessel. It was about 6 inches long with a beak of 1 inch and, in general outline only, showed some resemblance to a miniature kookaburra but was much more highly coloured. It would appear to be a land-bird but, apart from Swain Reefs (30 miles to the west) and Saumarez Reefs (25 miles to the NE), there was no land within 130 miles, the nearest being the Queensland coast in the vicinity of Port



Curtis. Weather at the time was fine and clear with light N'ly winds. Course 173°.

Further enquiries revealed that the bird had been with the ship for about two days previous to the above observation.

Position of ship: 22° 20'S, 153° 15'E.

Note 1. When forwarding the above report, the Director of Meteorology, Bureau of Meteorology, Australia, enclosed the following comments from Mr. R. M. Warneke of the Fisheries and Wildlife Department, Melbourne:

"To answer your query about the bird sighted on 6th February I sought the assistance of Mr. A. McEvey, Ornithologist at the National Museum. From the description given, Mr. McEvey was of no doubt that it was a kingfisher but it was not possible to be definite as to species. We had a good look at specimens of several likely species from Queensland and decided that it was either a forest kingfisher, *Halcyon macleayi*, or a Sacred Kingfisher, *H. Sancta*. The latter is more likely in view of its occurrence along the coast and its more nomadic habits."

Note 2. The *Island Chief* is an Australian Selected Ship.

TURTLES

North Atlantic Ocean and English Channel

m.v. *Otaio*. Captain F. S. Angus. Curaçao to London. Observer, Mr. J. B. P. Storey, 5th Engineer.

27th March 1969. At 1224 GMT a small reddish-brown turtle, about 2 ft in diameter across the shell, was seen close alongside. Air temp. 55°F, sea 56·2°.

Position of ship: 44° 07'N, 27° 16'W.

30th March 1969. Observers, Mr. A. J. Davis, 3rd Officer and Mr. C. J. Sherwood, Junior 3rd Officer.

At 1130 GMT a turtle, about 3 ft in diameter, was seen close alongside, swimming westward at a depth of 2–3 ft. It was being attacked by several gulls. At 0600: Air temp. 48·2°F, sea 48·0°.

Position of ship: 50° 19'N, 1° 28'W.

Note. Dr. L. D. Brongersma, Director of the Natural History Museum, Lieden, comments:

"The turtle seen on 27th March was a Loggerhead (*Caretta caretta*). The report is from an area where one would expect to meet with Loggerheads that are on their way to British or French waters, but from which no records are known as yet. I dispose of numerous records from the area north of the Azores, but none of them so far north as the turtle seen by Mr. Storey. Hence this record is a very welcome addition.

"The observation of 30th March is a valuable one because, as yet, no turtles have been reported from the Channel in March (or April). Among the 195 records of turtles from British and Irish waters there are only two from March and two from April (all from Ireland, and all four Loggerheads, *Caretta caretta*). A Leathery Turtle (*Dermochelys coriacea*) has once been recorded from Brittany in April. Both the Loggerhead and the Leathery Turtle must be considered in connection with the present record but, without further data, no definite identification can be made. If "3 ft in diameter" refers to the shell, the specimen may have been an adult Loggerhead or a young Leathery Turtle. If the observers have noticed that the shell was covered with horny scutes, the only possibility would be the Loggerhead.

"Gulls have been reported to attack a Leathery Turtle in Scottish waters (October 1959) and in Carmarthen Bay (September 1961)."

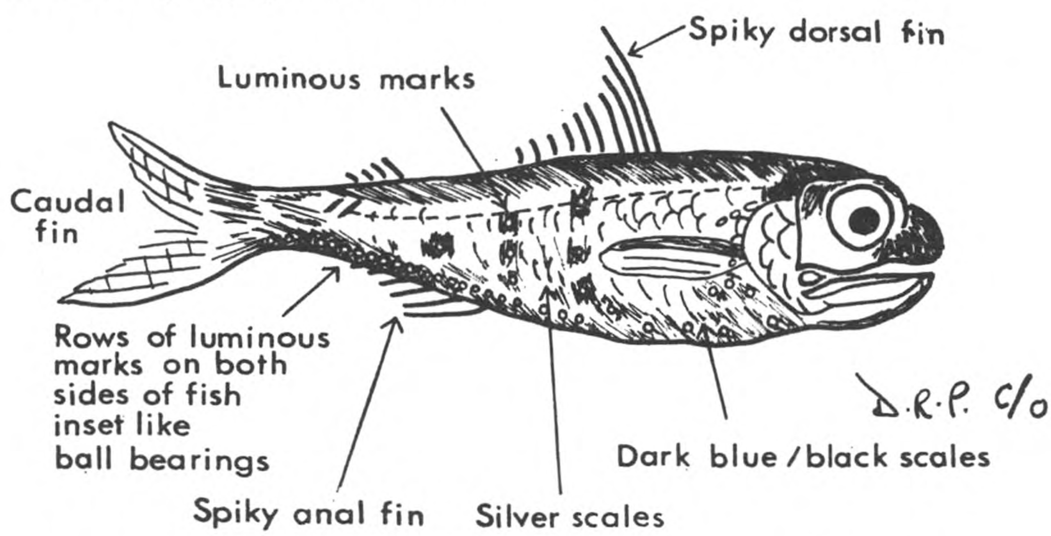
FISH

Western North Atlantic

m.v. *Manchester Faith.* Captain J. Illingworth. Manchester to Halifax, N.S. Observer, Mr. D. R. Perry, Chief Officer.

17th January 1969. This unidentified fish, shown life-size in the sketch, was washed aboard during rough weather while the vessel was off Sable Island. Air temp. 31·0°F, sea 37·4°. Wind NE, force 6. Depth of water 44 fm.

Position of ship: 44° 30′N, 60° 00′W.



Note. Mr. G. Palmer of the Department of Zoology, Natural History Museum, identified this as one of the lantern fishes, family *Myctophidae.*

There are about 170 species of lantern fish, varying in size from 2 to 6 inches long, which spend their day in the deep sea, but, when darkness comes, rise to the surface where food is more plentiful. They get their name from the two sets of lights, one consisting of small, round organs (photophores) arranged in two rows on the underside of the body and on the head. These are arranged in various patterns which are constant within a particular species. The other set of lights consists of a small number of plate-like photophores on the tail, just in front of the caudal fin. The lights on the flank glow dimly and probably serve as recognition signals within the shoal but the caudal light is much greater than that given off by all the other organs together and would be sufficient to illuminate a small room momentarily. This sudden flare of the tail light is probably used to blind a predator while the lantern fish escapes in the ensuing darkness.

It is interesting to link Mr. Perry's descriptive phrase "inset like ball-bearings" with a report from O.W.S. *Weather Observer,* at Station 'Juliett' in April 1952, of a widespread shoal of lantern fish which were seen to be "covered in round spots like dabs of solder".

MARINE LIFE

North Atlantic Ocean

s.s. *Kenya.* Captain I. K. Bowerman. Santa Cruz to Durban. Observer, Mr. G. F. Lack, Extra 2nd Officer.

19th January 1969. Between 1440 and 1545 GMT, and again around 1615, approx. 500–600 'jelly-fish' were seen in groups of about 80–100, and also single fish dotted about. It was thought that they may have been Portuguese Men-of-War. They were from 6 to 12 inches in length and the 'dorsal fin' extended 3 to 4½ inches above the surface. The top of the 'fin' and down for a length of 1 inch was a brilliant, luminous salmon-pink while the remainder was a transparent greyish-blue. On some a growth was observed attached to one end and behind this could be seen 'tails' extending 3–3½ ft downwards. Air temp. 75°F, sea 76°. Wind NW, force 3.

Position of ship: 9° 36′N, 16° 14′W.

Note. Miss A. M. Clark of the Department of Zoology, Natural History Museum, comments:

"Thank you very much for forwarding the report and the colour transparencies [not reproduced here] taken by Mr. Lack. They all appear to be of the Portuguese Man-of-War (Physalia) as he says. Considering the distance from bridge to sea surface, some of them show a surprising amount of detail when viewed through a lens. Would you convey our thanks to Mr. Lack when the opportunity arises?"

Indian Ocean

m.v. *Priam.* Captain I. R. Atkinson. Colombo to Dublin. Observers, Mr. R. W. Bristow, 2nd Officer and Mr. P. Boistelle, Cadet Officer.

27th January 1969. At 1750 GMT, whilst getting a sample of sea water for determining sea temp. for the 1800 observation, the ship was stopped. On pulling up the bucket after about 1½ min the cadet received a sting from a 'jelly-fish' attached to the rope. It measured 6 inches in length and was blue in colour and we transferred it to a sample bottle immediately. It was still alive but, unfortunately, one of its long 'tails' was broken on removing it from the rope. Formalin was added to the bottle which was then sealed. After about four days the colour faded but otherwise the 'jelly-fish' appeared to be in good order. It had a fairly hard jelly on it and the wrinkles appeared to be quite solid. It is thought to be of the Portuguese Man-of-War breed.

Position of ship: 30° 48′S, 34° 04′E.

Note. Miss M. Rowe of the Coelenterate Section, Department of Zoology, Natural History Museum, comments:

"The specimen forwarded to the Museum is a young specimen of the Portuguese Man-of-War, *Physalia physalia.* It is in a very good state of preservation and will be added to our collection. Thank you for sending it."

m.v. *Northumberland.* Captain R. G. Hollingdale. Albany, Western Australia to Durban. Observers, the Master, Mr. A. J. Ward, Chief Officer and Mr. J. Morrison, Junior 3rd Officer.

25th February 1969. At 0200 GMT the vessel encountered a large shoal of jelly-fish, most of which were breaking the surface while the remainder were thought to lie about 6 ft below. They were cylindrical in shape and tapered from a tail of 4 inches to a head of 2 inches in diameter. They were 12 inches long with a ridge extending the length of their bodies. At the head were two 'eyes', one the colour of yellow ochre and the other turquoise blue. The yellow 'eye' was much larger and situated more towards the head than the blue one. Some of the fish were seen to make sudden movements towards each other. A group was seen apparently connected side by side, forming a U-shape about 5 ft long. At times there seemed to be something trailing from the narrow end, some 12 inches in length. The vessel, which was making 15 kt in a very calm sea, took 30 min to pass through the main body of the shoal. Stragglers were observed for another 1½ hours. Air temp. 72·2°F, sea 74·3°.

Position of ship: 30° 59′S, 84° 59′E.

Note. Miss A. M. Clark of the Department of Zoology, Natural History Museum, comments:

"This report probably refers to salps (tunicates) rather than proper jelly-fish since the objects were cylindrical and some were connected together. These animals are hollow through the centre and move by jet propulsion. Sometimes they bud off a chain of young individuals which trails behind, as noted, finally breaking off. The yellow 'eye' was probably the gut mass which is concentrated into a small area. This must have been a very large shoal."

LUMINESCENCE

Arabian Sea

m.v. *Ramon de Larrinaga*. Captain G. D. Clarke. Singapore to Kuwait. Observers, Mr. H. Dickinson, jun., 3rd Officer and Mr. J. Prudhoe, Radio Officer.

11th February 1969. Between 1600 and 2000 GMT luminescence was so bright at times as to badly hinder visibility. It consisted of rapid, vivid-green flashes of light and broken bands 100–200 ft in length stretching WNW–ESE along the line of swell. Pin-points and blotches of brilliant white/green stretching up to 6 miles or so from the ship, some the size of a saucer and others much larger. On looking through binoculars it could be seen that the flashes extended to the horizon and the sea appeared to be covered with stars. Along the sides of the ship there were streaks about 12–15 ft wide of milky-silver glowing water bright enough to light up the sides and superstructure of the vessel. At 1655 Venus, on setting, glowed orange and bright red before slipping below the horizon and the luminescence ceased for a while. A few minutes later Saturn rose in the east and, at 1710, after gaining altitude and brilliance, luminescence started again although not so brightly as in the previous hour. Within 30 min it was as bright as before, only this time it was a luminous blue and confined to within a mile of the ship. There were no bands, just vivid flashes of white/blue light and brilliant luminosity of bow waves and wake. By 1900 the luminescence was confined to water disturbed by the ship but it was difficult to decide whether it was blue or green. Fish jumping from the bow waves also showed as vivid white/blue streaks. At 1945 the vessel passed through a large shoal of small fish, each one a brilliant light jumping out of the water. The splashing noise could be clearly heard like pelting rain, so much so that the 2nd Officer, who had just been called for watch, heard it from his cabin and came to the bridge all prepared for a downpour. Long, broad, luminous bands showed for 10 min at 1½–2 miles on the starboard bow, lying parallel in an E–W direction. An Aldis lamp shone on the sea surface did not appear to enhance the brilliance. The radar showed a fairly dense clutter similar in appearance to that of a low rain cloud. During the period the air temp. fell from 80°F to 75°, wet bulb from 76° to 69° and sea temp. 79° to 76·5°.

Position of ship at 1800: 18° 30′N, 63° 54′E.

s.s. *Sylvan Arrow*. Captain F. L. Curtis. Kharg Island to Assab, Eritrea. Observer, Mr. P. D. Kelly, 3rd Officer.

11th March 1969. When taking the 0001 sea temperature a piece of luminescence was found on the thermometer. The particle measured 1½ × 1 × 1 mm and had a black sort of nucleus with very fine particles around it which seemed to be in motion most of the time. It was these small particles which made the whole glow brighter. It glowed for about 8 min after being removed from the rubber bucket. Air temp. 76·8°F, wet bulb 73·6°, sea 79·7°.

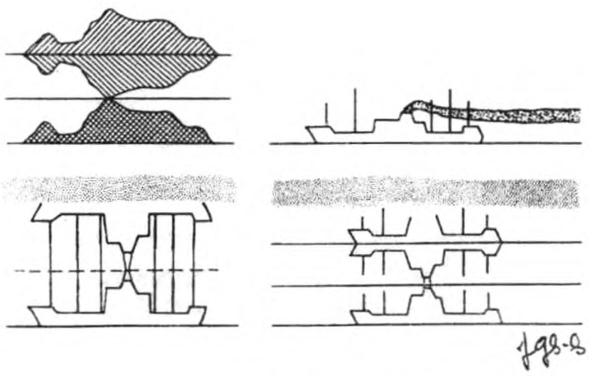
Position of ship: 15° 48′N, 52° 54′E.

ABNORMAL REFRACTION

Great Australian Bight

m.v. *Megantic*. Captain W. J. Stanger. Adelaide to Melbourne. Observers, Mr. V. H. Ridges, 2nd Officer, Mr. J. C. Carroll, 3rd Officer and Mr. J. G. Standring-Smith, Cadet.

11th January 1969. At 0400 GMT a double reverse-mirage effect was seen, bending the sea horizon where a dense haze bank met the sea. The actual coastline appeared with an inverted image above and a clearer upright image above that. Ships were sighted with a double and then single inverted image above, with derricks, masts,



samson posts and funnel all joined together. The funnel smoke was seen to sink instead of rise, leaving a layer of smoke miles astern and showing the presence of a temperature inversion. Air temp. 65·3°F, wet bulb 62·1°, sea 62·1°.

Position of ship: 38° 40′S, 142° 15′E.

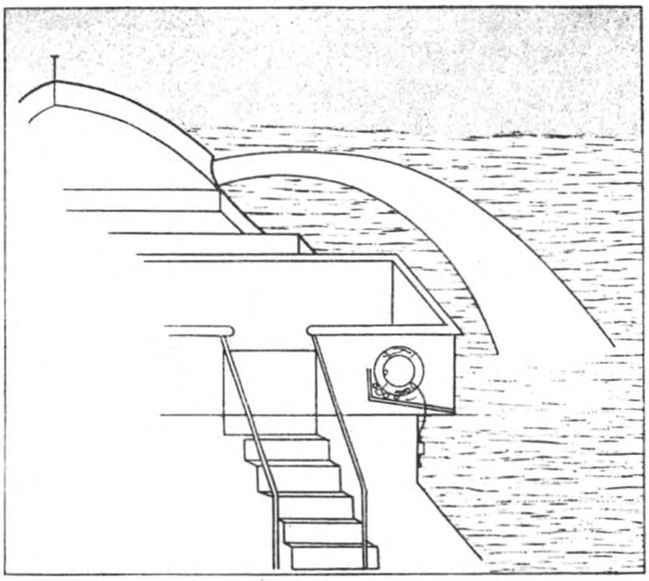
LUNAR FOG-BOW

South African waters

m.v. *Cardiganshire.* Captain D. M. Belk. Las Palmas to Penang. Observers, the Master, Mr. P. F. Robinson, Chief Officer and Mr. M. J. Harrison, 3rd Officer.

30th March 1969. At 2000 GMT, on an otherwise fine night with good visibility, the ship encounterered dense fog. The fog banks varied in size and appeared to extend to a height of about 120 ft, with the moon and stars visible above. Horizontal visibility was less than 200 yd. A fog-bow formed on the starboard side of the ship with the moon just abaft the port beam, bearing 330°, altitude 43°. The bow was white with no colour visible. It went from the sidelight, stretching forward down to the water. The bow re-formed each time the ship entered a fog bank and was very well defined. Air temp. 65·6°F, wet bulb 65·6°, sea 64°. Wind E'ly, force 3.

Position of ship: 34° 18′S, 25° 07′E.



Note. As the moon's altitude was 43° only the upper part of the bow would be observed. With lower altitudes the bow would be more complete. Since the fog-bow is due to refraction within water droplets much smaller than raindrop size, the angular radius of the fog-bow will not be the same as that of the more commonly observed rainbow. With low altitude of the luminary, fog-bows of more than a semicircle, sometimes full circle, may be observed and then measurements of the angular radius would be valuable.

LUNAR HALO

Mozambique Channel

m.v. *Gloucestershire.* Captain N. F. Fitch, M.B.E. Cape Town to Colombo. Observers, Mr. R. R. Baker, 3rd Officer, Mr. D. H. Thomas, Extra 3rd Officer and Mr. M. R. Brombil, Q.M.

8th March 1969. At 2100 GMT a $22\frac{1}{2}°$ halo formed round the moon and from off one side, as in a tangent, an offshoot appeared about the length of the radius of the circle. The Cs cloud around the moon stopped just on the edge of the halo. At 2230 an outer halo formed round the moon but now there were two offshoots, one either side of the inner halo. Air temp. 83·1°F, wet bulb 79·7°, sea 83·3°.

Position of ship: 19° 27′S, 41° 36′E.

2100Z 2230Z

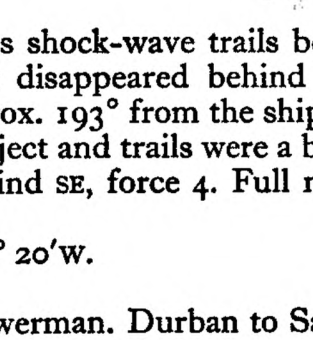
Note. Diagrams and a description of halo phenomena appear in the *Marine Observer's Handbook.* Upper and lower arcs of contact are occasionally reported. Reports of arcs contacting the halo in other positions are extremely rare.

SATELLITE

South Atlantic Ocean

m.v. *City of Manchester.* Captain J. S. Grant. Cape Town to Dakar. Observers, the Master and Mr. D. G. Hall, Extra 2nd Officer.

3rd March 1969. At about 2058 GMT what appeared to be a bright wedge-shaped cloud was seen in the west, bearing approximately 285° and about 10° above the horizon. With the aid of binoculars, it was seen to be a bright space vehicle or

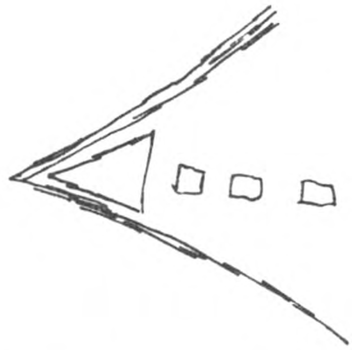


satellite with two conspicuous shock-wave trails behind it. It was observed until approximately 2107 when it disappeared behind a small cloud below the star Canopus on a bearing of approx. 193° from the ship and with a maximum altitude, by sextant, of 40° 20′. The object and trails were a brilliant white. Air temp. 80·2°F, wet bulb 75·5°, sea 81·2°. Wind SE, force 4. Full moon with a trace of Cu cloud. Course 323°, $14\frac{1}{2}$ kt.

Position of ship: 7° 06′S, 4° 20′W.

s.s. *Kenya.* Captain I. K. Bowerman. Durban to Santa Cruz.

3rd March 1969. At 2110 GMT an object appeared on a bearing of 230°, altitude 20°, and disappeared on bearing 170°, altitude 70°. It was moving very slowly and



its magnitude was estimated at −3·0. Through binoculars it seemed to be conical, followed by three other bright objects, with vapour trails extending on either side.

Position of ship: 2° 55′S, 6° 51′W.

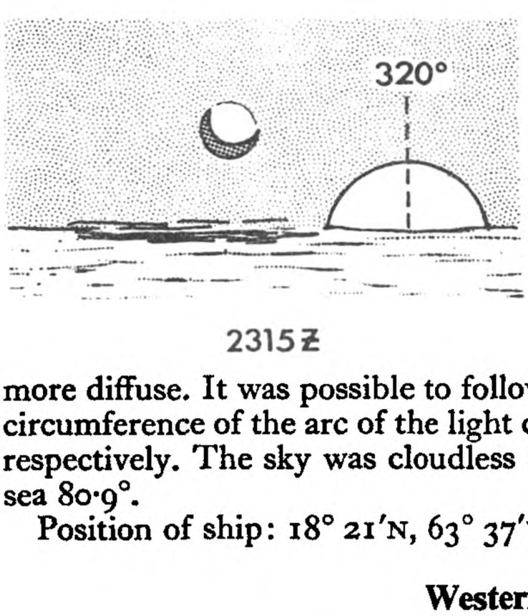
Note. The staff of the Satellite Prediction Group, Radio and Space Research Station, said that Apollo 9 was launched at 1600 GMT on 3rd March and that it is usual for the exhaust cloud of the rocket, which travels with it and is illuminated by the sun, to be visible for several hours after launch.

OPTICAL PHENOMENON

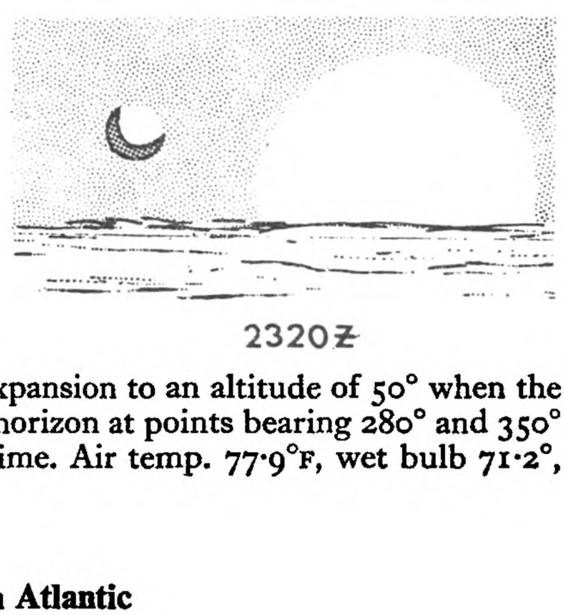
Caribbean Sea

m.v. *Otaio*. Captain F. S. Angus. Curaçao to London. Observers, Mr. W. Marshall, 2nd Officer, Mr. A. J. Davies, 3rd Officer and Mr. G. Adkin, Cadet.

20th March 1969. At 2315 GMT, about an hour after sunset, a semicircle of milky-white light became visible in the western sky and rapidly expanded upward and outward during the next 10 min. When first seen it was quite bright (e.g., as clearly defined as a high cloud across the face of a full moon) but, as it expanded, it became



2315Z



2320Z

more diffuse. It was possible to follow the expansion to an altitude of 50° when the circumference of the arc of the light cut the horizon at points bearing 280° and 350° respectively. The sky was cloudless at the time. Air temp. 77·9°F, wet bulb 71·2°, sea 80·9°.

Position of ship: 18° 21′N, 63° 37′W.

Western North Atlantic

m.v. *Port Victor*. Captain G. Carling. Curaçao to Dunkirk. Observer, Mr. R. A. Cunningham, 3rd Officer.

20th March 1969. At 2315 GMT a sharply-defined globular area of light was seen to rise on the western horizon and enlarge rapidly. By 2319 it had become irregular in shape and spread a general light. The moon, which had a double crescent, bore 282° and was two days old. At first, the moon was above and to the left of the light area but it eventually became enveloped by it. At 0001 on the 21st: Air temp. 78·1°F, wet bulb 74·3°, sea 79°. Cloud 3/8 Sc with good visibility.

Position of ship: 20° 36′N, 61° 10′W.

Note. Since this phenomenon did not occur above the sun's position it cannot be explained as a rare twilight effect. It has been suggested by the staff of the Radio and Space Research Station that a rocket experiment carried out from the ranges at Cape Kennedy or Puerto Rico is the most likely explanation for the reports from the *Otaio* and *Port Victor*.

METEOR

Caribbean Sea

m.v. *Trecarrell.* Captain T. Robinson. Liverpool to Cristobal. Observer, Mr. P. L. Hunt, 3rd Officer.

8th March 1969. At 0110 GMT an object, either meteorite or satellite, shot across the sky at a low altitude from SE to NW. It had a very long tail and the light from it was so intense that it lit up the ship and surrounding sea as bright as day. The

passage across the sky took 2 or 3 sec. The leading edge of the object seemed to be between red and violet in colour. It appeared to be spherical. Air temp. 80·2°F, wet bulb 76·5°, sea 80·4°. Wind E'N, force 5.

Position of ship: 12° 27'N, 75° 56'W.

AURORA

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

"Auroral sightings reported by observers in British ships during the three months January–March 1969 (and three for last year recently received) are listed below.

"Geomagnetic activity was highest in March when the index figure of 8_0 (in the planetary scale 0_0–10) for the 3-hourly periods before and after midnight was reached on 23rd/24th March and figures of 6– and 6_0 on two other occasions (12th and 17th).

"On 23rd/24th March reports confirmed the widespread nature of the display, with maxima around 2200 and 0200. Rays were overhead over southern England and similar latitudes across the Atlantic, while rayed and homogeneous arcs were simultaneously overhead at the much higher latitudes of the auroral zone. The red coloration which often characterizes big auroral displays was apparent in both northern and southern hemispheres. Communication fade-outs were experienced during the period.

"Frequent occurrences of aurora were visible to observers on duty in Weather Ships at station 'Alfa' during February and March and details were assiduously reported, to the extent that further supplies of report sheets had to be supplied to the Base. While accustomed to turning to dictionaries when dealing with reports in different languages, we had in one instance to turn to a different source of information to translate the description of an auroral form which was "like a freshwater hydra seen under a microscope".

"Many excellent sketches have again accompanied reports, one from the observer in *Clan Alpine* (11th February) being particularly noteworthy."

Date (1968–9)	Ship	Geographic Position	Λ	Φ	I	Time (GMT)	Forms
3rd Mar.	*Clan McGowan*	41°26′S 110°40′E	180	−52	−73	1830–1910	N
13th Oct.	*Rowanmore*	55°20′N 26°15′W	060	63	+71	0105–0120	HB
1st Nov.	*Samaria*	49°12′N 47°10′W	030	60	+72	2155–2220	RB, RR, P
2nd	*Samaria*	48°24′N 48°47′W	030	60	+72	0230–0250	HA, RA, N
8th Jan.	*Orsino*	64°45′N 22°00′W	070	71	+77	0030–0045	SA
19th	*Weather Surveyor*	58°45′N 18°37′W	070	65	+72	0045–0150	RA, N
	Orsino	65°55′N 23°50′W	070	72	+77	2050–2100	HB
	Weather Surveyor	59°00′N 18°58′W	070	65	+72	2150–2200	HB
						2320–0023	P
20th	*Orsino*	66°00′N 24°00′W	070	72	+77	2110–2120	HB
25th	*Weather Surveyor*	59°09′N 18°38′W	070	65	+72	2020–2210	N
2nd Feb.	*Weather Surveyor*	59°08′N 18°38′W	070	65	+72	2312–2333	RA
5th	*Weather Adviser*	61°12′N 29°24′W	060	69	+75	0200	RA
6th	*Weather Adviser*	61°24′N 30°36′W	060	69	+75	0100	N
		62°08′N 33°18′W	060	70	+76	2215–2400	HB, RA, RB, RR, N
8th	*Weather Adviser*	62°05′N 33°20′W	060	70	+76	0450	N
		62°12′N 33°07′W	060	70	+76	2150–2400	HB, RA, RB, RR
	Ross Orion	70°40′N 18°20′E	120	68	+77	2330–2350	HA, RB
10th	*Weather Adviser*	62°16′N 32°41′W	060	70	+76	2150–2300	RR
11th	*Weather Surveyor*	59°00′N 18°50′W	070	65	+72	0039–0059	N
	Weather Adviser	62°18′N 32°32′W	060	70	+76	0055	RB
	Clan Alpine	36°21′S 81°46′E	140	−66	−66	1500–1605	RR, P, N
12th	*Weather Adviser*	62°01′N 32°30′W	060	70	+76	2150–2400	HB, RR, P
	Weather Surveyor	58°53′N 17°55′W	070	65	+72	2309–0031	RA, P
13th	*Weather Adviser*	62°12′N 32°29′W	060	70	+76	2300	N
14th	*Weather Adviser*	62°07′N 32°48′W	060	70	+76	2200–0850	HA, HB, RB, RR, P
15th	*Weather Adviser*	61°54′N 32°54′W	060	70	+76	2045–2400	HA, HB
16th	*Weather Adviser*	61°57′N 32°39′W	060	70	+76	0500–0800	HA, HB, N
17th	*Weather Adviser*	61°57′N 32°42′W	060	70	+76	0650–0800	N
18th	*Weather Adviser*	61°06′N 32°52′W	060	70	+76	0150	HA
		61°54′N 33°13′W	060	70	+76	2050	HA
19th	*Weather Adviser*	61°57′N 33°05′W	060	70	+76	2150–2300	N
23rd	*Weather Adviser*	61°57′N 33°00′W	060	70	+76	0550–0630	All forms
24th	*Weather Adviser*	62°03′N 33°00′W	060	70	+76	0510–0800	HA, RB
28th	*Weather Adviser*	62°00′N 32°54′W	060	70	+76	2210–2300	HB, RB, RR, P
1st Mar.	*Orsino*	66°00′N 25°00′W	070	72	+77	2200–2300	HB, RB, RR
	Weather Adviser	62°08′N 32°37′W	060	70	+76	2305–2315	N
2nd	*Weather Adviser*	62°01′N 32°35′W	060	70	+76	0200, 0440	HB, N
5th	*Weather Adviser*	58°06′N 15°48′W	070	64	+72	0320	P, N
8th	*Orsino*	66°00′N 24°00′W	070	72	+77	2115–2300	HB, RR
10th	*Weather Monitor*	62°00′N 32°40′W	060	70	+76	2300	N
11th	*Weather Monitor*	62°08′N 33°11′W	060	70	+76	2302–0500	HA, HB, N
12th	*Trewidden*	57°27′N 09°00′E	100	58	+70	0130–0145	RA, N
14th	*Rievaulx*	65°48′N 08°30′E	100	65	+75	2050–2135	HA, RB
15th	*Rievaulx*	65°48′N 08°30′E	100	65	+75	0300–0420	RA, RR
	Weather Monitor	62°02′N 33°02′W	060	70	+76	2305–0100	RB, N
16th	*Weather Monitor*	62°13′N 32°32′W	060	70	+76	2345–0215	HB, RB
17th	*Redcar*	— —	100	64 (approx.)		0001–0345	HA, N
18th	*Weather Monitor*	62°00′N 33°00′W	060	70	+76	0300	N
	Redcar	68°00′N 15°00′E	110	66	+76	1830–2000	HB, RR, P
19th	*Weather Monitor*	62°01′N 32°55′W	060	70	+76	0200–0400	HB
20th	*Weather Surveyor*	58°59′N 19°14′W	070	65	+72	2135–0215	HB, RA, P
21st	*Weather Monitor*	62°05′N 32°40′W	060	70	+76	0110–0315	All forms
24th	*Corinthic*	35°36′S 61°12′E	120	−43	−63	0001–0006	N
	British Robin	43°40′N 70°14′W	360	55	+73	0200–dawn	RA, RR

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

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Weather Satellites

By N. Holdsworth
(Central Forecasting Office, Bracknell)

The first American weather satellite, TIROS 1, was launched on 1st April 1960 for the purpose of making experimental weather observations. Results were encouraging and further satellites were launched during the next few years. Reception techniques were improved, the satellites modified and new orbits tried. In 1963 TIROS 8 carried the first 'Automatic Picture Transmission' system (APT) for constant data read out. In 1965 TIROS 9 was launched into quasi-polar orbit to give, for the first time, world coverage on a day-to-day basis. By 1966 the lessons learnt from the experimental satellites (TIROS 1 to 10) had been consolidated and a fully operational programme was begun with the launching of ESSA 1 on 3rd February 1966. E.S.S.A. (Environmental Science Services Administration) is the controlling body for the American weather satellite programme.

Some of the earlier satellites in the ESSA series have now failed due to orbital or equipment deterioration but these have been replaced by more sophisticated equipment and the use of satellite photographs to assist weather analysis has now become a well-established part of meteorological practice.

The satellites themselves are basically of two types: command read out and automatic picture transmission. The command satellites read out on interrogation to the American tracking stations only but the APT satellites transmit almost continuously and can be received by any station with a suitable directional aerial and receiver. The eighth satellite in the ESSA series carries APT and is the one currently used by the British Meteorological Office.

ESSA 8 has a near polar orbit making an angle of about 12 degrees with the earth's polar axis. It is fixed in the same plane as the sun so that the satellite ground track corresponds as nearly as possible to local midday/midnight to give maximum daylight for photography. The rotation is southbound on the sunlit side of the earth and the period of orbital revolution is 1 hour 55 minutes.

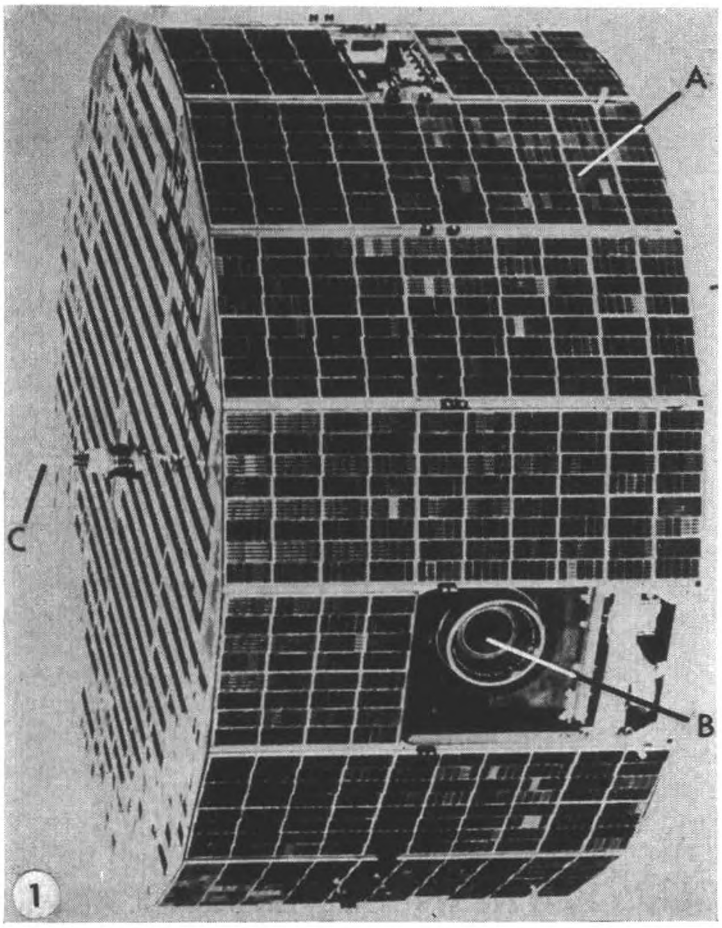
The vehicle itself is drum-shaped (*see* photograph opposite this page) and slowly rotates in its orbit like a wheel with the curved side towards the earth. Two cameras are used in the curved side 180 degrees apart, one acting as replacement for the other to compensate for any deterioration in performance which might develop. As the satellite rotates along its orbit the camera in use takes an instantaneous television picture when it is pointing straight down towards the ground. This is then scanned electronically and converted into a radio signal. It takes 3½ minutes to transmit the scan and a new picture is taken every 5½ minutes.

To provide consistency between photographs the cameras must be exposed pointing squarely downwards and one of the jobs of the ground control station is to make minor day-to-day corrections to the satellite attitude. A radio signal to the satellite causes electric current to pass through coils mounted round the circumference of the drum. This produces a reaction with the earth's magnetic field which moves the satellite into the required position.

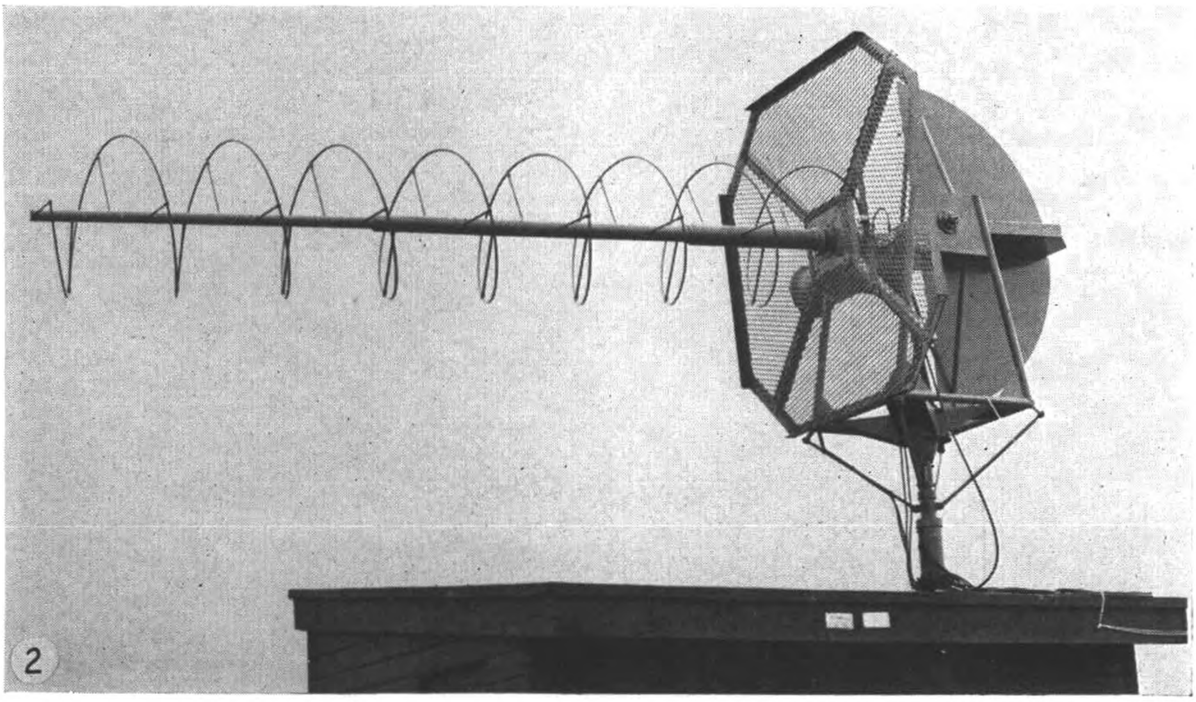
The height of the orbit is about 1,470 km and the cameras have a 90-degree field of view so that one photograph will cover an area some 1,500 nautical miles square. Three or four such pictures, overlapping each other, can usually be received during each orbit by a single APT station. For the British Meteorological Office at Bracknell in Berkshire this represents coverage from about 80°N to 30°N. The satellite is above the horizon for three or four passages during the course of a day, giving an east-to-west coverage in the order of 100 degrees of longitude, say from the Caspian to north-east Canada.

As soon as the satellite rises over the horizon the tracking station lines up the

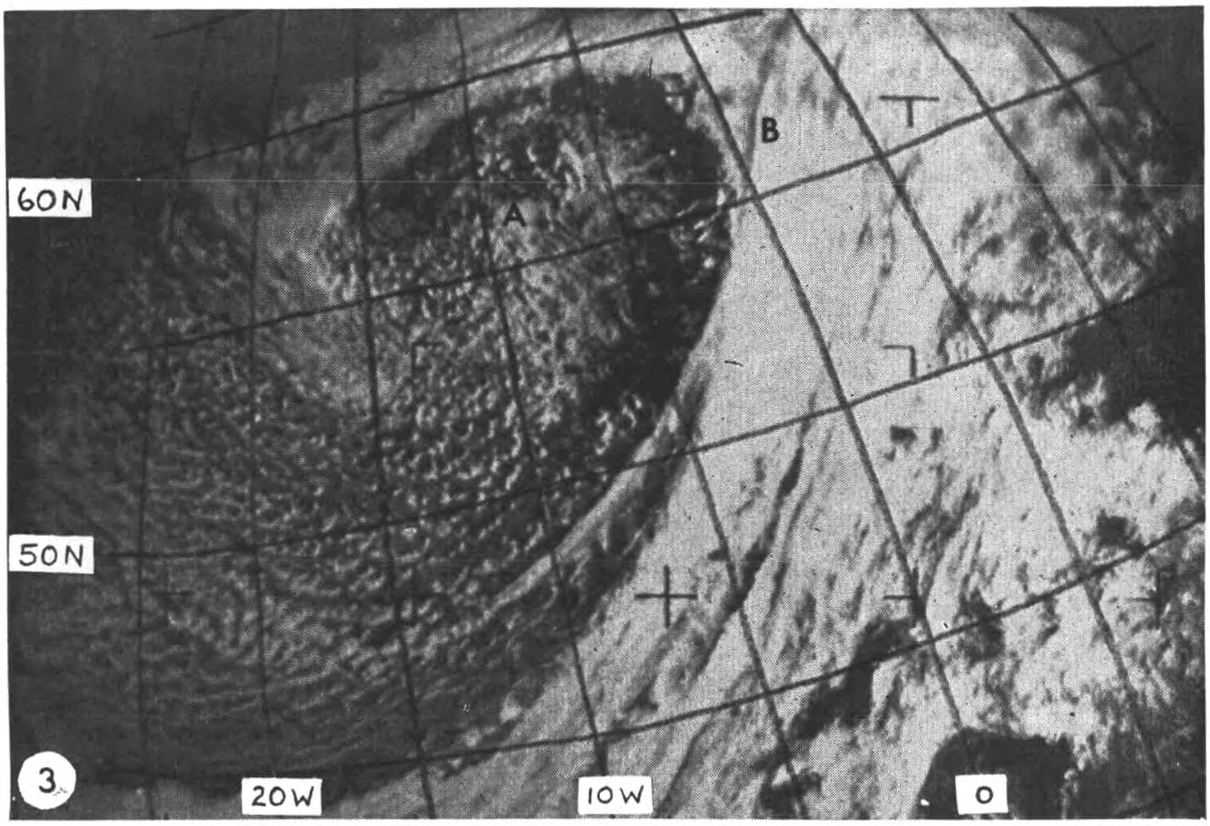
(*Opposite page 20*)



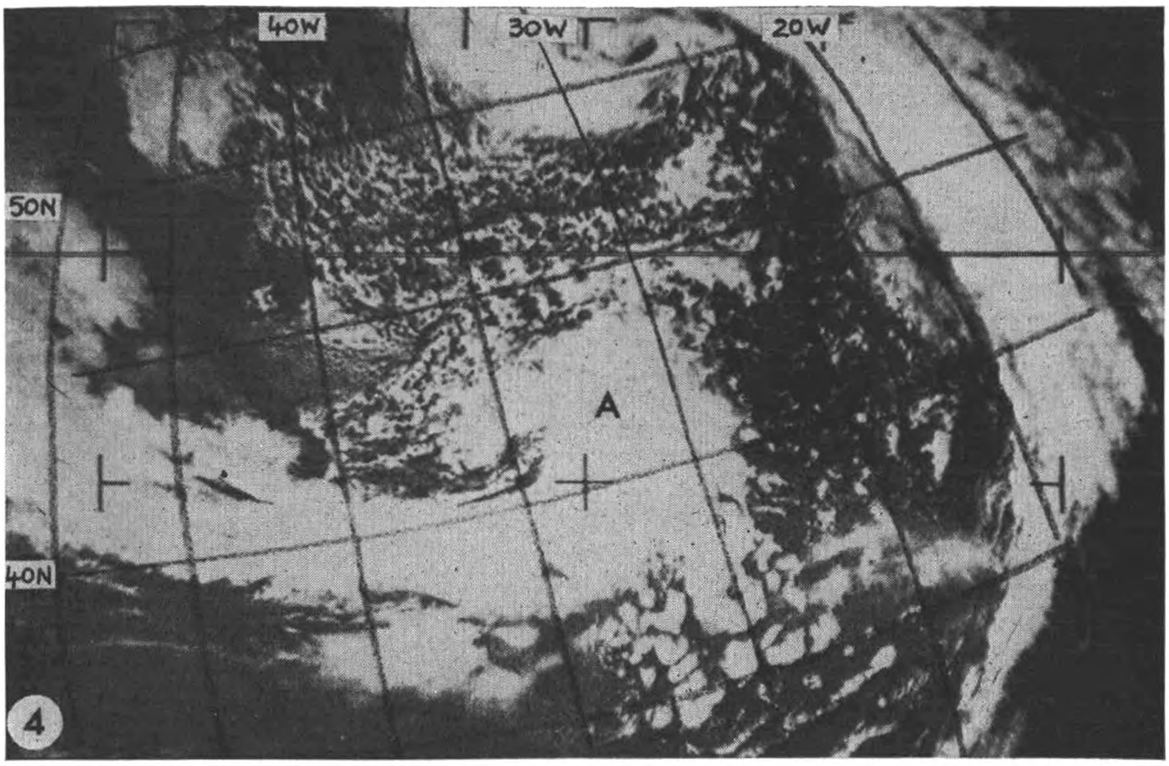
ESSA operational weather satellite, diameter 42 inches, depth 22 inches, approximate weight 305 pounds; A. solar cells, B. camera, C. aerial (*see* page 20).



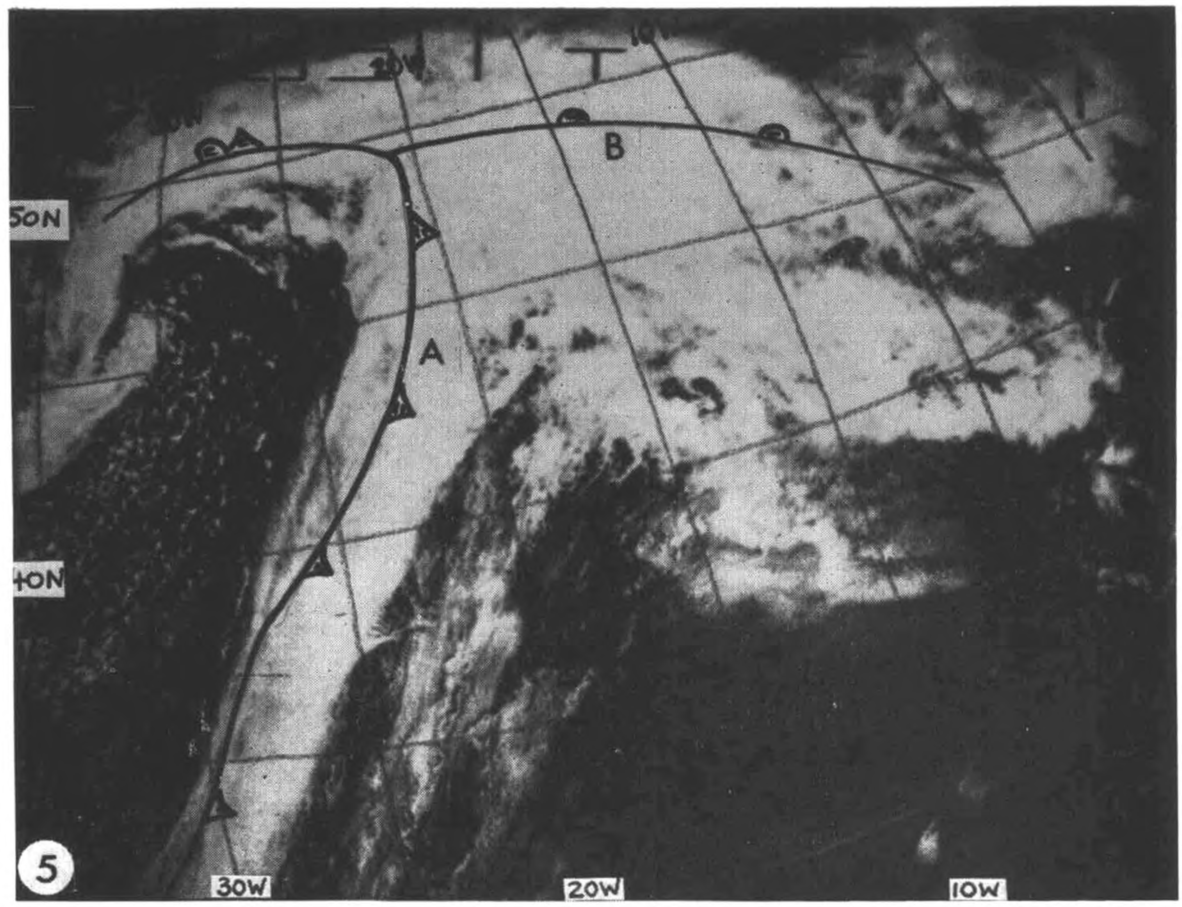
APT tracking aerial at Bracknell, Berkshire (*see* page 21).



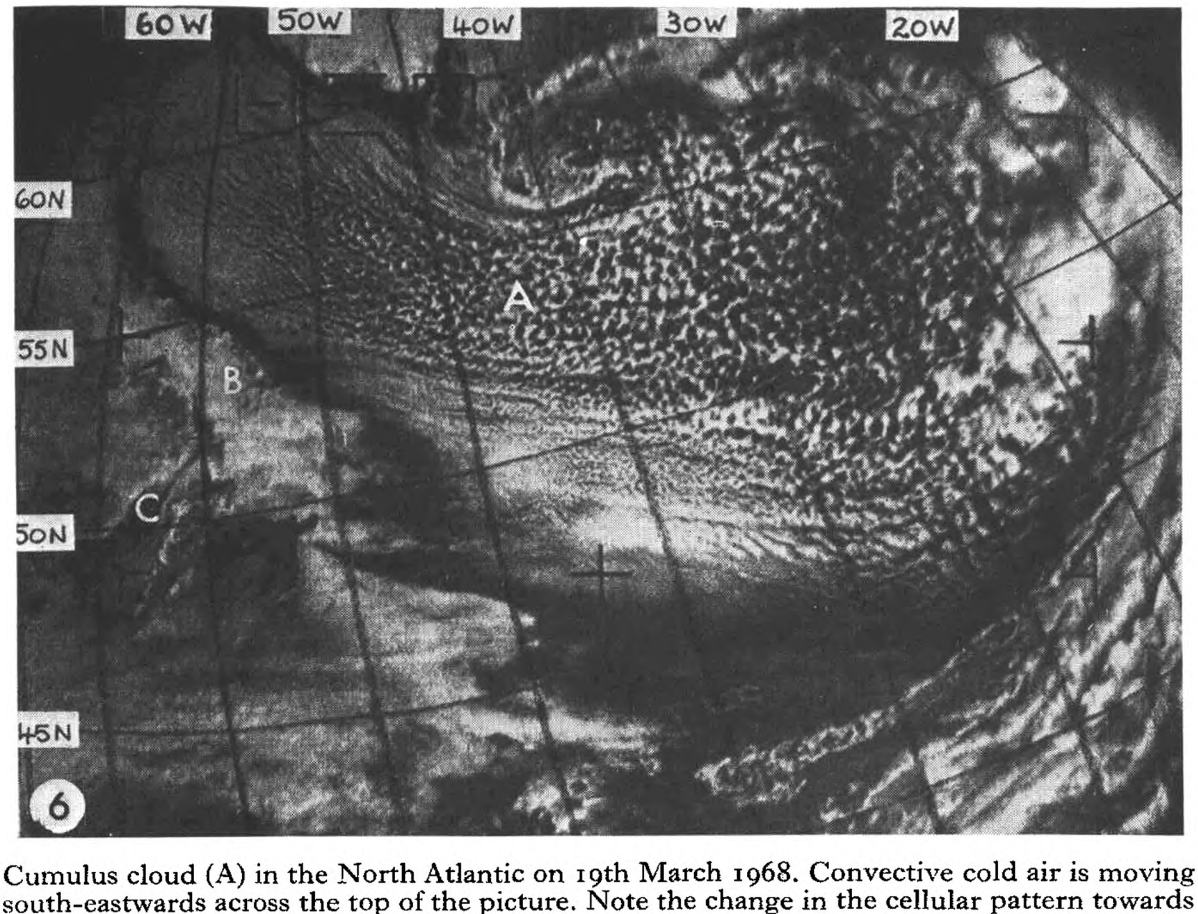
Depression near north-west Scotland on 3rd September 1967, associated with gale-force winds. The depression is occluding and the centre of rotation can be seen in the cold convective air at A. The high-level wind flow is south-westerly and the edge of the associated upper cloud can be seen at B (*see* page 21).



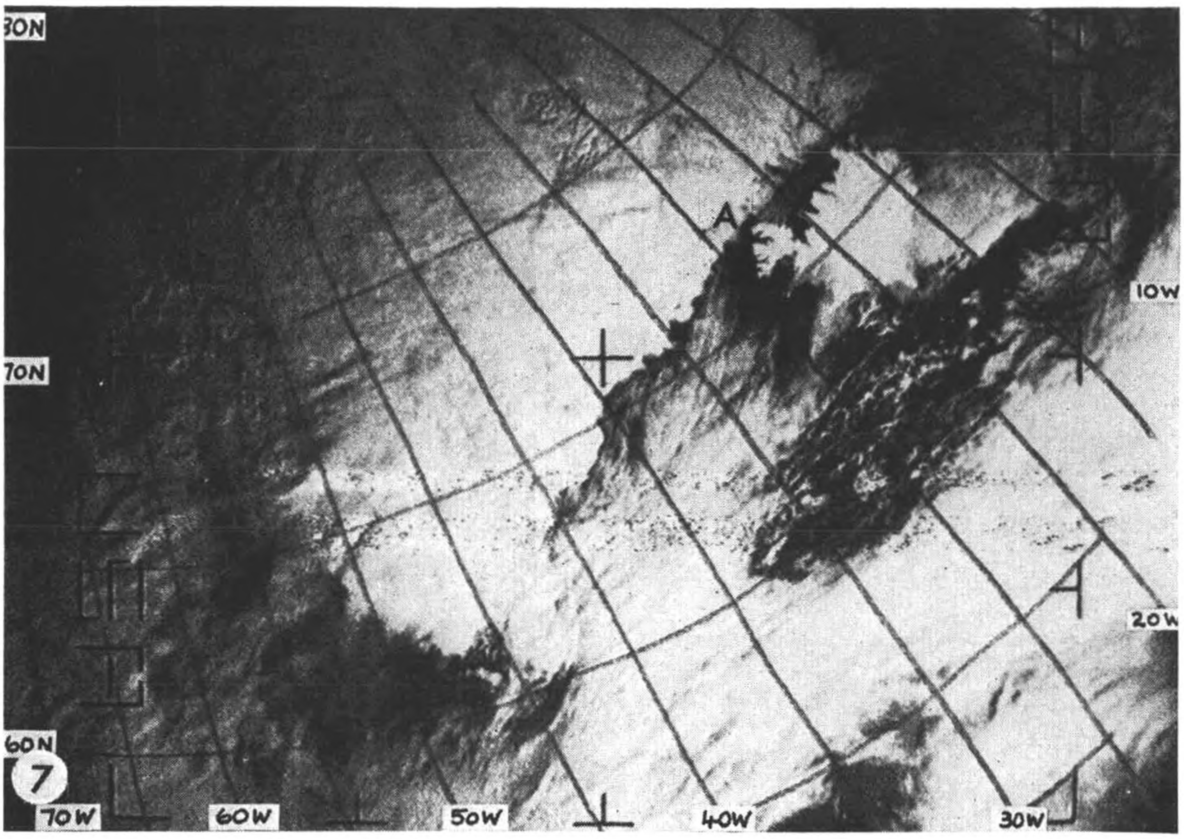
Comma-shaped cloud (A) of a developing secondary depression on 29th April 1969. The primary circulation lies to the north (*see* page 21).



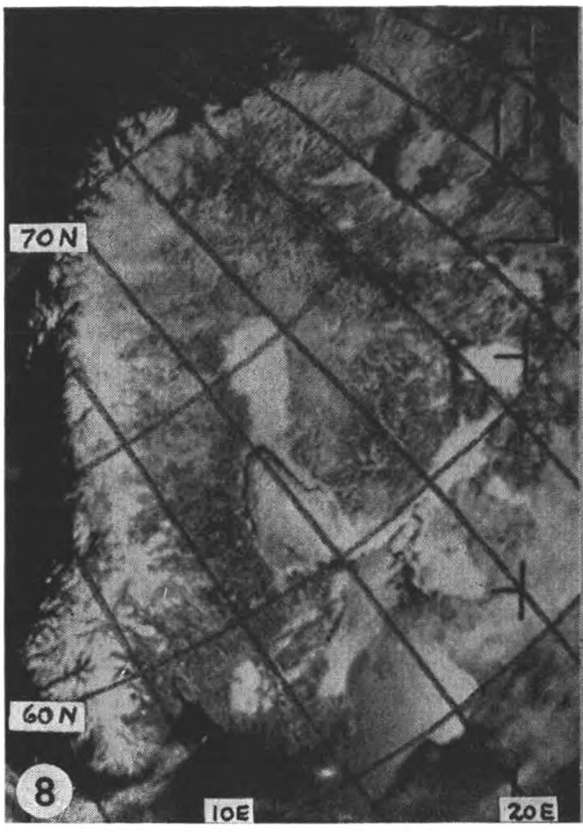
Frontal system over the Atlantic on 9th May 1969 with surface frontal positions added: A. cold front, B. warm front (*see* page 21).

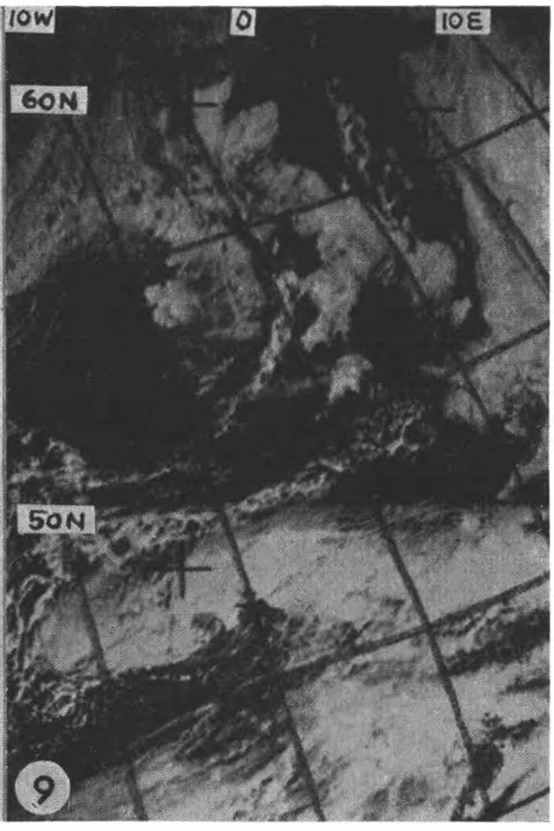


Cumulus cloud (A) in the North Atlantic on 19th March 1968. Convective cold air is moving south-eastwards across the top of the picture. Note the change in the cellular pattern towards the east where convection is most active. Sea ice can be seen at B and at C is the Gulf of St. Lawrence (*see* page 21).



The Greenland ice pack on 10th March 1969 reaching (at A) almost to the north coast of snow-covered Iceland. On rare occasions the ice will reach parts of the coast, as it did in the Spring of 1968 (*see* page 22).





Sea ice in the Baltic on 20th March 1969 (left) and snow cover over the British Isles on 17th February 1969 (*see* page 22).

aerial (*see* photograph opposite page 20) and begins to receive. The signals are amplified and fed into a facsimile recorder which prints on to electro-sensitive paper to form the photograph. By this method the picture signal can be simultaneously transmitted by telephone line to other places where the information is required.

Using orbital data, supplied by the American Weather Bureau, the times of receipt of the pictures can be translated into values of latitude and longitude and grid lines of the appropriate projection can then be superimposed. The pictures are then analysed and related to the current working weather charts.

Picture interpretation is carried out in conjunction with surface and upper-level charts drawn from conventional observations but of course the more noticeable features of the nephanalysis (cloud analysis) are pictorial, whereas those of the conventional chart are carefully measured isopleths of pressure, temperature, windflow, etc. It is therefore necessary to learn not only to recognize on the photographs the appearance of fronts, depressions and other traditional features but also to relate other cloud patterns to atmospheric behaviour. One of the most impressive cloud structures to be seen is the vortex spiral associated with a large depression which has become occluded so that the centre is positioned in the cold air (*see* photograph 3 following page 20). Lines of cumuliform cloud spiral into the centre and sometimes bear a remarkable resemblance to the galactic nebulae of which most of us have seen photographs in astronomical publications from time to time.

Nearly all depressions in fact show circulation in their cloud patterns in the early stages. Rotation is an important feature in the study of the atmosphere and cyclonic circulation (anticlockwise circulation in the northern hemisphere) is associated with rising air. As it rises the air cools and the water vapour it contains condenses into cloud droplets and eventually rain. As soon as cyclonic circulation has developed sufficiently to produce a cloud sheet it is identifiable on the photographs as a zone of rotation and often appears as a comma-shaped area of cloud of the order of several hundreds of miles in length (*see* photograph 4 following page 20). At this stage surface observations may not indicate positively the whereabouts or intensity of the development but it is usually quite apparent from the photographs and this information is used as a background to chart analysis. For example, the 0600 GMT North Atlantic analysis, transmitted by Portishead Radio, is prepared with careful reference to satellite photographs.

Once a depression has passed its early stages the upper and lower clouds combine to give a fairly typical picture with large bands of cirrus cloud sweeping along in the high level winds and layers of converging low level clouds moving into the depression centre. Sometimes these features are obscured by an over-all cloudiness but quite often some degree of identification is possible. The cold front is usually well marked by thick layered cloud followed by convective cumulus type in the cold air.

In photograph 5 (following page 20) the cloud band at A, with a clear-cut western boundary, is a cold front travelling eastwards in the circulation of a depression to the north. Warm fronts are less easy to fix but one can see the warm-front cloud mass at B. A few ships' observations have made it possible to orientate the surface warm front and the cloudiness and level of activity can be estimated from the picture.

In the cold air cumulus development takes place, showing firstly as a milky whiteness. The resolution of the photograph is about two nautical miles so that small cumulus cells are not individually observed. As convection becomes deeper the more active cloud globules group together into a larger-scale pattern showing doughnut-shaped cellular rings perhaps 20 miles across. In photograph 6 (following page 20) the convective flow is from the north-west and the gradual increase of activity eastwards is easily seen.

With slow-moving large-scale convection zones the area eventually becomes covered by high-level cirrus but the density and lumpiness of the texture is sufficient to show the convective nature of the cloud structure.

Fronts, especially cold fronts, will sometimes develop waves along their length which may later become active depressions of considerable importance and the early detection of these is advantageous. A bulge in the cloud on a cold front can betray this development. The subsequent movement of the wave can best be determined from the upper-level weather charts. Should it move into an area where uplift of air is encouraged it will grow in size and here again the photographs help.

Fig. 1 shows an upper-wind-flow pattern and areas C indicate the forward side of an upper trough where uplift can be expected. The band of cirrus cloud shows that some uplift is already present. A wave moving beneath this flow will deepen and become more active, developing into a well-formed depression.

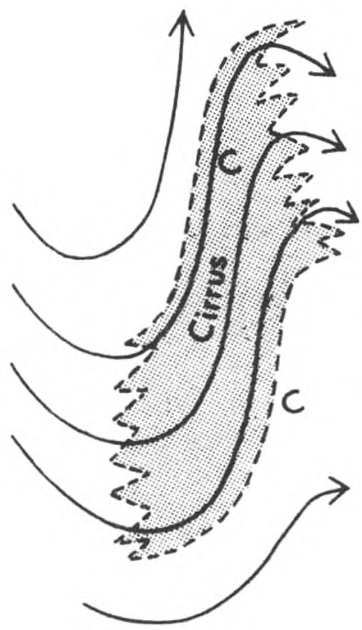


Fig. 1. A band of cirrus cloud indicating the shape of the high-level wind flow on the forward side (C) of an upper trough.

Sometimes an old depression which has filled up and lost its identity on the surface charts leaves the remnants of its rotation in the cold air marked only by a few concentric curves of scattered cumulus clouds. Hours or days after the old depression has effectively ceased to exist a new wave depression may form on the cold front and move past the southern periphery of the left-over rotation, absorbing some of the vorticity and developing more quickly than might otherwise have been anticipated.

So much for fronts and depressions which, although of considerable importance, are not the only weather problems to be encountered. When high-level cloud is present in only small amounts low-level features can be usefully observed. It is difficult to distinguish fog banks from low-level stratus cloud but if, for example, fog is known to be present in a particular area, the extent of it can be deduced from the picture. Unfortunately it is all too often covered by higher cloud in the vicinity of the Grand Banks and North Sea where the observations might be most useful but there are, nevertheless, occasions when the forecast can be improved from satellite data.

In general the same applies to ice edges. Continuous ice-fields can be distinguished from cloud by their texture and, to some extent, their high reflectivity (*see* photograph 7 opposite page 21). Well-broken ice is not easy to see and neither, of course, are such small features as icebergs, but ice in the White Sea, Baltic and St. Lawrence can be observed (*see* photograph 8 opposite page 21). The Greenland ice edge is often visible lying to the north of Iceland and is a helpful guide for trawlermen in these latitudes, although day-to-day fluctuations in strong winds are probably sufficiently large to make it necessary to view this information with some caution from the mariner's standpoint. Such observations, however, are examined in conjunction with ship, aircraft and harbour reports so that a continuous record of the ice position can be maintained with some confidence. Photograph 7 shows clearly the ice edge to the north of snow-covered Iceland.

Snow and ice of high reflectivity stand out clearly and photograph 9 (opposite page 21) shows the British Isles on one of those rare, comparatively cloud-free, winter days. The shape of the ground is marked by the snow cover and one can see the extent of this at a glance. When high winds are forecast in such circumstances drifting snow becomes a serious hazard to transport and farmers. Although many reports are received from ground observers it is not always possible to compile them into a pictorial map with such clarity, certainly not with the speed with which the satellite can do it for us.

With time the use of satellite photographs has gradually become more widespread and no doubt further advances will be made in the future. The early detection and tracking of hurricanes has now become commonplace. A system of hurricane classification has been developed by the U.S. Weather Bureau whereby the maximum surface wind can be determined from the appearance and size of the catherine-wheel-like cloud mass and has already been used to advantage on a number of occasions.[1] Large areas of the world where few, if any, weather reports are available can now be observed daily and new developments detected. We can now see what large-scale cloud systems really look like and study their movement and development with more adequate continuity. However advanced the forecasting technique, the correct analysis, from which to begin, is essential and satellite weather photographs are helping a great deal to achieve this objective.

REFERENCE

1. JOHNSON, R. P. The development of tropical storm 'Monica' as seen from satellite photographs. *Weather, London*, **24**, No. 5, 1969, pp. 181–186.

551.506.2(261.2/491.1):551.509:629.12

Trawler Safety off Iceland

AN ACCOUNT OF THE WEATHER SERVICE PROVIDED FROM THE 'ORSINO' DURING THE WINTER OF 1968–9

By D. P. Smith
(Meteorological Office, Bracknell)

The Trawler Safety Committee, under the chairmanship of Admiral Sir Deric Holland-Martin, was set up early in 1968 after the tragic loss of the *Ross Cleveland* (and *Notts County*) in Ísafjardhardjúp, *Kingston Peridot* off north Iceland and *St. Romanus* on passage to Iceland. The interim report of the Committee recommended that a mother ship be provided off Iceland to warn trawlers of hazardous weather conditions, especially icing due to freezing sea spray. The Board of Trade accepted this recommendation and for the winter of 1968–9 chartered the Hull trawler *Orsino* for this purpose. As meteorologist on board *Orsino* for the whole voyage, except for a three-week relief by Brian Waudby in February, I was able to see the operation at first hand and the following is an account of that voyage.

The *Orsino* is a 1,500-ton stern freezer trawler owned by Hellyer Bros. of Associated Fisheries Ltd. (*see* photograph opposite page 28). She was built on the Clyde and her sister ships are *Coriolanus*, *Othello* and *Cassio*. In appearance these ships, being high and stubby, bear little resemblance to traditional side trawlers which they and other stern trawlers are now replacing. However, despite this loss in appearance which is certainly cause for some regret, stern trawlers are not only more easy and safe to operate but are well designed specifically for the job. Space is used to the best advantage not only in freezers, as are most of the stern trawlers, but also in fresh-fish trawlers, such as the *Boston Lincoln*, which are now showing their capabilities. The equipment on *Orsino* is typical of that of a modern stern trawler where precise navigation and fish finding is of great importance. In addition to the echo-sounding recorders she is fitted with two Decca radars, Anschutz-Kiel gyro, automatic steering and a constant-speed variable-pitch propeller. All controls are on the bridge so that *Orsino* can usually be handled by the skipper without helmsman or engine-room telegraphs. These controls are duplicated at the after end of the bridge, where the winch controls are located, so that the skipper retains control of the ship when operating the trawl net.

In order to provide the meteorological and medical services from *Orsino* (the medical service was also recommended, as an additional benefit, by the Committee) a number of instruments were installed and minor structural alterations were made at Hull before departure on 27th November 1968. An anemometer and wind vane were mounted on the gantry mast, with dials on the bridge. Distant-reading thermometers (dry and wet bulb) were mounted in screens on either side of the bridge, being read on a meter inside (mercury thermometers were also in the screens as stand-by). A distant-reading hull temperature sensor was fixed in the engine room, suitably screened, and could also be read by selecting the appropriate channel on the meter used for the air temperatures. Two precision aneroid barometers were positioned on the bridge. Also, in the radio room, an extra transmitter was installed for greater R/T range while, below deck, some accommodation space was converted to a small hospital and sick bay. *Orsino* then sailed with her usual crew but without trawl nets (no fishing was carried out during the charter) and with extra specialist staff of a doctor, a meteorologist and a Board of Trade Advisory Officer.

The Advisory Officer, who was in charge of *Orsino* though not in command, had the responsibility of deciding the movements of the ship and of advising British fishing trawlers of when they should take or leave shelter. In deciding the movement of the ship the known requirements of the task had to be taken into account and given priorities, e.g., whether to be on the weather side of the fleet or tending the sick, while, in advising trawlers on sheltering or not, he was guided by the actual and forecast weather conditions. However, it was emphasized throughout the operation that he had no power of command over fishing trawlers and would issue advice only; the final decision remained with individual skippers. Nevertheless, the great majority of skippers followed the advice given by the Advisory Officer. Advisory Officers served three weeks only on board and were District Inspectors of the Ministry of Agriculture, Fisheries and Food or of H.M. Coastguard, except for the last Advisory Officer who was a Board of Trade Nautical Surveyor. *Orsino* was commanded by Skipper Eddie Wooldridge who is from an old Hull fishing family. He is a senior skipper with Hellyer Bros., having had command of *Orsino* since she was built and had brought her away from the Clyde. He was relieved for five weeks during the voyage by Skipper Laurie Oliver, a retired skipper who had had considerable Icelandic experience.

On passage to north-west Iceland the first trawler to be contacted was *Ross Kelvin*, also on passage. This contact was comforting to us on *Orsino* as there had been doubts on board of the value of the operation because it was thought that the ban on Icelandic fishing, imposed by the Hull owners up to 31st March, together with the good fishing at that time off the Norwegian coast, might lead to a complete absence of ships off Iceland. In fact there were 15 trawlers from Grimsby or Fleetwood off north-west Iceland on our arrival there on 3rd December and for most of the period up to the end of March there were near this number, though for a time during the very bad weather mid-January to mid-February the total fell to single figures. Elsewhere around Iceland there were usually one or two trawlers from Aberdeen. After March the numbers increased remarkably and, when *Orsino* left the grounds towards the end of April, the total was approaching 100, though many of these were on the grounds off south and south-east Iceland. Almost all of the trawlers visiting Iceland were side trawlers (*see* photograph opposite page 28) engaged in fresh fishing (with the notable exception of *Criscilla* from Fleetwood) with trips limited to about 24 days, until April 1969 when stern trawlers such as *Swanella*, *Boston Lincoln* and *Coriolanus* were seen for the first time.

Station off north-west Iceland was kept by *Orsino* throughout the period except for necessary visits to port for bunkering or crew changes. Generally time at sea was spent near the ice edge, or with the main fleet if this was elsewhere. At times, however, if weather conditions required a particular position, *Orsino* might be stationed upwind or on the weather side of the ships. Operations were generally confined to the area off Horn (North Cape)*, on the fishing grounds of Ísafjörd Gully (the outer deep of Ísafjardhardjúp), Hali Bank or Barda Ground and, later in the period, on the Vikuráll Bank (see Fig. 1). Very early in the season, in December, it was possible to sail east of the Horn towards Skagi but this was soon cut off by ice and no longer open. When there was no requirement for special weather positioning or medical visits the days were usually spent in plotting the ice edge which varied its location considerably following occasions of prolonged strong winds. The information thus obtained was transmitted not only to the trawlers but also to the Central Forecasting Office (CFO) at Bracknell and to the Icelandic Meteorological Service at Reykjavík.

Communications were, of course, the life-blood of the operation. A regular and frequent supply of information was essential in order that forecasts, based on the CFO issues, could be prepared on board. This information consisted of a selection of observations at three-hourly intervals from Iceland, Greenland, Jan Mayen, the

* Hereinafter the fishing area is referred to as 'the Horn' and the headland as 'Cape Horn'; trawlermen reserve the name 'North Cape' for Nordkapp at the northern tip of Norway.

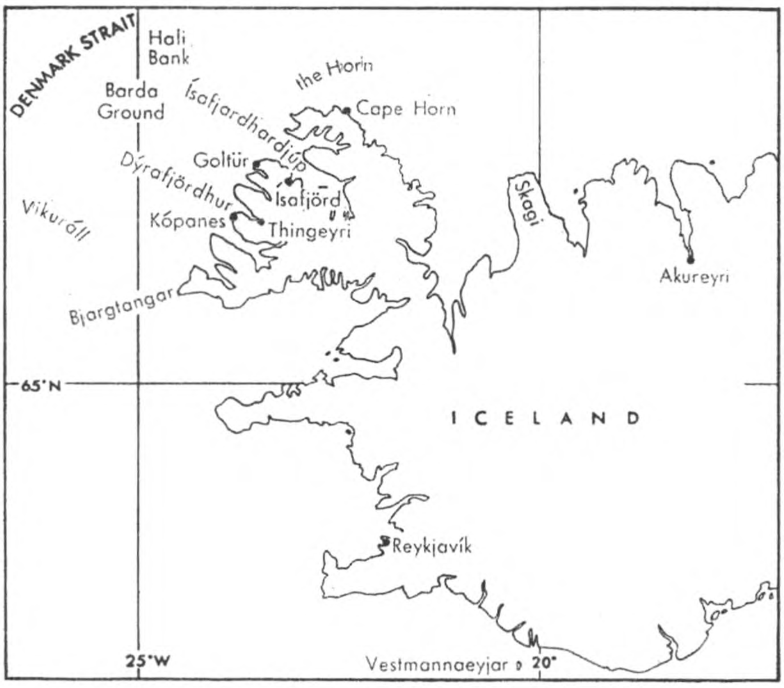


Fig. 1. Iceland and the neighbouring fishing grounds.

Faeroes and Ocean Weather Stations 'Alfa', 'India' and 'Mike'. These observations were collated by the Communications Branch at Bracknell and were supplemented by area forecasts every six hours and warnings at any time which were prepared by CFO. All this information was sent by landline to Portishead and then broadcast by W/T direct to *Orsino* on a selected wavelength. The observations were plotted on board and the forecasts were tailored specifically for the areas in which the ships were known to be operating. These forecasts were broadcast from *Orsino* to the trawlers twice daily at the 'round-up' times (0940 and 2140) or more often if the situation warranted this action. All warnings were broadcast to the trawlers immediately on receipt from CFO and, in addition, warnings were originated on board if the situation appeared to be deteriorating quickly. The position was more or less that of CFO keeping a watchful eye on the situation, ready with advice on long- and short-term trends, while the forecaster in *Orsino* was on the spot, ready to deal with weather developments from unexpected quarters as and when they arose. Such an arrangement depended to a very large extent on the over-all efficiency of the communications along the line and it is of great credit to all that seldom did these fail, except in the comparatively rare condition of poor radio propagation. The radio staff, under the competent guidance of the regular Radio Officer, Harry Butler, was increased to four in order to provided 24-hour working throughout the voyage. The meteorological information was also supplemented by radio facsimile on which the programme from Bracknell GFA or GFE was taken, the responsibility for operating the set also being with the radio staff.

In addition to coping with the W/T traffic from Portishead there was also R/T traffic from the trawlers on 2 Mc/s (skipper-to-skipper traffic on VHF was entirely with the Skipper on the bridge where he had a separate transceiver). This reached a peak twice a day at 0940 and 2140 when a round-up of all trawlers was made by the Advisory Officer. This was, of necessity, confined to the north-west area by R/T direct, and ships in other areas were linked by trawlers on passage or by W/T on schedule, though this was not very satisfactory. At the round-up time the forecast was issued by the meteorologist in the form of a brief resumé of the synoptic situation, a chat about the probable developments and the general confidence in the weather prospects, followed by a formal forecast at dictation speed. Finally, an idea was given of the winds and seas likely to be encountered on the way south for those homeward bound—this was based on the CFO medium-range forecast charts—with a quick look at prospects on other fishing grounds for those skippers planning operations elsewhere. These fishing grounds were those around Iceland until April, when the big freezers arrived, when a forecast of the Norwegian and Labrador weather was given in very general terms.

Being unused to the north-west Icelandic winter, the weather throughout the voyage seemed to me to be appallingly bad. Fierce gales and bitter storms followed each other at what seemed to be incredibly short intervals. During the whole of the period in this area there were no trawlers which completed a full voyage of about three weeks without sheltering for at least part of the time. There were a few occasions when ships had to sell their catch for what it would fetch in the isolated hamlet of Thingeyri in Dýrafjördhur, restock with fresh ice and start the voyage again. Nevertheless, it is probably true that last winter was typical of those in recent years and that the weather in this area is simply very bad at this time. There is, however, some evidence that the general level of temperatures has dropped compared with those of 10–15 years ago and this is borne out by trawler skippers' own observations. The ice edge is further south than is noted in the *Arctic Pilot* where the proximity of the ice to Cape Horn is treated as an uncommon occurrence. In fact ice has been down on the Cape early in both the last and the previous winters. The Horn was the general latitude of the ice edge after it had moved quickly south during December. Apart from movements due to persistent gales the ice lay from the Horn along the 100-fathom line as far as the Vikuráll Bank. This line was approximately the boundary between the warm Irminger Current and the cold East Greenland Current. In December, before the ice had reached this line, several sea-temperature runs were made across this boundary. Sea-temperature readings were taken at minute intervals and a drop of around 6 degC (from $+5°C$ to $-1°C$) was recorded over a distance of 3 miles. Later this position became the ice edge, remaining so intermittently till April.

Throughout the winter there were no persistent or strong south-westerly winds so it was not possible to check the view expressed in the *Arctic Pilot* that these winds tended to force the ice southwards after forming a block round Cape Horn. There is no doubt, however, that prolonged north-easterly winds push the ice down, though breaking it up at the same time. The furthest south that the ice was seen was Kópanes, some 50 miles south-west of Cape Horn. But, between the latitudes in which these points lay, great masses of ice were driven during occasions of sub-zero north-easterly winds—periods of at least three days of north-easterlies of Force 9 or over, with temperatures below $-10°C$. This is the sort of weather to which no trawler should be exposed for long and *Orsino* sheltered, usually in Dýrafjördhur, along with other ships. It was a truly awe-inspiring sight to emerge from shelter after a bout of such winds, having left a well-charted and firm ice-edge well to the north, to find the sea akin to a battlefield with huge lumps of ice, all shapes and sizes, littering the whole area, together with great fields which had broken away bodily from the main pack. These break-away masses would last for days but, given slacker winds, they would gradually melt or be driven north by the Irminger Current. Their persistence in these conditions was rarely more than four or five days, by which time the ice edge on the 100-fathom line had been resumed. The idea that this line marked the boundary between the two currents was confirmed early in April after a spell of mild southerlies, the first since December. The ice retreated temporarily and it was found that indeed the sea-temperature discontinuity noted earlier had reappeared.

Throughout January, February and March it seemed that almost any synoptic development would result in a north-easterly gale. The usual pattern was a depression passing to the south, followed by the high over Greenland quickly intensifying. At times the movement or development of either system without the other was quite sufficient to produce an unfavourable pressure gradient. The long storm in early

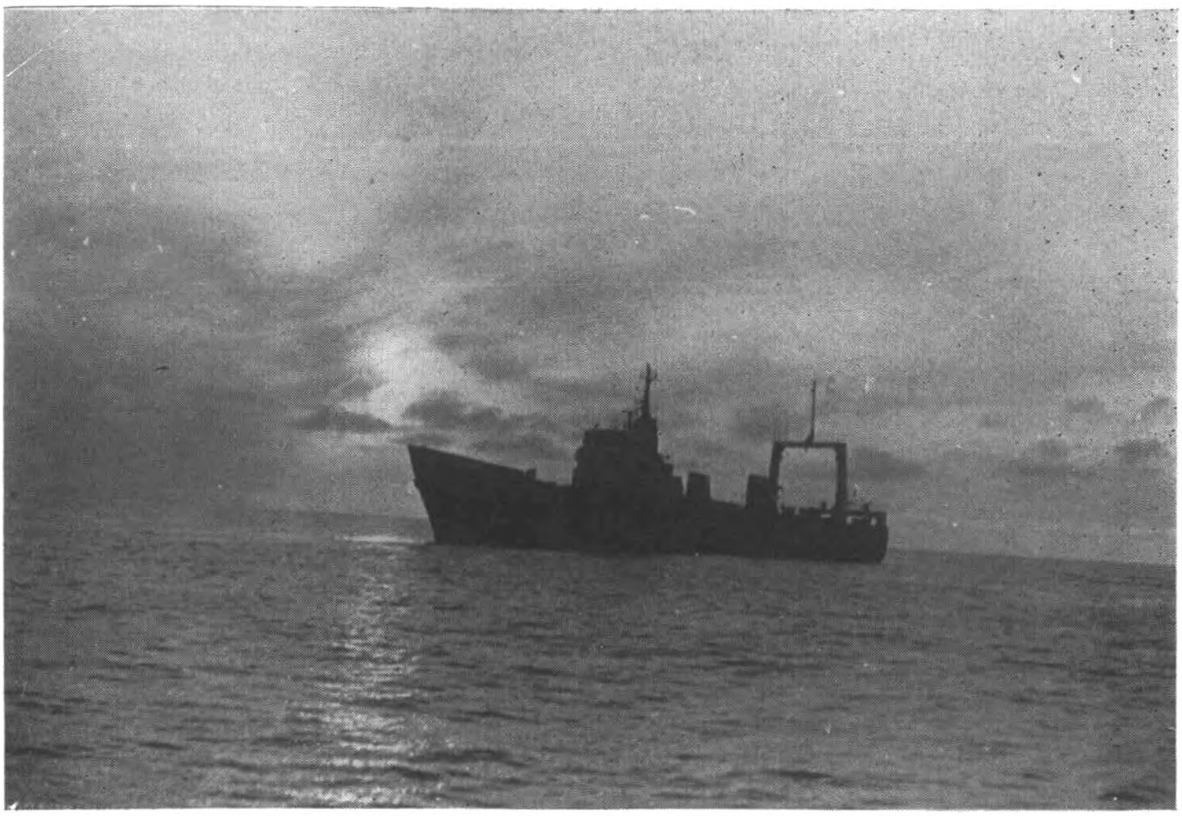
January was the result of a persistent, deep low near Jan Mayen sending a fierce, cold flow southwards from its west side. However, there is no doubt that the topography of Iceland is partly responsible for the numerous, strong north-easterly winds experienced in the north-west corner. The block of the high ground forming the north and north-west coastlines and continuing inland (the volcanic origin is clearly seen in the marked step-type of stratification seen in the high cliffs of Ísafjardhardjúp and Dýrafjördhur—*see* photograph following this page) creates a funnel in the Denmark Strait which is narrowest at the Horn. For a meteorologist in the area it is a safe rule of thumb that a pressure gradient of 8 mb in the Strait will produce winds of at least Force 8. The difficulty is in knowing when such a gradient exists and here it is important to draw isobars precisely to the reported pressures from Akureyri, Cape Horn and Göltur Lighthouse. The irregularities of the high ground distort the pressure pattern to a remarkable degree.

The first gale which *Orsino* encountered last winter off Iceland blew up soon after arrival and was perhaps a portent of things to come. After ten days of fine and easy weather a storm of Force 10–11 suddenly broke and temperatures dropped to around $-14°$C. Ships sheltered in Ísafjardhardjúp and Dýrafjördhur; the wisdom of this was seen after two days when a German trawler steamed close to *Orsino* with a large quantity of ice over the whole of her superstructure, masts and rigging. Remarkably, this was the worst case of icing which was seen during the whole of the period on station. It is, perhaps, a mark of the success of the operation that no British trawler suffered severe icing on these fishing grounds last winter in spite of very severe conditions. Sheltering was not usually advised unless winds were expected to reach at least Force 9 with severe icing and, during the season, 25 warnings of such conditions were issued (15 for the north-west area, 10 for elsewhere) which were subsequently confirmed by events. In fact, the only British trawlers which did encounter serious icing were those running off from North Britain towards Iceland when, on more than one occasion, they were heading into northerly gales, becoming heavily iced up and having to lay under the Vestmannaeyjar to chop ice before proceeding further.

Out of the succession of bitter north-easterly gales which blew so frequently last winter off north-west Iceland three are worthy of mention. The storm which lasted for six days around the middle of January was at least as severe as that which blew at the time of the loss of the trawlers *Lorella* and *Roderigo* in 1955. Air temperatures last January were a good deal lower ($-7°$C to $-13°$C, compared with $-2°$C to $-7°$C in 1955) and severe icing was a continuing hazard. This was the occasion when *Orsino* was carrying out daily sorties as a weather check to report back to the unfortunate trawlers waiting in Dýrafjördhur. Generally winds were around Force 12 and, unhappily, an Icelandic trawler was lost off Ísafjardhardjúp. The storm of 5th March was similar in many respects to that of the previous winter at the time of the loss of *Kingston Peridot.* A rapidly-deepening depression moved quickly eastwards with the centre passing very close to *Orsino.* The rise in pressure recorded on *Orsino* behind the depression was 37 mb in six hours (see Fig. 2). The low apparently filled off the west coast, transferring as a new centre east of Akureyri and causing sudden, fierce storms on the north coast, as it had earlier on the west coast when two Icelandic trawlers were lost. Then, in late April, just as *Orsino* was preparing to leave the grounds following a week of fine weather, a gale at least as bad as that in early December blew up and Dýrafjördhur was again the scene of ships sheltering. This gale is worth mentioning because of the impression on board in mid-April that the worst of the weather was over and *Orsino* had outstayed her usefulness. The reverse was, in fact, the case.

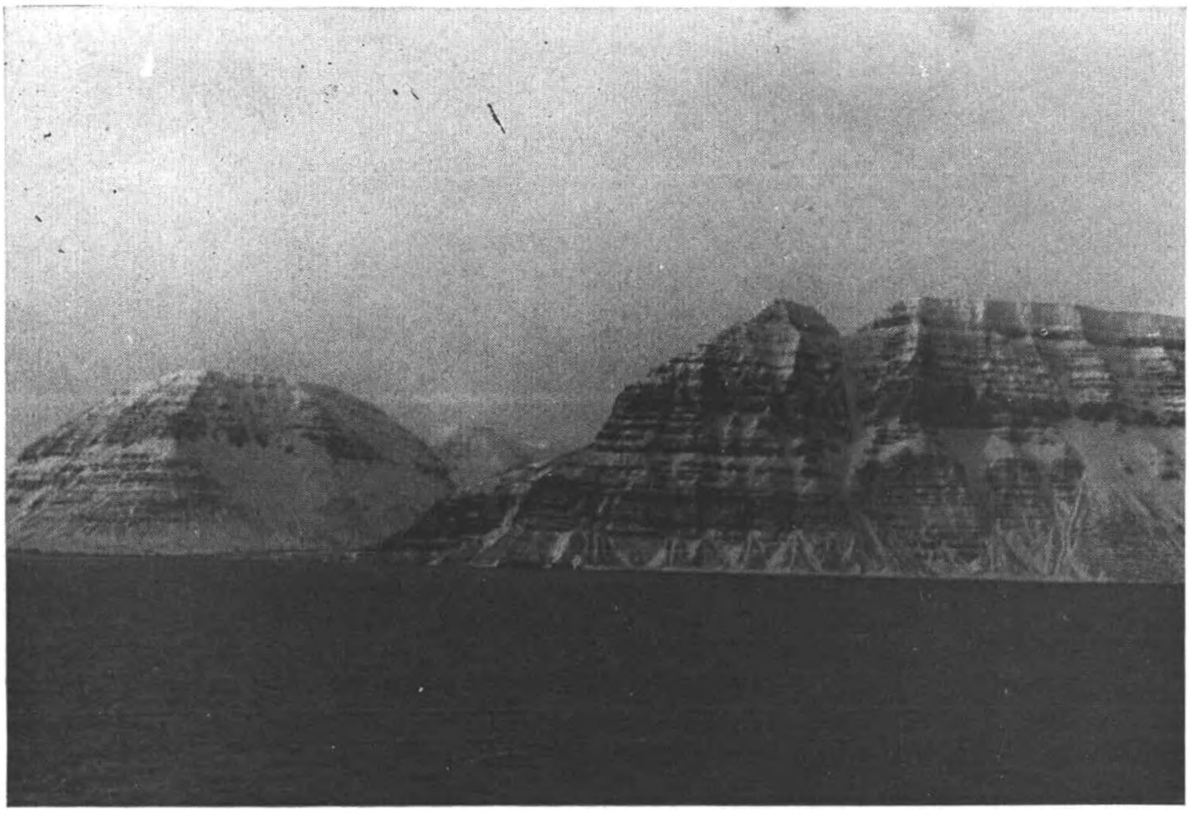
From the small amount of icing which was seen (some on *Orsino*) some useful facts are worth noting. Icing depends as much on the course and speed of the ship as on her size and shape. If a small side trawler is involved, then, when she is steaming full ahead (when shooting the trawl) into wind, a Force 6 with temperatures below $-5°$C is sufficient to give severe icing. On the other hand, a large stern trawler

(*Opposite page* 28)

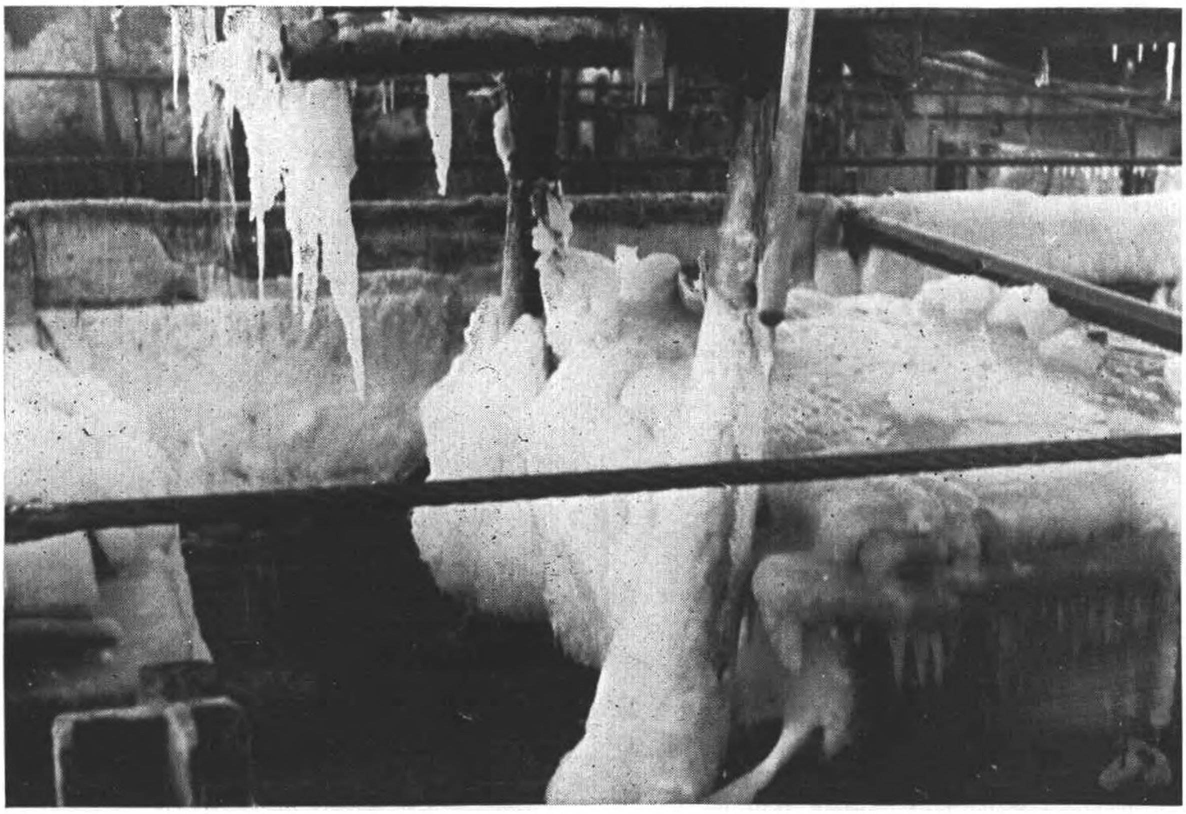


The *Orsino* (*see* page 24).

A side trawler—the *Ross Kipling* (*see* page 25).

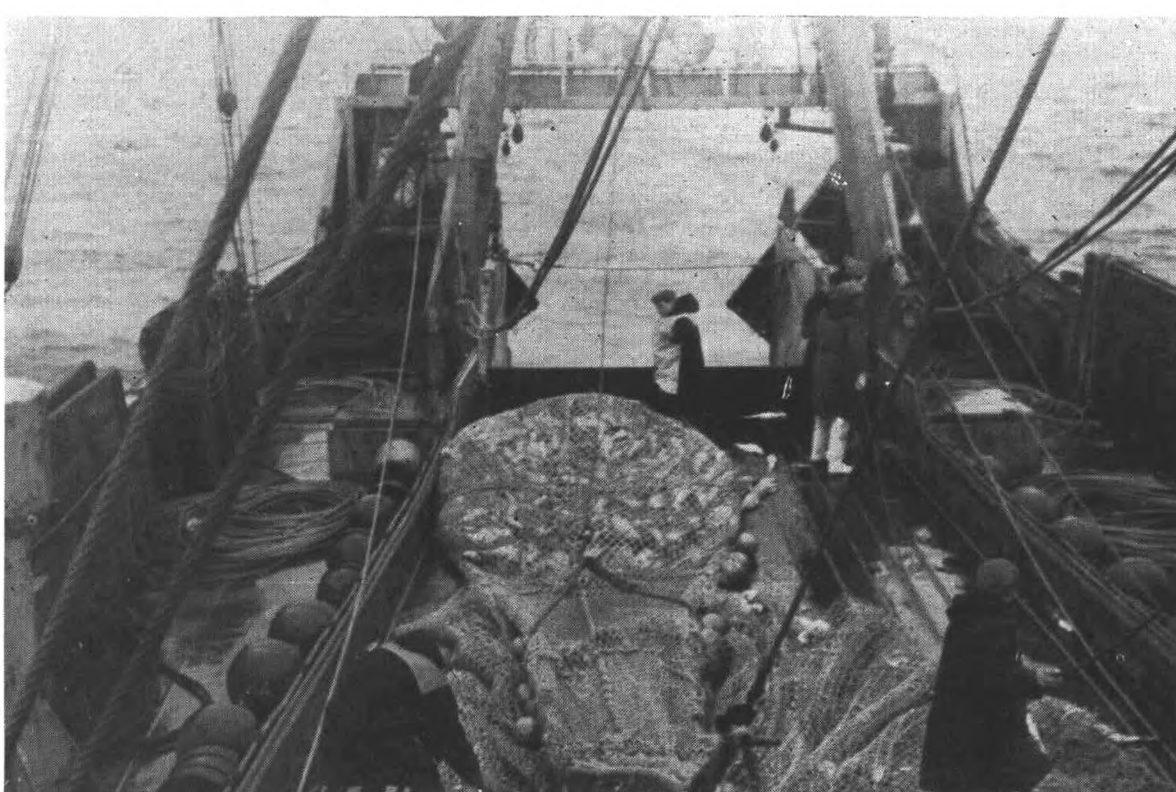


The cliffs of Dýrafjördhur (*see* page 28).

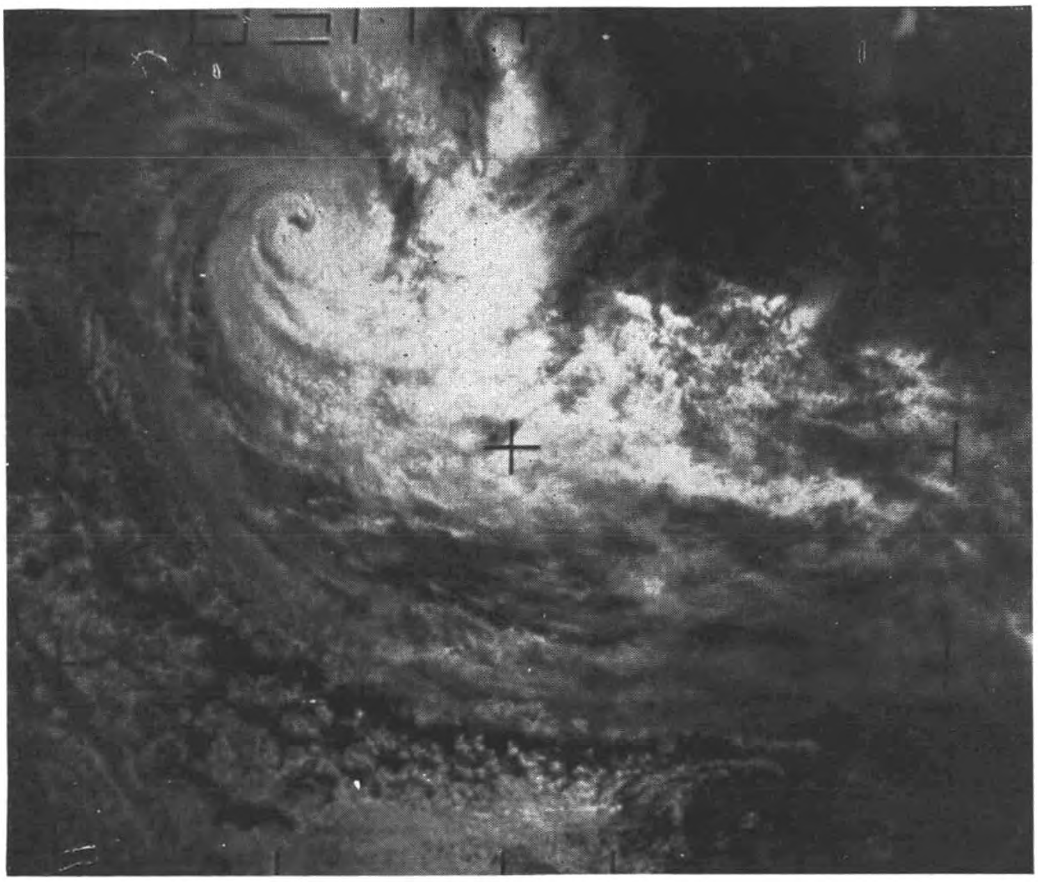


Icing on the *Boston Kestrel* (*see* page 29).

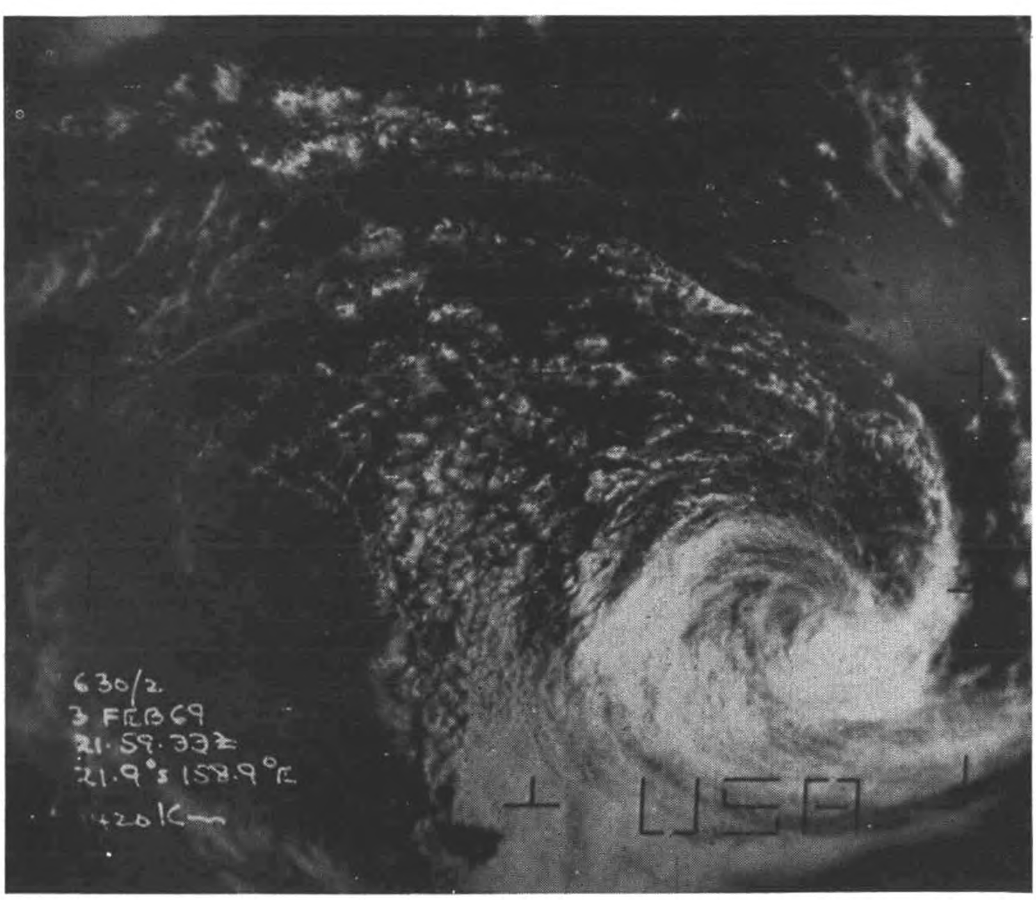
The town of Isafjörd in April when the worst of the winter was over (*see* page 30).



Landing the trawl aboard the *Lord Nelson* (*see* page 30).



Tropical cyclone Colleen as seen by satellite at 2121 GMT on 31st January 1969. The centre cross is at 23·0°S, 168·1°E (*see* page 32).



A later view of the storm, taken at 2200 GMT on 3rd February 1969. The centre cross is at 21·9°S, 158·9°E (*see* page 32).

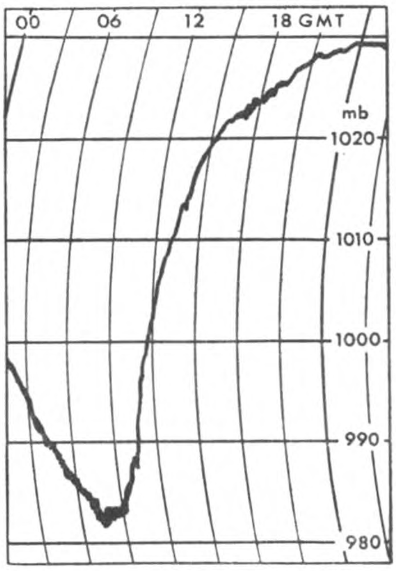


Fig. 2. The rise in pressure recorded on *Orsino* on 5th March 1969.

in such conditions will probably be making very little ice. In worse conditions, say Force 10–12 with temperatures well below -5°C, the sea temperature is not a very significant factor. In such a storm icing can occur off south Iceland or in areas further south where sea temperatures may be as high as $+8$°C. The air temperature is most important and a sudden drop may well indicate imminent icing conditions. This drop is often made obvious by the formation of Arctic frost-smoke fog, or 'black frost' as it is known by fishermen. It occurs quite frequently in these waters when a sea-air temperature difference exceeds 10 degC and is regarded by fishermen with some apprehension, but there seems little justification for this unless the portent of icing conditions developing is the reason. The greatest height which this type of steam fog reaches is about 30 feet, in the form of swirls in a strong wind, but generally it is well below this level and does not greatly reduce visibility. One danger which may be overlooked is that when temperatures are well below 0°C (say -5°C) all side trawlers will begin icing up by the very nature of their work, whatever the state of sea (*see* photograph following page 28). If this is followed by a period of moderate seas the ship will take on a skin of ice over most exposed parts. A ship in this state will be more poorly placed at the onset of severe icing than a ship which is clear of ice. The de-icing devices on the *Boston Phantom* (inflatable cushions) and the *Falstaff* (electrically-heated plates) were seen and examined from a short distance. Although both methods are undoubtedly effective (one casualty on the *Boston Phantom*, seen by the doctor, was a head injury caused by a lump of ice falling during de-icing) it is difficult to see how any device can cope with ice forming on the rigging, around the rails or radar scanner and other exposed and high areas. It still seems by far the best course for any ship, however well equipped, to avoid conditions which will produce severe icing.

Any commentary on the weather would be incomplete without mention of the extraordinary periods of practically flat calm. These would often follow some of the worst gales and provided a contrast which was complete in many respects—winds, visibility, sky, though not usually temperature. One such occasion was Christmas Day when the sun just crept around the horizon for a very few hours. The sea was smooth and the different hues in the sky, caused by the low angle of the sun glinting on the high clouds, was reflected in the water so that the atmosphere itself seemed a mass of greens, purples, reds and oranges. Visibility at the time was at least 65 miles, Bjargtangar being clearly seen.

The base for mail and landing patients (happily a rare occurrence) was Ísafjörd, some 10 miles up Ísafjardhardjúp, where a small hospital was open and there was a daily air service by Fokker Friendship of Icelandair to Reykjavík. The hospital was the one to which the Mate of the *Ross Cleveland*, Mr. Harry Eddom, was taken following his fearful night on a raft after his ship was sunk, and also to which the crew of the *Notts County* were taken after their ship had gone aground. The doctor who had so competently treated the survivors was a welcome visitor to *Orsino* on more than one occasion. The town itself is small and compact (*see* photograph following page 28) with a sheltered harbour, though ships sheltering there on the night of the *Ross Cleveland* disaster were dismasted. The small swimming pool in the town is very well heated so that coming outside to a temperature around −10°c after a swim is rather similar to taking an involuntary Turkish bath. Three visits were also made to Reykjavík and these afforded an opportunity to meet Icelandic and other colleagues.

Throughout the voyage relations with the Icelandic Meteorological Service were most cordial. Following a visit to the Reykjavík Meteorological Office, the Director, Mr. Sigtryggsson, visited *Orsino* and was welcomed by Skipper Wooldridge. Other visits were made to the German fishery ships *Poseidon* and *Frithjof* to meet their meteorologists who, in turn, boarded *Orsino*. The British Ambassador to Iceland was a distinguished visitor to *Orsino*, as was Admiral Sir Deric Holland-Martin who made a six-day visit on board which included a visit for a day to the side trawler *Boston Lightning*. Also in Reykjavík, a BBC News team made a short film which was later shown on television.

This account would not be complete without mentioning the visits made to other ships. The warmth of welcome and the hospitality shown on all the ships visited were quite outstanding; these occasions were, in many respects, the highlights of the voyage. The Commanding Officer of H.M.S. *Duncan* arranged with Skipper Oliver for exchange visits to be made, while at sea, by the crews of his ship and *Orsino*. (H.M.S. *Duncan*, and also H.M.S. *Malcolm*, made short voyages as Fishery Protection vessels to these waters.) Then, later on, with Advisory Officer Tim Fetherston-Dilke and Dr. Tom Dinsdale, we were welcomed aboard the Fleetwood trawler *Boston Kestrel* by Skipper Anthony Buschini. This is a fine side trawler, being one of the last to be built in this country, and has her port side partly covered in as a protection against weather, especially icing. A later visit was made to *Criscilla*, a smaller type of stern freezer from Fleetwood, commanded by Skipper Victor Buschini, a brother of the *Boston Kestrel*'s skipper. The spotless and spacious engine room, with a 7-cylinder Mirrlees diesel, was in marked contrast to the old *Hull City*, an oil burner with reciprocating engine and boiler which were much closer to the traditional engine room. The *Hull City* (in fact a Grimsby trawler) is a large ship, commanded by Skipper Malcolm Smith, and that visit is as memorable for the humour on the VHF chat as it is for the halibut brought back as a gift. On the Hull-based *Lord Nelson*, with Advisory Officer Bill Pond, the working of a stern trawler was shown in great detail by Mate Charlie Thresh (*see* photograph following page 28), followed by a full and frank discussion on meteorological and other aspects of trawlermen's work with him and Skipper Ben Ashcroft. Lastly, a visit to the *Coriolanus*, also from Hull, was an opportunity to see the factory deck in full operation, handling and processing fish from the net to refrigerated fish room in the form of clean fillets packed and frozen on board ready for immediate sale; Bill Pond, Tom Dinsdale and I were shown around by Skipper Neville Beevers.

There is little doubt that the weather service provided from *Orsino* for British trawlers off Iceland was welcomed and appreciated by practically all the skippers of those ships. Their ready acceptance of the advice given and their willingness to co-operate in the scheme was, to a great extent, the reason for the success of the operation. Also, the exchange of ideas, knowledge and views between the skippers and specialist members of the crew of the *Orsino* was a not inconsiderable side benefit which can not only improve the services to be provided in the future but also lead to a greater awareness, on all sides, of the problems involved. The above account has, I hope, shown what some of the meteorological problems are, though understandably these may well be minimized as the nature of fishing alters to meet the changing market.

"*Orsino* has been on again about not reporting in."

551.512.23

Tropical Cyclone 'Colleen'

By F. G. Strochnetter
(Tropical Cyclone Warning Centre, Brisbane)

A small tropical low drifted westwards across Santa Ysabel Island (8°s, 159°E) and past Vella Lavella during 27th and 28th January 1969, then turned south-westwards and southwards. The low developed into tropical cyclone Colleen in the southern Solomon Sea during the night of the 29th. Colleen then curved south-eastwards and deepened sharply and persisted as a major storm for the next week or so as it passed via New Caledonia into waters south-west of Norfolk Island (see Fig. 1).

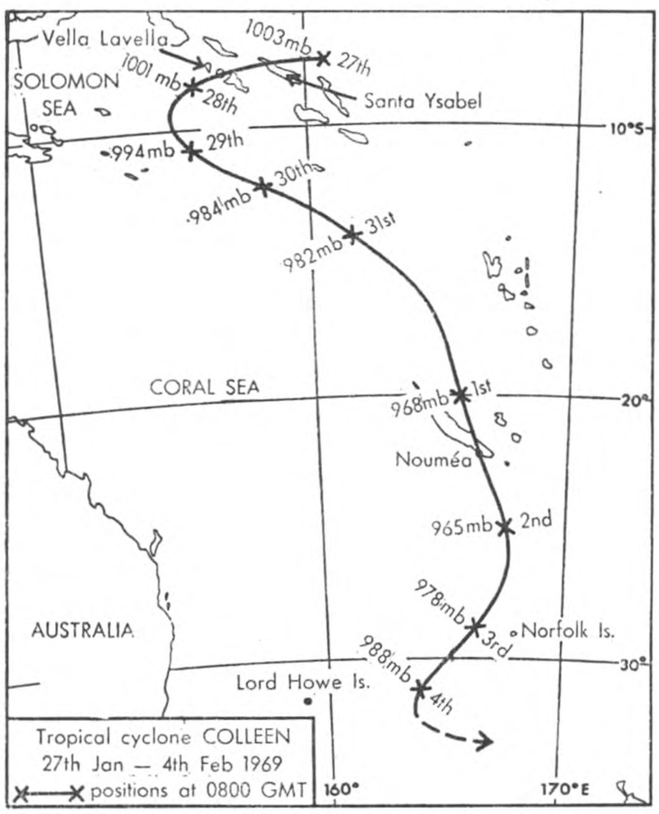


Fig. 1. Track of tropical cyclone 'Colleen', 27th January to 4th February 1969.

Ship reports were vital from the beginning and ships responded very well to a request for three-hourly weather reports made by the Tropical Cyclone Warning Centre at Brisbane. Ships in the area were mostly Japanese or British (United Kingdom, Australia, Hong Kong), with a few French and Dutch vessels and one from the U.S.S.R. As many as a dozen Coral Sea ship reports could be plotted on some synoptic weather charts during the earlier stages of the disturbance. With such quantities of reports—a comparative luxury for the area—a good consensus of the state of the weather could be obtained.

Ship reports thinned out as Colleen moved into waters north of New Caledonia and land stations supplied the lack for a while. However, there were still some notable ship reports to be received in the latter stages of the cyclone. The Colonial Sugar Refining Company's vessel *Rona* (an Australian Selected Ship) is a particular example. The *Rona* was *en route* from Sydney to Suva and during the afternoon and evening of 2nd February passed very close to the cyclone's centre, proceeding under dead reckoning due to dense cloud cover. At this time the ship was about midway between Noumea and Norfolk Island. At 0700 GMT on the 2nd the ship's corrected barometric pressure reached a minimum of 968·2 mb. Apparently the ship was very close to the centre of the storm because the east-south-easterly wind dropped from its previous speed of 60 knots to 30 knots by 0700 and by 0900 had swung north-north-westerly at 20 knots. The ship was making very little way at this time and the cyclone was moving southwards at 8 to 10 knots, which suggests that the eye could hardly have been more than 20 miles across. However, the ship did not actually report an eye.

The *Rona* encountered waves 10 metres high and mean winds of 60 knots in this neighbourhood. The storm at this stage, although severe enough, was a little weaker than when it passed southwards close to Tontouta and Noumea, around 1500 to 1700 GMT on 1st February. Both those places registered a minimum mean-sea-level pressure on their barographs of 962·5 mb, with spells of average wind-strength between 65 and 70 knots and as much as 28 inches of rain in the neighbourhood.

While the *Rona* was escaping from the central parts of the storm the British *Turakina* was proceeding northwards, fairly close in, in western quadrants of Colleen, *en route* from New Plymouth (New Zealand) to Guam. The *Turakina* came within about 150 nautical miles of the storm centre, but reported winds no stronger than 37 knots, accompanied by waves, both swell and sea, of 5 to 5½ metres in height. The reports from the *Turakina* were invaluable since the ship was in the right place at the right time, making regular reports in an area otherwise devoid of reports. This was particularly so between 0300 GMT and 1100 GMT on 3rd February when Colleen was passing south-westwards between Norfolk Island and the *Turakina*. A southward movement of the storm had been inferred but the ship's reports corrected this notion and also made it clear that the cyclone had lost little of its strength up to that time.

The thanks of the Tropical Cyclone Warning Centre at Brisbane are due to the Captains and Officers of the vessels *Rona* and *Turakina* for providing extracts from their weather logs. These two ships were involved in Colleen in especially interesting ways, as outlined above, but a ship report is of great value even well away from a storm and thanks are due also to the many other ships which responded so readily to the request for three-hourly reports.

Of the accompanying photographs (opposite page 29) the first was taken from a height of 1,420 kilometres by the ESSA 8 satellite, at 2121 GMT on 31st January. The storm was then centred near 16·2°S, 164°E, approaching its peak. Cold air of southern origin is evidenced by the cumuliform cloud in the bottom left-hand side of the picture. This cold air eventually spread around the northern side of the cyclone, as can be seen in the second photograph taken by ESSA 8 at 2200 GMT on 3rd February. The storm was then decaying slowly as this 'occlusion' process continued and the storm was losing its inflow of tropical air and assuming the character of a vigorous sub-tropical low. The island of New Caledonia is outlined clearly in the middle right-hand side of this picture, almost due north of the cyclone's centre which was near 30°S, 165°E at the time.

Editor's note. As this storm degenerated and moved further east the British *Port Vindex* encountered the 'Violent Storm' reported on page 6.

NOTES ON ICE CONDITIONS IN AREAS ADJACENT TO THE NORTH ATLANTIC OCEAN FROM JULY TO SEPTEMBER 1969

July

Low pressure became established over the Canadian side of the Arctic during the month, moving the polar anticyclone over to the Barents Sea. Low pressure persisted in the Iceland area and that system dominated the wind pattern over all areas south of 75°N between Scandinavia and eastern Canada. The resultant winds were relatively warm over most areas except the Barents Sea and south Greenland where northerly winds prevailed and excessive ice persisted.

Canadian Arctic Archipelago and Foxe Basin. Temperatures remained a little below normal over the Archipelago, nevertheless the polynya in Amundsen Gulf remained larger than usual and break-up began in Coronation Gulf and Prince of Wales Strait. In Foxe Basin the ice situation was near normal. Temperatures rose to as much as 7 degC above normal and fairly rapid break-up occurred in the east of the area.

Hudson Bay and Strait. Although winds were light and variable over the area a marked contrast in temperature occurred across Hudson Bay: to the west temperatures remained a few degrees below normal and to the east temperatures were as much as 7 degC above normal. By the end of the month open water existed in James Bay and to the north-west of a line from Cape Churchill to Mansel Island. Close pack-ice, more than normal, persisted between these areas. In Hudson Strait the ice situation was about normal with a few patches of open or very open pack-ice remaining at the end of the month.

Baffin Bay and Davis Strait. The normal amount of pack-ice existed on the east side of Baffin Island, extending eastwards to 59–60°W. In the south-east of the Davis Strait there was again an excess of ice. Despite light north-west winds, pack-ice, on rounding Cape Farewell, spread northwards to 65°N at 56½°W by mid-month, an extreme condition, but later the ice edge receded to about 61°N, leaving a patch of open pack-ice between 62° and 64°N along 53°W.

Labrador Sea and Great Bank. These areas, as normal, were entirely ice-free at the end of the month. Icebergs were reported further east than normal, at 52°W, off Labrador though the southern limit of icebergs moved north and by the end of the month only a few scattered bergs were reported south of 50°N.

Greenland Sea and Spitsbergen. The decrease of ice commented on in June continued with the result that in the Denmark Strait and northwards over the Greenland Sea there was less ice than normal. This continued decrease was largely due to easterly winds on the north side of the Icelandic Low driving the ice edge westwards. At 73°N this edge was 80 n. miles back from its normal position. South of the Denmark Strait winds from a northerly point kept temperatures a few degrees below normal and ice conditions along the south-east coast of Greenland were much worse than usual. Average temperatures persisted near Spitsbergen and ice conditions were normal except for an excess of ice on the Barents Sea side.

Barents Sea. Ice conditions remained worse than usual over this area, particularly over the eastern half where northerly winds kept temperatures 3 to 5 degC below average, and the ice edge here was located 50 to 120 miles south of normal. In the extreme south-east close pack-ice persisted to the east of Kanin Peninsula and south of 70°N, an extreme condition for this area.

August

A depression remained in the vicinity of Iceland and high pressure persisted to the north of Norway. The low on the Canadian side of the Arctic extended southwards into central Canada and a further low pressure area over east Canada completed a semicircular belt of low pressure from the Beaufort Sea across Hudson Bay to Iceland. As a result the only areas affected by persistent northerly winds were the eastern Barents Sea and south-east Greenland. In both these areas temperatures remained below normal and ice conditions were excessive.

Canadian Arctic Archipelago. Some break-up occurred, as normal, in the Jones Sound area as temperatures recovered to near or a little above average. Open water existed from Amundsen Gulf through Coronation Gulf to Victoria Strait and overall there was a little less ice than normal over this area.

Foxe Basin. The break-up in the east continued as temperatures remained around 2 degC above normal and there was less ice than average. By the end of the month open water or very open pack-ice existed except in the south-west where there was an area of close pack-ice.

Hudson Bay and Strait. Despite above-average temperatures, ice conditions remained excessive in the southern half of the Bay, mostly south of 57°N; the Bay is normally ice-free at this time. A little ice existed in the north-west of Hudson Strait early in the month but this soon melted.

Baffin Bay and Davis Strait. Temperatures remained near to or a little above normal and much of the area was ice-free. The normal amount of ice remained in the north in the vicinity of Smith Sound but there was more ice than normal along the east coast of Baffin Island. This area of ice, mostly open pack-ice, affected the western half of Baffin Bay between 66°N and 72½°N. Off south-west Greenland ice conditions were again extreme. Moderate south-east winds, coinciding with northerly winds off south-east Greenland, drove the east coast ice round Cape Farewell to 60½°N, 49°W, far beyond any known limit.

To the south, in the Newfoundland area, only a few icebergs were reported and none of these were south of 49°N.

Greenland Sea and Spitsbergen. Northerly winds assisted the flow of pack-ice out of the Arctic and into the Greenland Sea. The deficit of July was thus overcome and the ice edge returned to its normal position. However, in the south, off south-east Greenland, ice conditions were extreme. This was largely due to persistent northerly winds. A belt of close pack-ice existed along this coast as far as Cape Farewell, breaking to open pack-ice on rounding the cape. This area off south-east Greenland is normally ice-free at this time. Ice conditions were normal near Spitsbergen with very open pack-ice surrounding the island group.

Barents Sea. Winds from a northerly point were maintained, especially in the east, and temperatures remained around 2 degC below normal. Excessive ice conditions persisted, especially between 25°W and 45°W where the ice edge at 76½°N was up to 150 miles south of normal. The ice to the east of the Kanin Peninsula at the end of July had melted by the end of the month.

September

This month saw marked pressure changes over most of the area. The Barents Sea anticyclone gave way as low pressure became established over the Norwegian Sea and high pressure replaced the depression over central Canada. However, low pressure persisted to the south-west of Iceland. As a consequence relatively warm south to south-west winds replaced cold northerly winds over the Barents Sea. Northerlies persisted along the east coast of Greenland and over eastern Canada. Ice conditions reached a minimum during this month and in many northern areas there were reports of the occurrence of new ice.

Canadian Arctic Archipelago. The sea-ice deficit continued and, although freezing was delayed at first, the change to northerly winds caused a 2–3 degC fall in temperatures and some new-ice formation occurred, especially in the Gulf of Boothia (where, exceptionally, conditions were excessive) and in Lancaster Sound.

Foxe Basin. Cool north to north-west winds prevailed and temperatures fell to 1 degC below normal. By the end of the month there was a very small area of open pack-ice in the south, a little very open pack in the north-west and some new ice in the north-east; in all there was a slight excess over this area.

Hudson Bay. Very small amounts of ice remained in the south near Cape Henrietta Maria, an extreme condition according to existing ice atlases.

Baffin Bay and Davis Strait. Winds were mainly light and variable over this region and temperatures ranged from about 2 degC above normal at the head of Baffin Bay to around 2 degC below normal in the southern part of the Davis Strait. Close pack-ice from Smith Sound moved south of normal to 75°N on the coast of Devon Island. A large area of mainly open pack-ice persisted off eastern Baffin Island between 64°N and 71°N and 59°W and 62½°W, a near extreme condition. In the south-east the Cape Farewell pack advanced to 62°N early in the month but this ice was later driven back to Cape Farewell and at the end of the month this area was almost ice-free.

In the Newfoundland area the iceberg season drew to a close. A few icebergs were observed eastwards of Belle Isle Strait. No icebergs were observed south of 50°N.

Greenland Sea and Spitsbergen. Winds were mainly north to north-east over the Greenland Sea, freshening in the latter half of the month. In the north temperatures fell to just below normal and in the south remained at around 2 degC below normal. The increase in ice cover of August was continued and by the end of the month there was a slight excess over most parts. In the south the extreme conditions of last month relaxed to come within known limits, nevertheless very open pack-ice existed along the coast, normally ice-free, from Angmagssalik to Cape Farewell. In the Spitsbergen area winds became southerly and temperatures rose from 1 degC below to 3 degC above normal. Slightly excessive ice conditions around the archipelago reduced later to near normal.

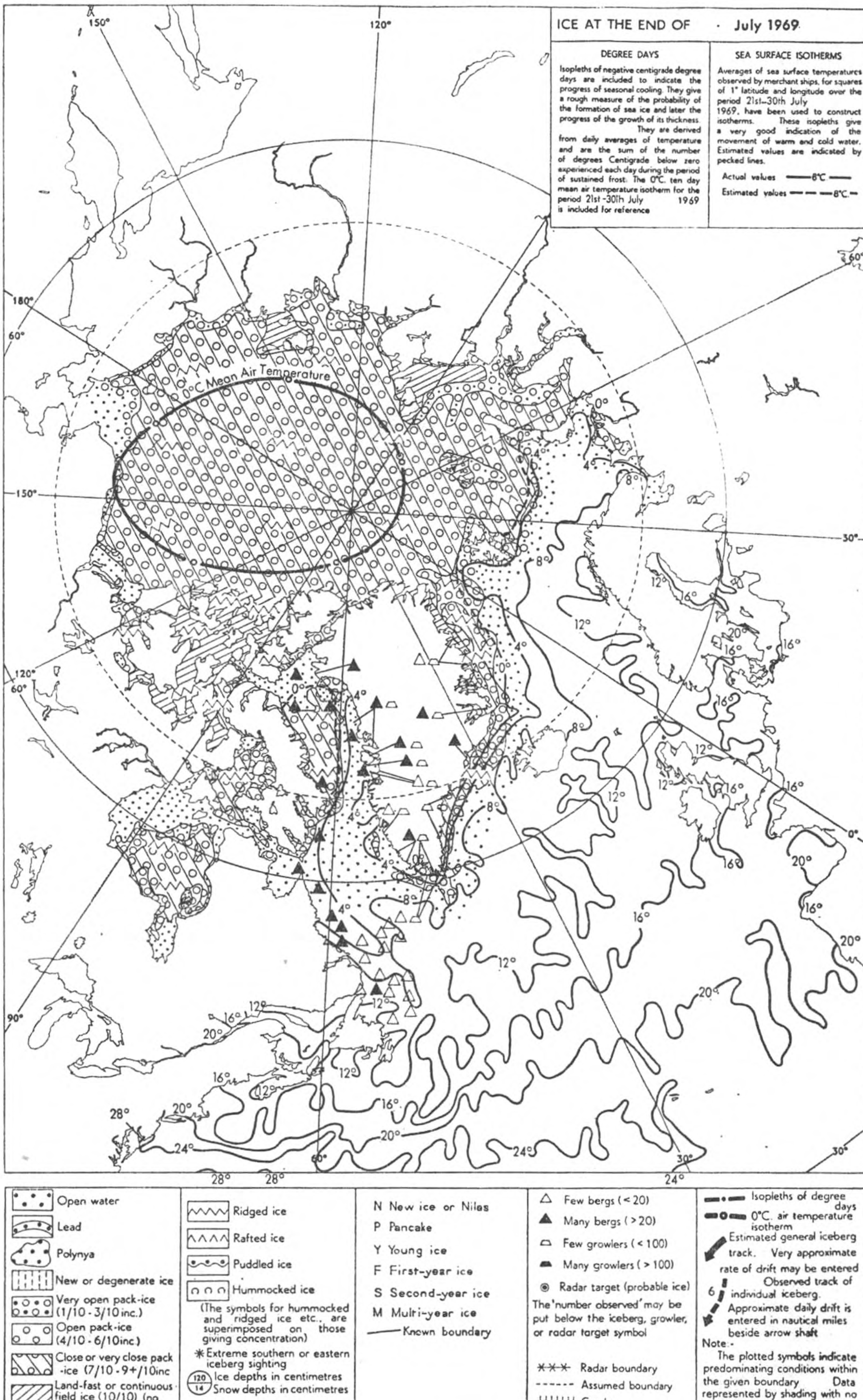

ICE AT THE END OF · July 1969
DEGREE DAYS
Isopleths of negative centigrade degree days are included to indicate the progress of seasonal cooling. They give a rough measure of the probability of the formation of sea ice and later the progress of the growth of its thickness. They are derived from daily averages of temperature and are the sum of the number of degrees Centigrade below zero experienced each day during the period of sustained frost. The 0°C. ten day mean air temperature isotherm for the period 21st-30th July 1969 is included for reference
SEA SURFACE ISOTHERMS
Averages of sea surface temperatures observed by merchant ships, for squares of 1° latitude and longitude over the period 21st-30th July 1969, have been used to construct isotherms. These isopleths give a very good indication of the movement of warm and cold water. Estimated values are indicated by pecked lines.
Actual values 8°C
Estimated values 8°C
0°C Mean Air Temperature
Open water
Lead
Polynya
New or degenerate ice
Very open pack-ice (1/10 - 3/10 inc.)
Open pack-ice (4/10 - 6/10inc.)
Close or very close pack -ice (7/10 - 9+/10inc
Land-fast or continuous field ice (10/10) (no open water)
Ridged ice
Rafted ice
Puddled ice
Hummocked ice
(The symbols for hummocked and ridged ice etc., are superimposed on those giving concentration)
✳ Extreme southern or eastern iceberg sighting
120 Ice depths in centimetres
14 Snow depths in centimetres
N New ice or Niles
P Pancake
Y Young ice
F First-year ice
S Second-year ice
M Multi-year ice
Known boundary
Few bergs (< 20)
Many bergs (> 20)
Few growlers (< 100)
Many growlers (> 100)
Radar target (probable ice)
The 'number observed' may be put below the iceberg, growler, or radar target symbol
Radar boundary
Assumed boundary
Cracks
Isopleths of degree days
0°C. air temperature isotherm
Estimated general iceberg track. Very approximate rate of drift may be entered
Observed track of individual iceberg. Approximate daily drift is entered in nautical miles beside arrow shaft
Note:-
The plotted symbols indicate predominating conditions within the given boundary. Data represented by shading with no boundary are estimated

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

(This does not include growlers or radar targets)

Limits of Latitude and Longitude		Degrees North and West												
		66	64	62	60	58	56	54	52	50	48	46	44	42
Number of bergs reported south of limit	July	> 279	> 273	> 273	> 273	> 273	> 272	> 229	> 65	> 19	> 1	0	0	0
	Aug.	> 111	> 111	> 110	> 110	> 110	> 108	> 67	> 19	> 4	0	0	0	0
	Sept.	> 118	> 118	> 118	> 108	> 69	> 50	> 26	> 8	0	0	0	0	0
	Total	> 508	> 502	> 501	> 491	> 452	> 430	> 322	> 92	> 23	> 1	0	0	0
Number of bergs reported east of limit	July	> 279	> 279	> 279	> 279	> 275	> 261	> 221	> 111	> 25	> 5	> 4	> 4	0
	Aug.	> 111	> 111	> 111	> 111	> 109	> 75	> 34	> 20	5	1	0	0	0
	Sept.	> 118	> 115	> 94	> 71	> 51	> 41	> 15	> 12	6	6	6	4	4
	Total	> 508	> 505	> 484	> 461	> 435	> 377	> 270	> 143	> 36	> 12	> 10	> 8	4
Extreme southern limit	July	47° 29'N, 46° 44'W on 30.7.69												
	Aug.	49° 00'N, 54° 00'W on 8.8.69												
	Sept.	51° 12'N, 53°23'W on 21.9.69												
Extreme eastern limit	July	53° 24'N, 42° 24'W on 17.7.69												
	Aug.	50° 00'N, 47° 50'W on 4.8.69												
	Sept	59° 05'N, 40° 50'W on 27.9.69												

> ('greater than') has been inserted where there is some doubt as to the actual number of icebergs at some of the sightings, but the true value is probably greater than the value given.
Extreme limits during the 3-month period are underlined.

Barents Sea. Light, cool, easterly winds were replaced by strong south-south-westerly winds during the month and temperatures recovered from as much as 4 degC below to 4 degC above average. The ice edge retreated northwards under the influence of these strong winds, but at the end of the month the edge, as far south as 75°N at 40°E, was still 50 to 100 miles south of normal.

R. M. S.

Note. The notes in this article are based on information plotted on ice charts similar to the map shown opposite but on a much larger scale (39 in × 27 in). These charts are published at ten-day intervals and are available at the price of reproduction on application to the Director General, Meteorological Office (Met.O.1), Eastern Road, Bracknell, Berks. Alternatively, they may be seen at any Port Meteorological Office or Merchant Navy Agency. Up-to-date ice charts are broadcast daily by facsimile.

Book Reviews

Reflections in the Sea, by Douglas Phillips-Birt. 8¾ in × 5⅝ in, pp. 116, *illus.* Nautical Publishing Company, Captain's Row, Lymington, Hampshire, 1968. Price: 30*s.*

In these days, when so much technological matter is coming off the presses, one is apt to feel a little diffident about 'having a nice quiet read' for the natural pleasure of dipping into literature for its own sake is all too often tempered by the guilty feeling that one ought really to be 'getting on with something'.

In this book we are given the best of both worlds for every one of the essays it contains is not only a pleasant piece of literature in its own right but contains a lot of informative matter.

The author, under the pen name Argus, has been writing a monthly column with this title in the *Yachting Monthly* since 1952 and the book is a selection from his columns during the first sixteen years, together with a few additional pieces. Under five headings, Ocean, The Land and Sea, Sailor's Talk, The Poet's Eye and Seas of Antiquity, he covers the sea in all its moods, those who have sailed upon it and those who have written or talked about it.

With sixteen magnificent photographs of the sea and shore line, not omitting even a dockside picture, each captioned by a quotation from Masefield, this book would be an admirable companion for that blessed half-hour between coming off watch and falling asleep.

L. B. P.

Celestial Navigation, by Frances W. Wright. 11 in × 8½ in, pp. 156, *illus.* Cornell Maritime Press Inc., Box 109, Cambridge, Maryland, 1969. Price $7.50.

The American author of this guide has spent many years teaching the subject and on six ocean voyages has practised the methods she taught to U.S. Navy and Harvard students.

The book is well produced and generously illustrated. It is divided into parts to meet the various needs of users, depending on their experience and requirements. The first three parts deal with basic principles, the different kinds of time used in solar navigation and the definition of terms used in nautical astronomy and will not therefore be required by those who only need to refresh their knowledge.

An unusual and accurate method of obtaining the latitude by meridian altitude of the sun is described in Part IV—the 'Noon Curve'—in which the sextant altitude of the sun is plotted vertically against GMT horizontally. As it takes about an hour to obtain the latitude by this method it is unlikely to be favoured by many professional navigators accustomed to taking a meridian altitude and working it up in rather less than ten minutes. The Noon Curve can also be used for finding the approximate longitude.

The Sight Reduction technique favoured by Dr. Wright for obtaining an astronomical fix makes use of the American publication H.O. 249, *Sight Reduction Tables for Air Navigation*, Vols. I, II and III. Using this publication, or similar tables published in the U.K., the *Nautical Almanac* and a prepared form, sights can be worked in about fifteen minutes with a little practice. Extracts from H.O. 249 and the *Nautical Almanac*, together with spare reduction forms and Universal Plotting Sheets, are included in the book for the use of the student navigator.

As many readers of this journal will know there is no shortage of books on celestial navigation. Many excellent and inexpensive guides have been published in recent years, most of them for the use of non-professional navigators. Dr. Wright's approach is new and as a primer for the busy yachtsman who does not wish to study the subject in depth it has much to commend it; some, no doubt, will be put off by the price. It certainly deserves a place in the library of all navigation schools.

A. D. W.

The Complete Nautical Astronomer, by Charles H. Cotter. 8¾ in × 5¾ in, pp. 336, *illus.* Hollis and Carter Ltd., 9 Bow Street, London W.C.2, 1969. Price: 63*s.*

We have become rather used to well-written books from the pen of Mr. Cotter; this one is no exception and he treats his subject with his usual care and thoroughness. If he teaches as well as he writes his navigation students at the Institute of Technology and Science in Cardiff are fortunate.

In this book, which he regards as a companion volume to his *Complete Coastal Navigator*, Mr. Cotter delves deeper into the general subject of nautical astronomy than is done in the normal manual of navigation and he adds to the reader's interest by including a lot of historical background. He does not attempt to provide worked examples of actual navigational problems (except for calculating the GMT of moon's transit); he leaves that to the manuals of navigation and concentrates rather on the basic principles. There are numerous drawings and diagrams, all of which seem to be very clear and easy to understand.

Above all, this is a useful book of reference for the practical navigator and one is tempted to believe that the author may have been thinking of Lecky when he wrote it. In an excellent chapter on the care of the sextant he includes a brief quotation from Lecky. The practical nature of the contents is, perhaps, best illustrated by some of the chapter headings: Rates of Change; the Treatment of Errors in Astronomical Navigation; the Use of the Nautical Almanac; the Daily Routine of the Nautical Astronomer.

One hears so much nowadays about electronic aids, including the use of artificial satellites, that one may be tempted to wonder if nautical astronomy has much value for the modern navigator. Mr. Cotter brings the reader to earth with the reminder that "when the ship is away from land, in the absence of electronic aids to navigation, the principles and practice of nautical astronomy must be brought to bear in seeking answers . . .". One can never be sure aboard any ship that electronic aids will unfailingly be available.

C. E. N. F.

Personalities

RETIREMENT.—CAPTAIN P. A. JOHNSON has retired from the sea after 46 years' service.

Peter Johnson was born in the Shetland Islands in 1904; nearly all his ancestors were connected with the sea as were most Shetlanders in those days.

He first went deep sea in 1923 as an ordinary seaman aboard the *Navarino*, a large tramp belonging to The Glasgow Shipowners Co. He worked his way up to become a Quartermaster in the *Demosthenes* of the Aberdeen White Star Line, a passenger vessel on the Australian run. He then went to the *Vancolite* belonging to the Imperial Oil Company of Canada. Whilst in her he completed his sea time for 2nd Mate, sat and passed the examination at Glasgow in 1929 and returned to the Company as 4th Officer of their *Calgarolite.*

He passed for Master at Glasgow in 1935 and then joined the Coast Lines as 2nd Officer of their *British Coast.* In this Company he remained for the rest of his sea career, 34 years, the last 28 of which were in command.

Captain Johnson was appointed to his first command, the *British Coast*, in 1941. At that time she was chartered by the Ministry of War Transport to carry petrol between the U.K. and Gibraltar, a most hazardous employment. He then commanded the *Atlantic Coast* and remained in her until the end of the war. For some 16 months he had her ferrying supplies on the West African coast; as she was not fitted out for tropical service many of his crew went down with malaria and had to be sent home to the U.K. and he had to accept replacements from Freetown jail. After refitting in Liverpool, Captain Johnson took her down to the Mediterranean where she took part in the allied landings in North Africa, Sicily and Salerno.

After the war, Coast Lines vessels went back to their normal trades in home waters but these gradually changed with the times and his last year before retirement was spent trading to the Mediterranean in the *Spartan Prince* (formerly the *Cheshire Coast*).

Our association with Captain Johnson goes back to 1937 when he sent us a meteorological logbook from the *Eastern Coast.* After the war his voluntary service for us was all in Marid Ships (vessels in the short sea trades observing and transmitting sea temperatures only). In fourteen separate years since the war Captain Johnson has had these records kept in his commands, starting with the *Southern Coast* in 1949, then the *Atlantic Coast*, *British Coast*, *Lancashire Coast* and finally the *Spartan Prince.*

We wish him health and happiness in his retirement.

L. B. P.

APPOINTMENT OF THE NEW MARINE SUPERINTENDENT, METEOROLOGICAL OFFICE

Captain Gerald Arthur White has been appointed as the new Marine Superintendent of the Meteorological Office and he took up his appointment on 3rd November 1969.

Captain White went to sea in 1941 as a cadet with Canadian Pacific Steamships and served with this company until 1947 when he joined the Royal Fleet Auxiliary service as 2nd Officer. At the age of 25 he passed for Extra Master and was promoted Chief Officer with the R.F.A.

After a period as a Nautical College lecturer Captain White returned to sea in 1956 in command of a survey and exploration ship. In 1958 he came ashore to join the Board of Trade as a Nautical Surveyor and his first appointment was to the Central Board of Examiners in London. He was later posted to Liverpool for survey duties and subsequently promoted to Senior Nautical Surveyor and posted to Newcastle-upon-Tyne.

Captain White has had considerable experience as a voluntary observer in the Far East, observing for the Hong Kong Meteorological Service.

A. D. W.

Fleet Lists

Corrections to the list published in the July 1969 number of *The Marine Observer*

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

GREAT BRITAIN (Information dated 14.10.69)

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

Name of Vessel	Captain	Owner/Manager
Innisfallen	T. C. Davies	British & Irish Steam Packet Co. Ltd.
Penelope Everard	J. C. Jewsbury	F. T. Everard & Sons Ltd.
Pentland	A. Wallace	Currie Line Ltd.
Spero	A. T. Jardine	Ellerman's Wilson Line Ltd.
William J. Everard	T. L. Vaughan	F. T. Everard & Sons Ltd.

The following vessels have been deleted:

Dido, Elwick Bay, Fernhurst, Heron, Lairds Loch, Scottish Coast, Sydenham.

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

Skipper	Radio Operator	Trawler Owner/Manager
B. Boyce	A. Wilkinson	Hellyer Bros. Ltd.
J. W. E. Boyle	C. Bird	Boyd Line Ltd.
T. Evans	G. Swallow	Boston Deep Sea Fisheries Ltd.
J. Gordon	A. S. Wittlin	Northern Trawlers Ltd.
E. Hall	P. R. Hickson	Northern Trawlers Ltd.
J. Humphrey	G. A. Osborne	T. Hamling & Co. Ltd.
J. N. Kerr	R. H. Wilson	Ross Trawlers Ltd.
K. Knox	K. Ward	T. Hamling & Co. Ltd.
B. McCall	J. L. Thorpe	Ross Trawlers Ltd.
F. Myers	J. Brickwood	Hudson Bros. Ltd.
J. Nelson	K. H. Massey	T. Hamling & Co. Ltd.
F. Peacham	J. Wells	Hudson Bros. Ltd.
D. Pulfrey	A. S. Wittlin	Northern Trawlers Ltd.
K. Thompson	A. J. Nettleship	Hellyer Bros. Ltd.

The following ships have been recruited as Selected Ships:

Name of Vessel	Date of Recruitment	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Albright Explorer	28.7.69	J. Wise	R. Whiting, J. S. Jones, C. Bush	R. P. M. Edmunds	James Fisher & Sons Ltd.
Beaverfir	10.9.69	T. Parker	J. Donn, G. Spencer, R. Potts		Canadian Pacific Steamships Ltd.
Benreoch	14.7.69	J. R. Rodger	A. I. McFeate, A. Glen, A. Davidson, I. Donaldson	J. Gillhooly	Ben Line Steamers Ltd.
Border Castle	9.7.69	E. V. Judge	J. Wood, J. T. Gunn, G. Phillips		Common Bros. Ltd.
Clan Robertson	11.9.69	R. Harber	R. Bigwood, R. Slack, J. Cowie	D. Imrie	Clan Line Steamers Ltd.
Colorado Star	5.5.69	G. Pigott	W. R. Houghton-Boreham, P. W. Hutchinson, M. A. Mansfield	J. C. Martin	Blue Star Line Ltd.
Elysia	20.8.69	A. J. F. Colquhoun, M.B.E.	G. Parker, S. Rigley, J. Swan		Anchor Line Ltd.
Foreland	17.6.69	J. L. Downie	J. S. Allan, J. N. McDonald, D. Clifford		Shipping & Coal Co. Ltd.
Manapouri	15.4.69	J. D. Guyler	T. W. Carnduff, I. S. Roberts, R. R. Walker	M. Moore	New Zealand Shipping Co. Ltd.
Manchester Concorde	22.5.69	L. Taylor	M. Miles, M. Milroy, R. Webb	W. E. Harrison	Manchester Liners Ltd.
Mataura	7.5.69	E. F. H. Allen	R. A. Newnham, H. J. Vercoe, J. Murt	D. L. Byne	New Zealand Shipping Co. Ltd.
Menestheus	29.4.69	J. W. Hutchinson	P. R. N. Robinson, J. R. K. Corrin, P. J. H. Purves, W. F. Wood	J. B. Carr	Ocean Fleets Ltd.
Plagiola	9.4.69	P. Levoguer	D. Lake, B. Snazell, M. Hampson	J. Boyle	Shell Tankers (U.K.) Ltd.

The following ships have been recruited as Supplementary Ships:

Name of Vessel	Date of Recruitment	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Albright Pioneer	25.9.69	J. H. Kitching	D. Williams, J. Price, H. Towers	D. Brown	James Fisher & Sons Ltd.
Baron Cawdor	23.7.69	A. Mackinlay	D. S. Gordon	D. Hynd	H. Hogarth & Sons Ltd.
Cape Wrath	8.4.69	A. MacLeod	G. McGregor, J. Tattersall, M. Smith	D. A. McLeod	Lyle Shipping Co. Ltd.
Mobil Energy	1.5.69	G. J. Robertson	J. C. Cole, C. W. Parven, W. Harvey	W. Kavanagh	Mobil Shipping Co. Ltd.
Northern Reward	6.8.69	W. Harris	S. Barr	S. Barr	Northern Trawlers Ltd.
Phyllis Bowater	28.4.69	M. Turner	M. Bedford, B. Reid	T. Kearsey	Cayzer Irvine & Co. Ltd.
St. Jasper	18.4.69	T. Doyle	R. T. Murphy	R. T. Murphy	T. Hamling & Co. Ltd.

It is regretted that the following Selected Ships were omitted from the July 1969 Fleet List:

Name of Vessel	Date of Recruitment	Captain	Observing Officers	Senior Radio Officer	Owner/Manager
Diomed	11.7.69*	D. K. Dunlop, R.D.	R. F. Speedie, J. R. Smith, R. Dinnie, J. M. Stewart	A. Watt	Ocean Fleets Ltd.
Manchester Challenge	1.11.68	P. N. Fielding	L. Street, C. J. Hunt, D. R. Perry, D. R. Nutton	W. E. Harrison	Manchester Liners Ltd.

The following Selected and Supplementary Ships have been deleted:
Alice Bowater, Alva Bay, Benavon, Cairngowan, Corinthic, Crystal Jewel, Echo, Eden, Glitra, Gothic, Herefordshire, Inishowen Head, Jamaica, La Loma, Manchester Shipper, Matina, Milo, Mobil Apex, Ramon de Larrinaga, Renoir, Richard de Larrinaga, Royal Arrow, S.A. Oranje, Sarpedon, Shackleton, Sylvan Arrow, Sylvania, Texaco Canberra.

* Date of last return.

BRITISH COMMONWEALTH

AUSTRALIA (Information dated 30.9.69)

(This complete list was not available for the July 1969 number)

Name of Vessel	Owner/Manager
Selected Ships:	
Abel Tasman	H. C. Sleigh Ltd.
Al Mahrosa	Sheiks of Kawait
Andros	Australia-West Pacific Line
Aradina	Eastern & Australian S.S. Co. Ltd.
Arafura	Eastern & Australian S.S. Co. Ltd.
Arakawa	Eastern & Australian S.S. Co. Ltd.
Aramac	Eastern & Australian S.S. Co. Ltd.
Arawatta	Eastern & Australian S.S. Co. Ltd.
Australasia	Austasia Line
Balarr	Howard Smith Industries Pty. Ltd.
Bamora	British India S.N. Co. Ltd.
Barpeta	British India S.N. Co. Ltd.
Barwon	Associated S.S. Pty. Ltd.
Binburra	Australian National Line
Bogong	Associated S.S. Pty. Ltd.
Bolnes	Kristian Jebsen Rederi
B.P. Endeavour	B.P. Tanker Co. Ltd.
B.P. Enterprise	B.P. Tanker Co. Ltd.
Braeside	Burns, Philp & Co. Ltd.
Burwah	Howard Smith Industries Pty. Ltd.
Cape Don	Dept. of Shipping & Transport, Australia
Cape Pillar	Dept. of Shipping & Transport, Australia
Carpentaria	British India S.N. Co. Ltd.
Centaur	Blue Funnel Line Ltd.
Chakdina	British India S.N. Co. Ltd.
Chakrata	British India S.N. Co. Ltd.
Chandpara	British India S.N. Co. Ltd.
Coral Chief	China Navigation Co. Ltd.
Delamere	Western Australian State Shipping Service
Delos	Australia-West Pacific Line
Dongara	Melbourne S.S. Co.
Dorrigo	Western Australian State Shipping Service
Dulverton	Western Australian State Shipping Service
Eigamoiya	Nauru Government
Empress of Australia	Australian National Line
Hobart Star	Blue Star Line Pty. Ltd.
Iron Derby	Broken Hill Pty. Co. Ltd.
Iron Flanders	Broken Hill Pty. Co. Ltd.
Iron Kimberley	Broken Hill Pty. Co. Ltd.
Island Chief	China Navigation Co. Ltd.
Juna	British India S.N. Co. Ltd.
Kabbarli	Western Australian State Shipping Service
Kangaroo	Western Australian State Shipping Service
Kanimbla	Associated S.S. Pty. Ltd.
Koojarra	Western Australian State Shipping Service
Koolama	Western Australian State Shipping Service
Kooringa	Associated S.S. Pty. Ltd.
Lemnos	Australia-West Pacific Line
Marsina	Burns, Philp & Co. Ltd.
Milos	Australia-West Pacific Line
Moana Raoi	British Administration of the Gilbert and Ellice Islands
Montoro	Burns, Philp & Co. Ltd.
Moresby	Burns, Philp & Co. Ltd.
Mundoora	Associated S.S. Pty. Ltd.
Port Albany	Blue Star Port Lines Ltd.
Port Alfred	Blue Star Port Lines Ltd.
Port Huon	Blue Star Port Lines Ltd.
Port Melbourne	Blue Star Port Lines Ltd.
Port Montreal	Blue Star Port Lines Ltd.
Port New Plymouth	Blue Star Port Lines Ltd.
Port St. Lawrence	Blue Star Port Lines Ltd.
Rhexenor	Blue Funnel Line Ltd.
Rona	Colonial Sugar Refining Co. Ltd.
Samos	Australia-West Pacific Line
Sletholm	Karlander (Papua) Pty. Ltd.
Stentor	Blue Funnel Line Ltd.
Tenos	Australia-West Pacific Line
Tientsin	China Navigation Co. Ltd.
Townsville Star	Blue Star Line Pty. Ltd.
Triadic	British Phosphate Commissioners
Tri-Ellis	British Phosphate Commissioners
Tulagi	Burns, Philp & Co. Ltd.
Windarra	Melbourne S.S. Co.
Wongala	Tucker Shipping Pty. Co.
Supplementary Ships:	
Bass Trader	Australian National Line
Mittagong	Associated S.S. Pty. Ltd.

CANADA (Information dated 16.10.69)

(This complete list was not available for the July 1969 number)

NAME OF VESSEL	OWNER/MANAGER
Selected Ships:	
Arcadia	P. & O. Lines Management Ltd.
A. T. Cameron	Government of Canada
Baffin	Government of Canada
Bluenose	Canadian National Railways
Bridgepool	Sir R. Ropner & Co. Ltd.
Camsell	Government of Canada
Canberra	P. & O. Lines Management Ltd.
C. D. Howe	Government of Canada
Cygnus	Government of Canada
Dawson	Government of Canada
Derbyshire	Bibby Line Ltd.
d'Iberville	Government of Canada
Droxford	Risdon Beazley Ltd.
Frank H. Brown	White Pass & Yukon Ltd.
Gulf Canada	Gulf Oil Ltd.
H 1060	Kent Line Ltd.
H 1070	Kent Line Ltd.
H. R. MacMillan	Canadian Pacific Steamships
Hudson	Government of Canada
Iberia	P. & O. Lines Management Ltd.
Imperial Bedford	Imperial Oil Ltd.
Imperial Acadia	Imperial Oil Ltd.
Imperial Ottawa	Imperial Oil Ltd.
Imperial Quebec	Imperial Oil Ltd.
Imperial St. Lawrence	Imperial Oil Ltd.
Irvingstream	Irving Oil Co.
Ixia	Stag Lines Ltd.
John A. Macdonald	Government of Canada
John Cabot	Government of Canada
J. V. Clyne	Canadian Pacific Steamships
Kapuskasing	Government of Canada
Labrador	Government of Canada
Limnos	Government of Canada
Louis S. St. Laurent	Government of Canada
Martin Karlsen	Government of Canada
Montcalm	Government of Canada
Narwhal	Government of Canada
N. B. McLean	Government of Canada
Nego Anne	Wallem & Co. A/S
Northern Shell	Shell Canada Ltd.
N. R. Crump	MacMillan & Clyne Ltd.
Oriana	P. & O. Lines Management Ltd.
Porte Dauphine	Government of Canada
Queen of Prince Rupert	British Columbia Ferry Authority
Silvercape	Silver Line Ltd.
Simon Fraser	Government of Canada
Sir Humphrey Gilbert	Government of Canada
Sir William Alexander	Government of Canada
Texada	Wingate International Shipping Co.
Thomas Carleton	Government of Canada
Thor I	Thor Dahl A/S
Thorshope	Thor Dahl A/S
Thorsriver	Thor Dahl A/S
Thorstream	Thor Dahl A/S
Wheat King	Upper Lakes Shipping Co. Ltd.
Wolfe	Government of Canada
Supplementary Ships:	
Acadia	Government of Canada
Alexander Mackenzie	Government of Canada
Anna Bakke	Knut Knutsen O.A.S.
Astrid Bakke	Knut Knutsen O.A.S.
Bonneville	A. F. Klaveness & Co. A/S
Bougainville	A. F. Klaveness & Co. A/S
Bronxville	A. F. Klaveness & Co. A/S
Emerillon	Shell Canada Ltd.
Gosforth	Burnett Steamship Ltd.
Maxwell	Government of Canada
Princess of Acadia	Canadian Pacific Steamships
Sunnyville	A. F. Klaveness & Co. A/S
William Carson	Canadian National Railways

Auxiliary Ships:

Canada has 51 ocean-going Auxiliary Ships and 51 Auxiliary Ships operating on the Great Lakes.

HONG KONG (Information dated 5.9.69)

The following ships have been recruited:
Eredine (John Swire & Sons Ltd.)
Eriskey (John Swire & Sons Ltd.)
Fortune Glory (Continental Navigation & Enterprises Ltd.)
Hyria (Shell Bermuda (Overseas) Ltd.)
Shansi (China Navigation Co. Ltd.)
Star Aldebaran (Everett S.S. Corporation S/A)
The following ships have been deleted:
Changsa, Hero, Red Dragon, Star Alcyone.

INDIA (Information dated 1.9.69)

The following ships have been recruited as Supplementary Ships:
Vishva Vandana (Shipping Corporation of India Ltd.)
Vishva Vinay (Shipping Corporation of India Ltd.)
The following ship has been recruited as an Auxiliary Ship:
Vishva Marg (Shipping Corporation of India Ltd.)
The following ships have been deleted:
Bharatmitra, Jag Jiwan.
The following ship has changed her name and ownership:
Jag Mitra is now *Maha Jag Mitra* (South East Asia Shipping Co. Ltd.)

NEW ZEALAND (Information dated 13.9.69)

The following ships have been recruited as Selected Ships:
Maheno (Union S.S. Co. of New Zealand Ltd.)
Marama (Union S.S. Co. of New Zealand Ltd.)
Waimate (Union S.S. Co. of New Zealand Ltd.)
The following ship has been recruited as a Supplementary Ship:
James Cook (New Zealand Government).

SINGAPORE (Information dated 13.10.69)

The following ships have been recruited:
Golden Harbour (Guan Guan Shipping Ltd.)
Golden Summer (Guan Guan Shipping Ltd.)
Neptune Aquamarine (Neptune Orient Lines Ltd.)
Neptune Topaz (Neptune Orient Lines Ltd.)
Neptune Zircon (Neptune Orient Lines Ltd.)
The following ships have been deleted:
Kota Naga, Perak, Perlis.

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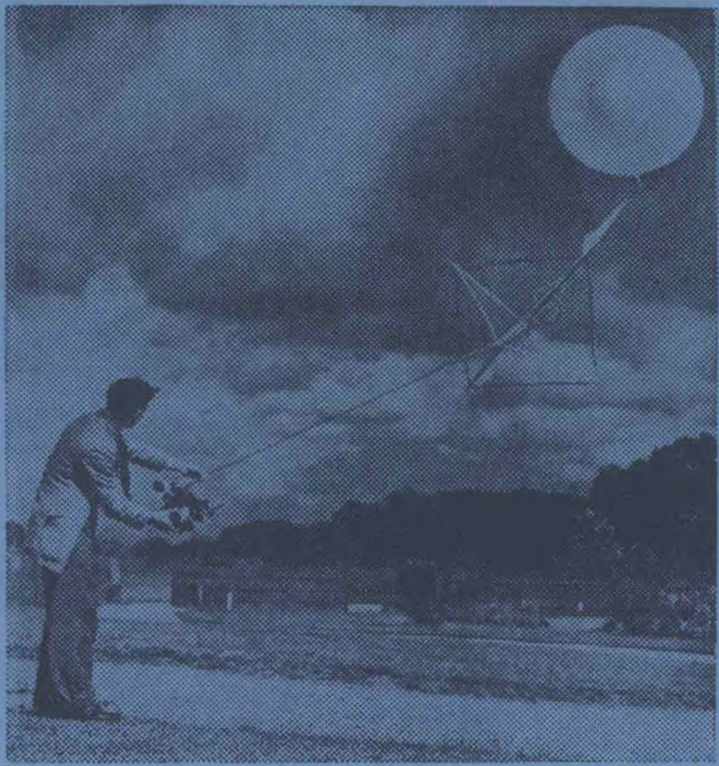

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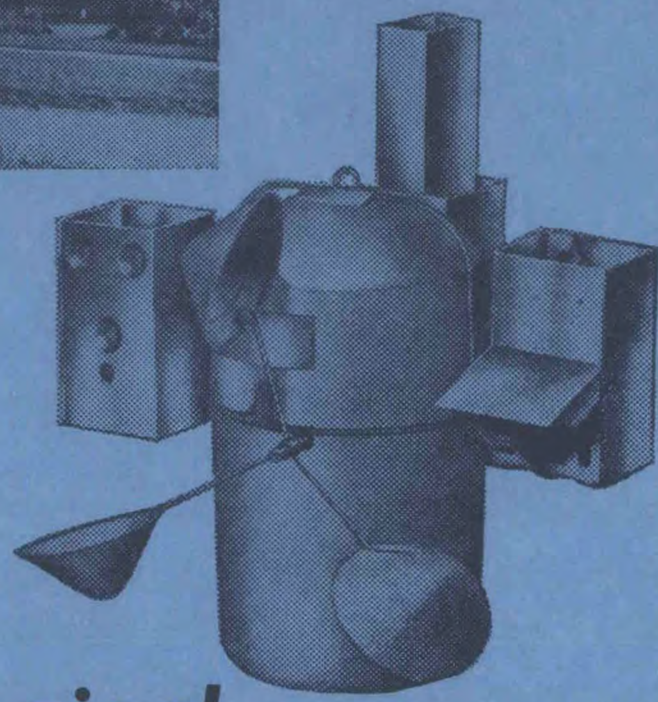

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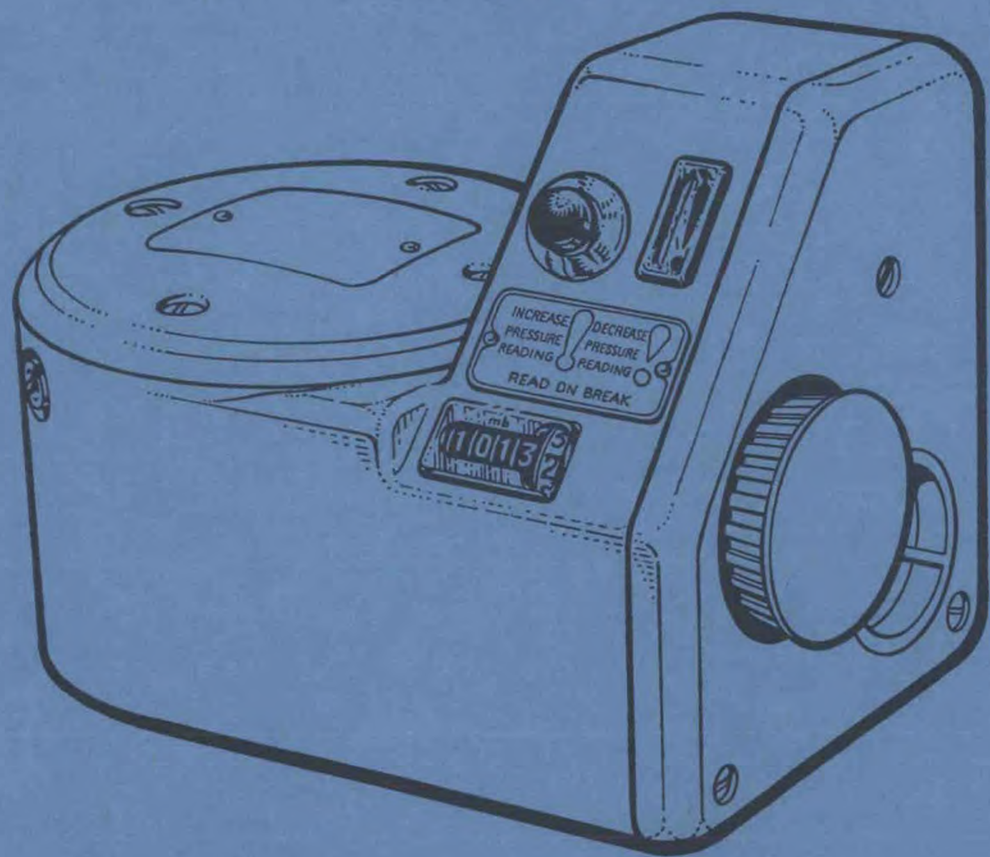

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