OFFSHORE

NUMBER 42 JUNE/JULY 1978 50c*

Navigation Issue

SIGNIFICANT DATES IN THE HISTORY OF NAVIGATION

3,000 B.C.

Hoang Ti credited with use of compass ashore.

1,000 B.C. and earlier

Although astronomy and mathematics, even ship construction reached considerable accomplishment in several ancient civilizations, the other element required to force advances in navigation — the need to traverse great distances — was often missing.

With two notable exceptions — the Dhow and Junk — ships were not large or seaworthy enough to undertake very long ocean voyages. We do not know why the Chinese Junk never penetrated further West than Arabia but we do not know when this type of vessel was first constructed at an ocean-going size.

700-600 B.C.

The Phoenicians used a simple form of star navigation; the Greeks learned from them.

150 B.C.

Hipparchus recorded that at that time the observation of eclipses was the only method of ascertaining longitude.

circa 70 A.D.

The Mediterranean has become a well-organised seasonal shipping area with rules and statutes. Winds were used by name to indicate direction.

150 A.D.

Ptolemy's "world", with its exaggerated easterly extent of Asia, established a misconception that was to last for 10 centuries.

400-800 A.D.

Chinese trade voyages extended from Arabia to the Pacific, perhaps even to what is now British Columbia. Arabs, however, do not believe that anything lies to the eastward of Japan.

circa 800 A.D.

Arabs trade with China in their vessels.

877 A.D.

Vikings reach Greenland.

1,000 A.D.

Vikings reach "Vinland" (New England)

circa 1050 A.D.

The compass came into use in Northern Europe; there is no record of its introduction further South but presumably it came from China via the Middle East seamen, or even overland on the caravan routes to Italy.

1200-1300 A.D.

Plane charts in use in the Mediterranean.

1261 A.D.

First English record of ships paying dues for the upkeep of navigational lights (Yarmouth Harbour Entrance).

1280 A.D.

Italians and Catalans used written Traverse Tables "Poleta de Marteloio" but these are only relative and without directional reference. The earliest known Portolan Chart.

circa 1290 A.D.

'Compasso da Navigare', a Pilot Book for the Mediterranean and Black Seas, compiled.

1300-1400 A.D.

The card compass superseded the cruder needle compass but the cards were marked with wind directions at first.

circa 1410 A.D.

The first English 'Rutter' — a Pilot Book for N.W. European waters — was compiled.

1448-1468 A.D.

Italian Charts extended to the Atlantic but were largely drawn from Portuguese information.

1400-1500 A.D.

The 'carrack' type of vessel developed in Northern Europe; the increasing literacy of seamen helped by the invention of printing, enabled them to increase their knowledge of many aspects of navigation; the pegged traverse board became common; the "Dutchman's Log" used without calculation.

(continued page 32)

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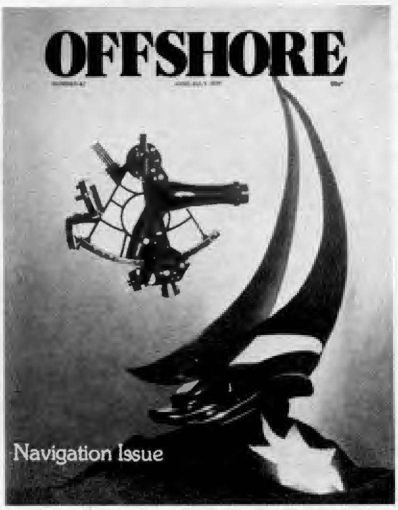
FEATURES



Cover: The Government of Tasmania Trophy is one of the most beautiful of trophies to be won each year by a contestant in the Hitachi Sydney-Hobart Yacht Race. Here it is symbolically shown sailing over a sea, which is the C.Y.C. burgee, with sextant motif in the southern sky — representing dedication to the sport of ocean racing and the pursuit of knowledge of the seaman's craft. We are indebted to the many C.Y.C. Members who have contributed articles to this end in this special navigation issue of 'Offshore'.

Cover design and photography by Carolyn and David Colfelt.

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Longitude — after a fashion

by Jack North

After many weary days and nights at sea Noah released a dove. It flew up and up and circled round until it got tired. Then it returned to the Ark. A week later he let it go again. As it gained height the bird sighted land and flew off towards it. Noah, noting the direction of flight, shaped his course accordingly.

That story from the Book of Genesis describes perfectly what might be called the land bird system of navigation. Ancient navigators were used to coastal voyages only; they rarely went out of sight of land. When they did, and felt they were drawing near shore again, they released a land bird carried specially for that purpose. If it saw nothing but water, the bird returned to the ship, as Noah's dove did. But if land were in sight the bird, not liking shipboard life very much, headed shoreward. The navigator watched its course and followed while saying to his crew, 'I knew it was there all the time'.

Noah was using the navigational method of his times although it was not usual for the bird to return with an olive leaf in its beak as the dove did. Perhaps the fact that the only other living dove was in the Ark had something to do with that.

Deliberate deep-sea voyaging began in the first century A.D., most likely when the Romans discovered they could get from the Gulf of Aden to India just by keeping the monsoon on the starboard quarter. There must have been a lot of hit-or-miss in it, and no doubt the land bird system was used. This sytem had a run of some thousands of years, right up to Viking times, in fact.

The introduction of the mariner's compass has been described as the greatest single advance in the art of navigation. It came to the European world by way of the Arabs and Greeks, who might have picked up the idea from the Chinese. The date of this introduction cannot be fixed accurately but the compass was known to European navigators in the twelfth century.

It did not win general acceptance at once because it was expensive and not too reliable. But the strongest thing against it was the hint of sorcery and witchcraft which surrounded it. They had firm ways of dealing with witches and sorcerers in those days.

About the same time, and also from the Arabs and the classical world, came the astrolabe. This was used to determine the position of sun, moon and stars. Anyone who cared to think about it knew the world was round; in the fourth or fifth century B.C. the Greeks worked out that it was about 21,600 nautical miles in circumference.

The story of Columbus having trouble with his crew because they thought the 'Santa Maria' would tumble over the edge of the world is only a fable. Columbus's own account shows that the sailors had a much more sensible and prosaic reason for their complaints; when half the ship's food is eaten it's time to go back.

Columbus used an astrolabe. He also used the cross-staff which was soon to supersede the astrolabe. These gave him latitude; longitude was by dead reckoning all the way. Perhaps that was why he thought he'd reached Asian waters.

Over the years the backstaff took the place of the cross-staff but the next significant breakthrough came with the invention of the reflecting quadrant, in 1730. The sextant came on the scene in 1731 and rivaled the quadrant for about a hundred years before it took over completely. In essentials it was no different from the present-day sextant. With the coming of the sextant and the quadrant the backstaff joined the astrolabe and the cross-staff in the museums. So did the octant which, invented by Sir Isaac Newton, had enjoyed a short term of popularity.

The steering wheel came on the scene at about this time. Until then ships were steered by tillers, often controlled by a lever-like device called a whipstaff. The wheel and an improved compass made it possible to hold a steady course for hour after hour, which gave the navigator a chance to produce a more reliable dead reckoning. Actually D.R. stands for deduced reckoning, but let it be. Everyone calls it dead reckoning.

Dead reckoning was never completely trustworthy, especially in those days when there was no sure means of measuring a ship's speed or distance run. The log used in English ships was a wooden triangle weighted with lead along one edge so that it floated upright and offered the greatest resistance to the water. Attached to a line on a reel, it was thrown overboard every so often. The line was knotted at 25-foot intervals if a 15-second timeglass were to be used (50-foot intervals in the case of a 30-second sandglass) and the number of knots that ran out in a 15-second (or 30-second) period was equivalent to the number of nautical miles the ship would travel if she maintained that speed for an hour. It became customary to refer to a ship's speed in knots, but *never in 'knots per hour' which was, and is, the hallmark of the landlubber.*

This form of log was cast hourly in warships and East-Indiamen and two-hourly in all other blue-water vessels, according to Falconer's Marine Dictionary. It was in use in some sailing ships until well into the twentieth century.

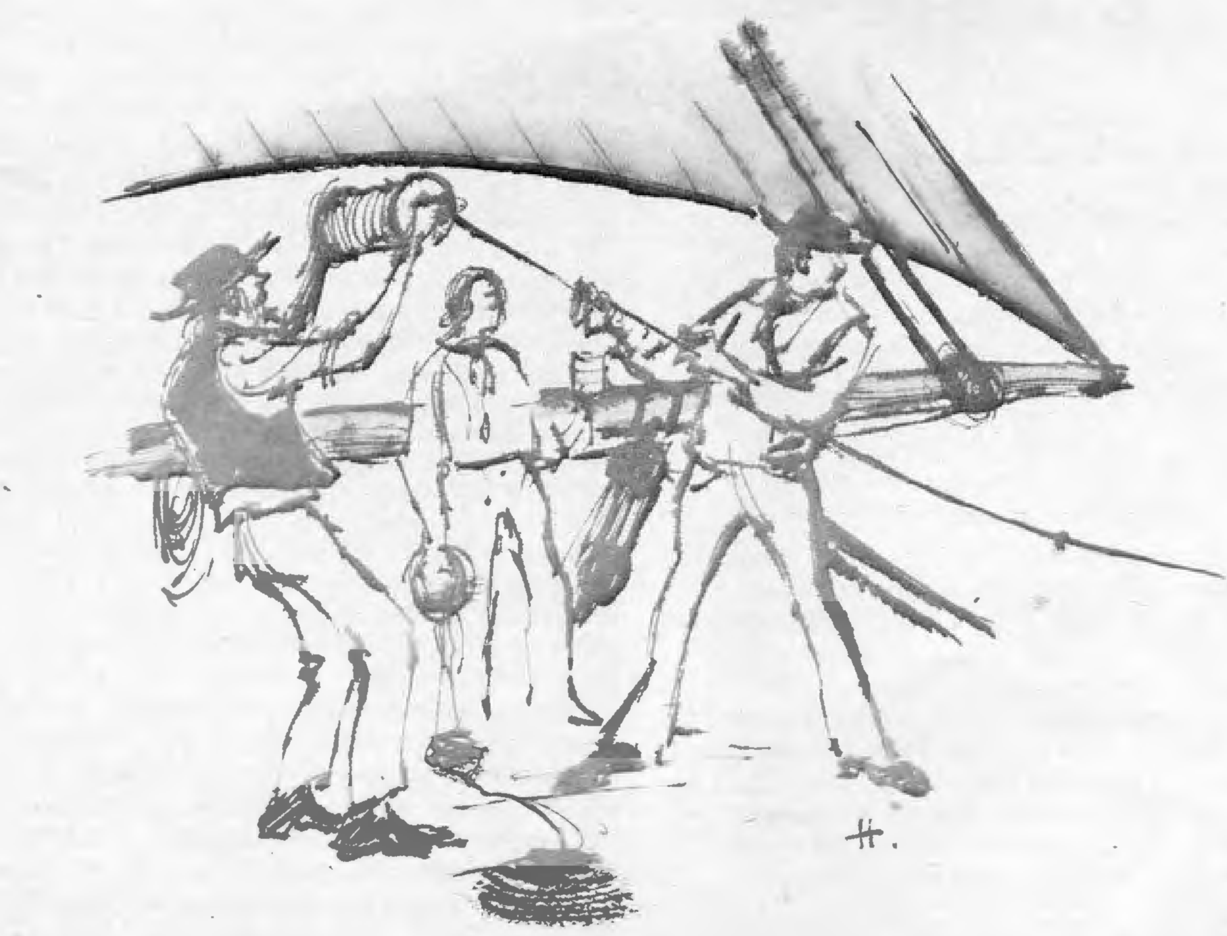
The lead line was the other navigational instrument. In its smaller form known as the 'hand lead', it has been in use for centuries and is still used. It needs no description. Although the deep-sea lead (called the dipsy lead) survived until this century, mechanical sounding machines and echo sounders took over eventually.

The deep-sea lead was usually a hundred fathoms, and heaving it was a job for the whole watch. The crew ranged along the ship's side, each with a coil of the line over one arm. As the man at the bow heaved the lead he shouted 'Watch, there, watch,' His share of the line disappeared and the next astern took over, yelling his warning of 'Watch, there, watch', and so on. When the deep-sea lead failed to find bottomg the ship was 'off soundings'. Hauling all that line in again was hard work; the lead plummet weighed 25 to 30 lbs.

Britain wanted a foothold in the Pacific. Spain, Portugal and Holland were secretive about their discoveries in the South Seas, and such charts as there were were not much help. Although pretty right for latitude, the longitudes were often hopelessly out. Longitude was determined either by dead reckoning or the 'method of lunar distances'. This involved measuring the angle between the moon and sun, or a suitable star, and then going through a long and intricate series of calculations. The navigator had to be a brilliant mathematician, and most weren't. Anyway an error of 1' in the observed angle meant an error of 30 miles in longitude.

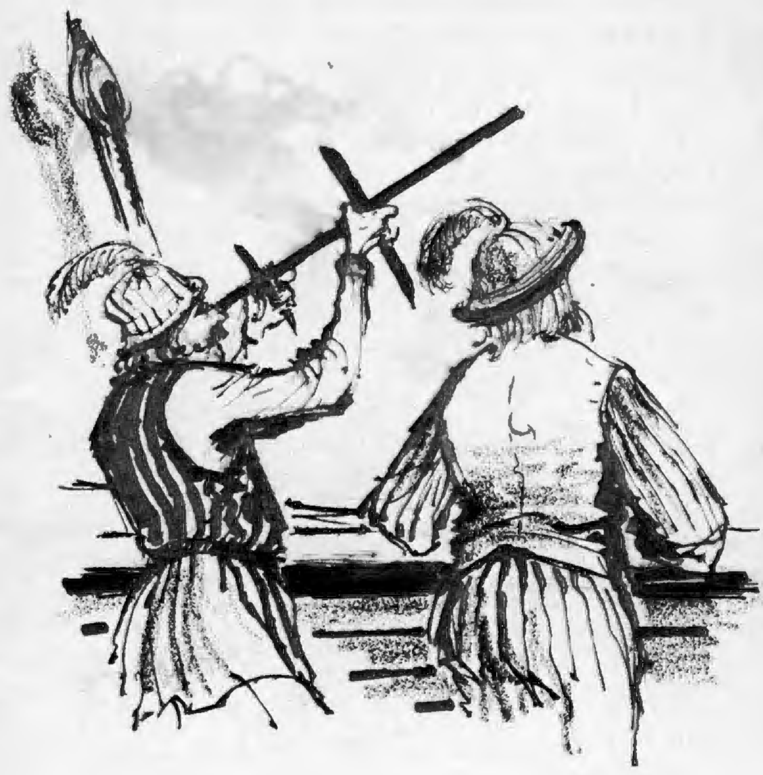
An accurate timepiece was required if the far seas were to be properly charted; the British Board of Longitude set the ball rolling by offering £20,000 to anybody who could produce one. It was a huge sum in an era when an able seaman received sixpence a day and a naval captain five shillings. All sorts of weird inventions were presented to the Board.

Meanwhile British ships were poking about, discovering things here and there. In 1768 Captain Wallis came home after his voyage around the world in H.M.S. 'Dolphin' and announced, among other discoveries, Tahiti, which he named King George III Island. It



was decided to send Lieutenant James Cook out to King George III Island in charge of an expedition to observe the Transit of Venus.

The Transit of Venus occurs when the planet Venus passes between the earth and the sun; it happens less than once in a hundred years. Cook's expedition got to Tahiti in time but missed the observation because of a cloudy day. Yet his voyage in the 'Endeavour' produced marvels of cartography. His navigation instruments were sextant and quadrant compass, hand-log, lead-line, a few doubtful watches and the 'Nautical Almanac' which the Admiralty had first published in 1767. He proved himself a master of the method of lunar distances, and his reputation as a seaman and navigator was established when he returned to England in 1771.



In the meantime John Harrison produced his practical chronometer, known as No. 4. The first three also worked but were too big and awkward for shipboard use. Then the Board of Longitude turned niggardly; it was decided that £10,000 was enough and Harrison only got that after taking the case to law. King George III was furious. "You have been cruelly wronged", he told Harrison at a reception, and ordered the Board to pay over the full amount of £20,000. Harrison, now in his seventies, had spent nearly forty years working on his chronometers and Britain has probably made few better bargains.

A chronometer was built by Larcum Kendall to Harrison's No. 4 design. In appearance it was a big, heavy watch. When Cook sailed on his second voyage in 1772 he was issued with this chronometer but had no faith in it. Yet before the three-year voyage was ended he was writing enthusiastically of the "trusty watch".

During that voyage Cook's 'Resolution' penetrated the Antarctic ice. He then sailed north for the winter and discovered the New Hebrides before proceeding south for another go at the ice. This time the 'Resolution' reached latitude 71° 10'; no other sailing vessel had ever gone that far south. In all these extremes of climate Mr. Kendall's chronometer kept perfect time. Cook was able to chart everything correctly and iron out errors in previously charted positions. Now a convert to the chronometer, he took the same timepiece with him when he sailed on his third and final voyage.

Cook and the chronometer had given England a mighty lead in the Pacific. In 1787 the First Fleet under Captain Arthur Phillip sailed to found the settlement which was to become Sydney. Chronometers, for all their popularity, were expensive, and most merchant ships didn't carry them. As nearly all the ships of the First Fleet were chartered merchantmen it was the practice for H.M.S. 'Sirius' to work out the longitude with the aid of her chronometer and signal this to the rest of the Fleet.

In the year the First Fleet sailed, 1787, another ship left Portsmouth for the South Seas. She was the 'Bounty' commanded by Lieutenant William Bligh. Having been master and navigating officer of the 'Resolution' on Cook's last voyage Bligh knew the worth of Mr. Kendall's chronometer. It was issued to the 'Bounty' at his request.

On passage to Tahiti he discovered the Bounty Isles east of New Zealand. He charted their position accurately and sounded with the deep-sea lead, finding bottom at seventy-five fathoms, but he did not go ashore there. His hot temper suffered when, at Tahiti, someone let the chronometer run down; it should have been wound daily. He started it again, resetting it as nearly as he could to Greenwich time as calculated by lunar observation. We cannot know how accurate that resetting was, as the famous mutiny broke out late in April 1789.

The ship was on passage from Tahiti to the West Indies with her cargo of breadfruit seedings. While she was in the Friendly Islands, somewhere to the north-west of Tonga, Fletcher Christian, in a moment of madness, triggered off the sudden revolt. Various reports mention navigation instruments in use on board the 'Bounty' at the time. Mills, the *gunner's-mate, cut a length off the deep-sea leadline to tie the captain up. Maybe he'd grown to hate hauling in a hundred fathoms or so of line with a 30 lb lead weight on the end of it.*

It all happened just at daybreak. After being forced into the longboat Bligh asked for navigation instruments. "Here is my own sextant, Mr. Bligh", Christian replied, "and you know it to be a good one". He added the 'Daily Assistant', a book of tables, for good measure.

Matthew Quintal objected to the bosun taking a compass from the storeroom but was overruled by other mutineers. Quintal let the compass go while grumbling that "You might as well give him the whole b—y ship. He'll get right back to England with that compass". It was a compliment to Bligh's navigation though Quintal probably didn't mean it to be.

There was a quadrant in the boat as well as the sextant, while a midshipman brought along Hamilton Moore's 'Navigation'. This contained tables used by eighteenth century navigators and also listed the latitude and longitude of well-known ports throughout the world. But for a timepiece the castaways had only the gunner's watch.

On the hectic voyage that followed they discovered the Fiji Islands and, some days later, skirted the northern end of the New Hebrides. They made a log, a miniature of the big one used on board ship. Bligh admitted it was a move to occupy the minds of the crew as much as anything. all the time it was a toss-up whether the overloaded boat would sink or be taken by canoe-loads of savages, or whether the crew would die of starvation. Yet Bligh managed to produce meticulous reports of his discoveries and to fill in a few blanks on the chart of the north Queensland coast. All in all, it was a voyage of remarkable achievement.

When he reached Batavia (now Djakarta) Bligh took passage home in the Dutch vessel 'Vlydte'. He had no great respect for Dutch navigation; the Hollanders used a sort of grid compass which was re-set whenever they discovered the variation had altered 2½ degrees since the last adjustment. "This is steering within a quarter point without aiming at greater exactness", he wrote disgustedly.

"They heave no log . . . . Their method of computing their run is by means of a measured distance of forty feet along the ship's side; they take notice of any remarkable patch of froth when it is abreast the foremost end of the measured distance, and count half-seconds until the froth is abreast the after-end". The number 48 was divided by the number of half-seconds so obtained, the result being "...the rate of sailing in geographical miles in one hour, or the number of Dutch miles in four hours". A Dutch sea-mile was equivalent to four nautical miles.

He went on to criticise their methods of celestial navigation and wrote that "From all this it is not difficult to conceive the reason why the Dutch are frequently above ten degrees out in their reckoning. Their passages likewise are considerably lengthened by not carrying a sufficient quantity of sail".

Bligh was in a tearing hurry to get home. He chafed as the 'Vlydte' just 'jogged along' by day and shortened sail at nightfall. It can't have been much fun for the captain of the 'Vlydte' either. A typical entry in Bligh's journal is:

> *"our reckonings are now proved to be 7½ degrees wrong as my observed longitude pointed out before. Yet the captain will not acknowledge it".*

And later in the journal:

> *"Any other ship would be carrying every sail".*

And again:

> *If I had the command of this vessel I could run 1½ knots more than this man".*

This was the sort of thing he was writing in a private journal. There is no record of what he said aloud, but he had the gift of upsetting people just by being right. The Dutch captain must have been very glad to unload him into an English shore-boat in the Channel, 145 days out of Batavia. This included 14 days spent in Capetown.

On the other side of the world the 'Bounty' mutineers made an abortive attempt to settle on a tropic isle. When the natives drove them out they returned to Tahiti where many of them elected to stay. They had had enough. In any case some of them were not mutineers and had nothing to fear. The rest recknoned they could hide in the mountains when the inevitable British warship came to look for the 'Bounty', and they had a nice story hashed up for use if they were caught.

They were caught, and their story was no good. It hadn't occurred to anyone that Bligh would get his boatload of men home to tell the truth. Those mutineers that reached England were hanged.

Fletcher Christian and a half-dozen others who decided to stay with the 'Bounty' sneaked off one night without telling anyone where they were going. They kidnapped a dozen or so Tahitian girls when they sailed into mystery and, as the years passed, it was assumed that the 'Bounty' and her people had met their end somewhere in the vast South Seas.

In 1808 Captain Mayhew Folger of the American merchantman 'Topaz' told a strange story to the British consul in Valparaiso. He had come upon a small island in the lonelier part of the South Pacific. There were people on this island, an old English sailorman, several elderly Polynesian women and a lot of bi-racial children. The old sailor whose name was Alexander Smith was the last surviving 'Bounty' mutineer.

This was Pitcairn's Island, discovered by Captain Carteret in H.M.S. Swallow in 1767 and named after the man who sighted it. As bad weather prevented Carteret from landing he charted its position and went on his way. There was a copy of his book in the 'Bounty' and Christian, having read it, decided that Pitcairn was the only place where he and his crew could find safety. As it turned out, it was an even safer refuge than he imagined.

On reaching the position given by Carteret they saw no land at all; they eventually found the island after six weeks of searching. It was many miles out of its charted position and Christian nearly had another mutiny on his hands as his disheartened crew got sick of looking for it.

Folger's story seemed credible. Alexander Smith, as the 'Bounty's' crew list showed, has been a mutineer. And the chronometer given to Folger by Smith was the one made by Mr. Kendall way back in 1772. used by Cook and later issued to the 'Bounty'.

Captain Folger's written report is sufficient commentary on the shortcomings of the navigation methods of pre-chronometer days:

> "The latitude is 25° 2' and the longitude 130° W. Captain Carteret might well have erred 3 or 4 degrees in an old crazy ship with nothing but his log to depend on".

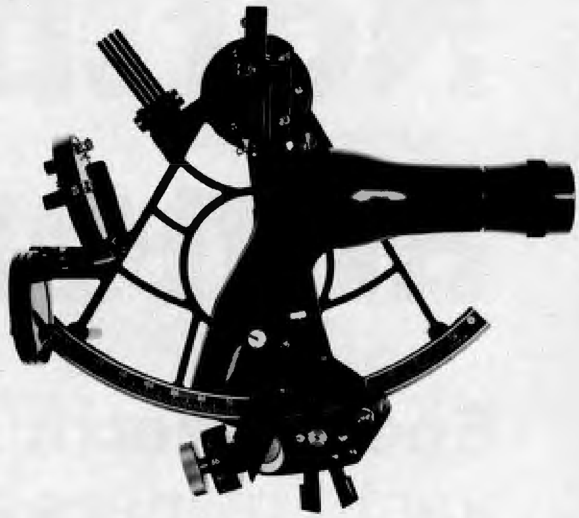
Bligh made another breadfruit voage and as he was successful this time, nobody ever heard of it. Yet he produced the first reliable chart of Torres Straits during that voage. One of his surveying officers was a young midshipman named Matthew Flinders who himself became a master navigator. Anyone who learnt his navigation under Bligh learnt properly.

In later years Flinders produced a compass that would be acceptable by modern standards. He found how to make adjustments for deviation; the flinders bars still used in magnetic compasses were his invention. In 1801-1803 he sailed H.M.S. 'Investigator' around *the Australian continent and all subsequent charts are descended from his original work of that voyage.*

Among his midshipmen during the circumnavigation was John Franklin who years later, as Sir John Franklin, led an expedition of two ships to sail through the North-West Passage, above Canada and Alaska. The expedition disappeared. As was learnt long after, the ships became trapped in the winter ice and their entire crews died while trudging south to find food and shelter. The full story is not known but it is felt that no matter what else went wrong, there were no navigational blunders from the man who learnt his trade through the line that stretched back through Flinders and Bligh to Cook.

From those days to now is a far cry, and outside the scope of this story. If the navigator wants to know where land is he just sends out a radar pulse and it returns to him with its message, like Noah's dove did. Maybe the wheel is turning full circle. Perhaps Gordon Marshall should add a chapter on ornithology to his navigation course.

NAVIGATION FOR DROPOUTS



by Frank Underdown

Everyman and his girlfriend are setting sail for the blue Pacific to escape from civilisation. En route they all seem to pass through a nautical shop to purchase Tables and chronometers and other impedimenta of navigation. They escape to their maritime Mecca laden to the gunwales with symbols of the culture they wish to escape, with books of figures and clocks to remind them of the daily grind of the counting house.

One wonders how the simple Polynesian managed in the same waters without such gear? How did Slocum do it with only a dime store alarm clock minus a minute hand?

Supposing one of these modern dropouts was so cantankerous as to refuse to ship a set of NP-401's or any other sight reduction tables? How would he manage his celestial navigation?

Navigation is basically a matter of establishing one's position on earth. In our scheme of thinking, we define position in terms of coordinates of latitude and longitude, a system which seems as good as any other although it is by no means universal. How would our man without Tables find his lat. and long. in the middle of the Pacific with only the celestial bodies for reference (Assuming he had a sextant or was a particularly shrewd judge of angles.)?

Finding the latitude has always been easy: all over the world the midday sun proclaims it; it can be found from the meridian passage of stars and planets (not to mention the moon), whilst north of the Equator, Polaris is its permanent witness. To particularise, during the day on which this article was written (11 February 1978) the following bodies were available to a mariner in the vicinity of Sydney — say at 35°S 152E — for meridian passage (i.e. latitude) observations:

dawn — Hadar, Arcturus and Rigel Kent:
daytime — the Sun at about 12.14 E.S.T. and the Moon at about 14.13 E.S.T.;
dusk — Aldebaran, Atria, Capella and Rigel.

So on this particular day our cantankerous friend would have no shortage of opportunity to observe his latitude. Most other days would offer similar opportunities.

Each of the meridian passage observations would equally afford excellent possibilities for a longitude observation. At meridian passage, of course, the observed body lies on the observer's meridian and the G.H.A. of the body is the longitude of the observer. I know a Master who claims to be able to judge the meridian passage of a body to within half a minute of time, which means that (if his claim be true) he can judge his longitude to within ± 7.5 miles.

Assuming our friend the Mecca seeker had not such a fine eye for sextant altitudes, he could nevertheless use the equal altitude method to obtain longitude from both the sun and moon during the day of 11 February 1978 and, properly done, this would give him precise results.

The situation at twilight would be different. Twilight would be too short to observe equal altitudes but the following use of the 2102-D starfinder would yield reasonable results. Sometime, either before or after the meridian passage of his chosen star, he could observe the altitude of a star, preferably due east or west of him, i.e. as close as possible to his prime vertical. He would then adjust the appropriate disc for the starfinder so that the observed altitude elipse on the movable disc lay on the observed body plotted on the base of the starfinder. The pointer on the starfinder now points to his L.H.A. Aries. The value of L.H.A. Aries subtracted from the G.H.A. Aries of the time of the observation is his G.H.A. (i.e. his longitude).

For example, our friend was in the vicinity of Sydney — date 11 February 1978. A p.m. meridian passage sight of Aldebaran showed that his latitude was 35°S. Shortly after the meridian passage of Aldebaran he 'shot' Alphard (nicely placed to his east) for an altitude of 20°. The G.M.T. of this sight was 9h 08m 06s.

Our navigator places the disc for 35°S on the starfinder and rotates it so that altitude 20° in the eastern sector of the disc lies on Alphard. The pointer on the disc indicates an L.H.A. Aries of approximately 70° 30'. From the Almanac he finds that G.H.A. Aries for 9h 08m 06s is 278° 06'.2. Subtracting 70° 30' from this gives a G.H.A. of the ship of 207° 26'.2 which translates into a ship's longitude of 152° 33'.8.

If the navigator is quite sure of his latitude he needs only one star sight at twilight to establish the longitude. The star chosen should bear as close as possible to due east or west. Oldies will recognise tht the technique being used if 'longitude by chronometer', the starfinder being used to replace the traditional calculation.

Again, if the navigator is totally lost — hasn't the foggiest idea of his position — two suitable placed star sights can be 'reduced' by the starfinder to give a reasonable estimate of latitude and longitude. This is because two star sights with a good angle of cut will always give latitude and, latitude being known, longitude can be deduced from the Starfinder.

Suppose our friend, with no more idea of his position other than that he is reasonably sure it is in the southern hemisphere, observed Betelgeuse and Acrux to have altitudes of 44° 10′.9 and 20° 15′.7 respectively, the G.M.T. of the observation being 9h 08m 06s. He selects a starfinder disc at random and juggles it so that Betelgeuse lies on altitude 45° (roughly), Acrux on 20° and the 0°–180° line is on the centre (South Pole) peg. When he has these three points in contact the centre post will lie close to latitude 35°. Our navigator places the template for 35°S on the starfinder and finds that Betelgeuse and Acrux now lie nicely on their correct altitudes, thus establishing his latitude as 35°S. The pointer on the disc will lie in the vicinity of L.H.A. Aries 70° 30′, from which he can deduce his longitude. In a couple of minutes he has come from total uncertainty about his position to a very good estimate of it!

In the illustration given I have cheated in a way by choosing sights which particularly fitted the Starfinder. An observer at (say) 39° latitude would have to remove the disc from its peg and juggle it so that latitude 39° was on top of the peg. This tends to inaccuracy which is augmented because the disc does not exactly fit 39°. Again, the Starfinder is not manufactured to extremely accurate limits and errors must be expected from this. A series of tests indicates that an average accuracy of ± 30 minutes of arc (i.e. 30 miles) can be obtained by this very simple use of the 2102-D. I imagine that more accurate results would be obtained from a Star Globe.

Conclusion: Our cantankerous friend can cope quite well without the Tables and also, by so doing, has entirely eliminated plotting whilst using only the easiest of sights. His equal altitude observations don't even need to be corrected – just the raw sextant altitudes are used. Even if he is completely lost, a clock and a 2102-D will 'find' him near enough for practical purposes. What more could he ask than that? With easy sights and no plotting, why should he cumber himself with those dollars' worth of NP401s?

All right! All right! I expect Gordon Marshall will use a few thousand well chosen words to blast the above philosophy but I don't think our friend in the South Pacific will care all that much!

Reading about navigation

There are an incredible variety of books written about navigation. Probably they all have their good points; otherwise they probably would not have been published.

But some of them are antiquated. They tend to linger on because die-hard old ship's captains tend to become navigation lecturers in their retirement and often they work on the philosophy that "I leant from Bloggs' book, and what was good enough for me is good enough for my students".

The fact that the lecturer learnt forty years earlier and applied his knowledge on a 20,000 ton vessel is not particularly helpful to the man with a pocket calculator and a desire to sail a 10 metre yacht.

John Ivimey, of Boat Books at Crows Nest, says he shudders at some of the aged navigation texts he is asked for in his store. Boat Books has by far the biggest range of books on navigation and on all aspects of boating in Australia, and it is worth a browse. His recommendations for the small craft navigator eliminate many of the 'oldies' but still leave a wide choice.

For coastal navigation, John suggests two low priced local books, Jeff Toghill's 'Coastal Navigation for Beginners' ($3.50) or 'Elements of Practical Coastal Navigation' ($5.40) by Peter Green, (no, not that Peter Green, but a Melbourne chandler of the same name), and a relatively high-priced English book, 'Practical Yacht Navigator' ($14.55) by Kenneth Wilkes.

Both the Australian books are fairly compact paper backs but cover the subject in good detail. Peter Green's comes complete with its own practice charts of the Bass Strait – Wilson's Promontory area on which the exercises in his book are based.

'Practical Yacht Navigator' is a much bigger book (208 pages) with outstanding diamgrams in two colours which make comprehension of the text extremely easy. This book covers the subject in more detail and in a very logical sequence.

It's not just Gordon Marshall and his boating birds who have proven that navigation is no longer a male chauvinist domain. The world's current best selling navigation writer is a female – Mary Blewitt. Her 'Celestial Navigation for Yachtsmen' (she wasn't sexist at all, and "yachtspersons" hardly sounds right) is still top of the sellers on this subject. Currently it is priced at $5.75, but will go up when new stocks are received. It is a slim volume (only 62 pages), and John Ivimey sees it more as a highly useful keep aboard book for quick reference rather than as a teaching medium. She tells you what to do all right, but without any background detail of why you should be doing it. Her preference is for the Air Sight Reduction tables, and her method is generally regarded as being quick.[1]

John's preference for a 'taching' book on astro is again written by Kenneth Wilkes. Called 'Ocean Yacht Navigator' ($16.50), it's written at the same high standard of information as his coastal book and is backed up by outstanding diagrams and illustrations.

Whilst there is a reluctance to use English or American texts for astro navigation because of the problem of having to reverse figures for the Southern Hemisphere, there is really no choice because at this stage there is no Australian book specifically on the subject. Jeff Toghill will rectify this later in the year with his 'Celestial Navigation for Beginners', but it's not possible to commence on this book at this stage.

For those who want to combined both coastal and celestical navigation in one book, John recommends two Australian titles: they are Toghill's (again!) 'Yachtsman's Navigation Manual' ($14.95) and Frank Underdown's 'Navigation of Small Craft', ($10.20). Both have been reviewed by John Hawley in 'Offshire', and his summation is that Toghill will teach you all you need to know and if you want to go further into the subject, then Frank Underdown's book will satsify that need.

There is one book which stands out above all others in this field. That is 'American Practical Navigator' or, as

[1] As a new student of celestial navigation I have found Mary Blewett's book to provide a simple and lucid explanation of the geometry behind the subject, and I do not fully agree with John Ivimey's assessment. Ed.

it is most commonly known, 'Bowditch' after its original author, Nathaniel Bowditch, who wrote it in 1802! An absolute genius, Bowditch was motivated to write his book because he had found some 8000 errors in the then leading navigational tome! This absolutely authoritative work has been continuously updated by the U.S. Navy, and the latest edition is a total revision, which became available again only in the early part of this year. It covers literally every aspect of navigation as well as weather, electronics, piloting, oceanography and even contains its own tables. All told, there are more than 2100 pages in its two volumes which, at $23.50 for the two, must be one of the best values in today's market place.

That's just the highlights of the practical navigational range at Boat Books. For lovers of the esoteric, there is a facsimile of a French edition of one of the world's first books every written on navigation. It is 'L'Art de Navigeur', first published in 1554. John Ivimey doesn't know how many errors Nathaniel Bowditch would have found in it, but the old world spelling (in French), the beautiful aged paper and slip-cased leather binding make it a thing of real beauty. It is a true collector's piece being a numbered, limited edition of which only 1000 copies were produced. Each copy carries a certificate of authenticity. At $75.00 it is not cheap but is bought largely by collectors like Pat Corrigan, who know that its value will rise.

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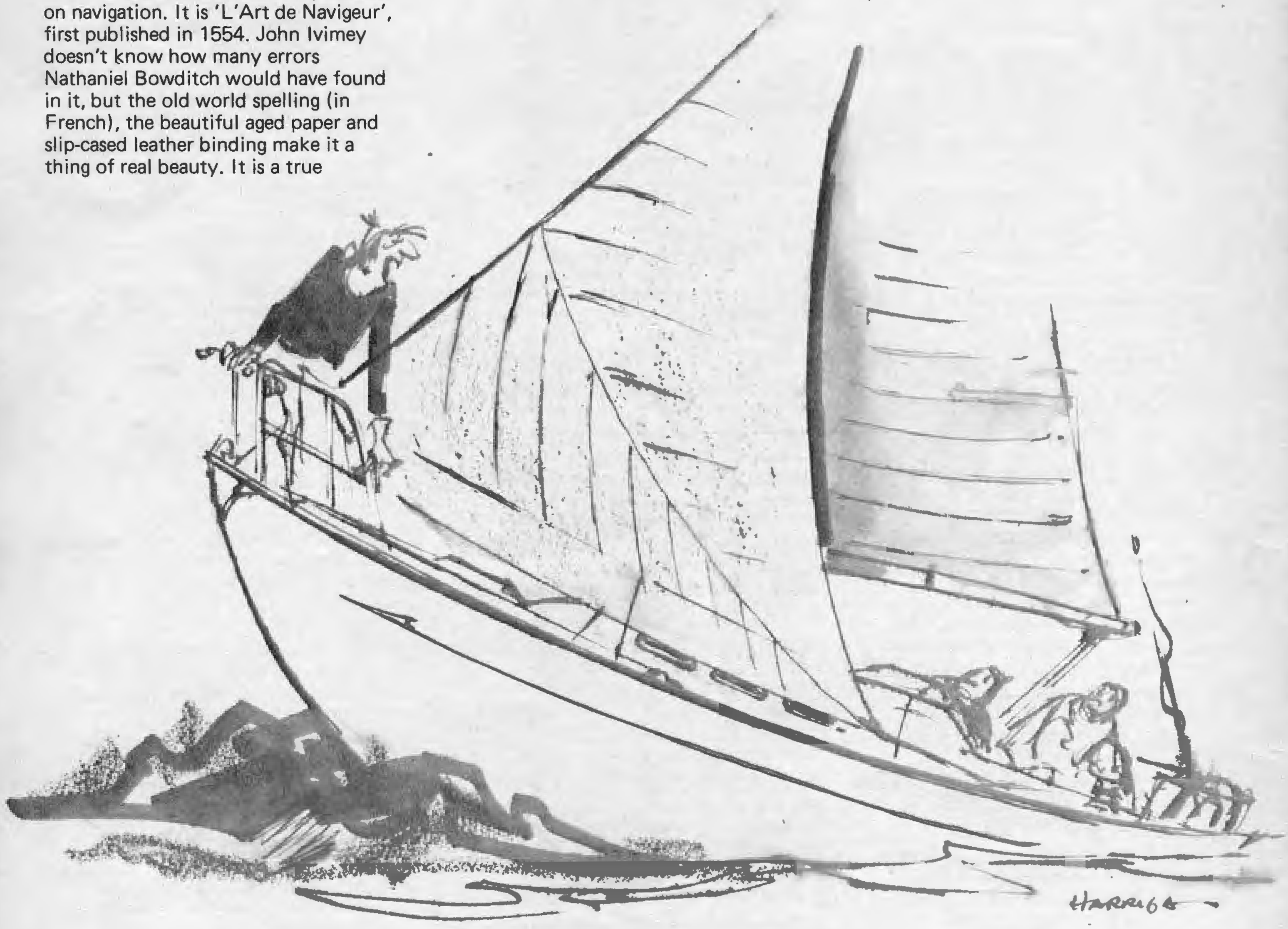
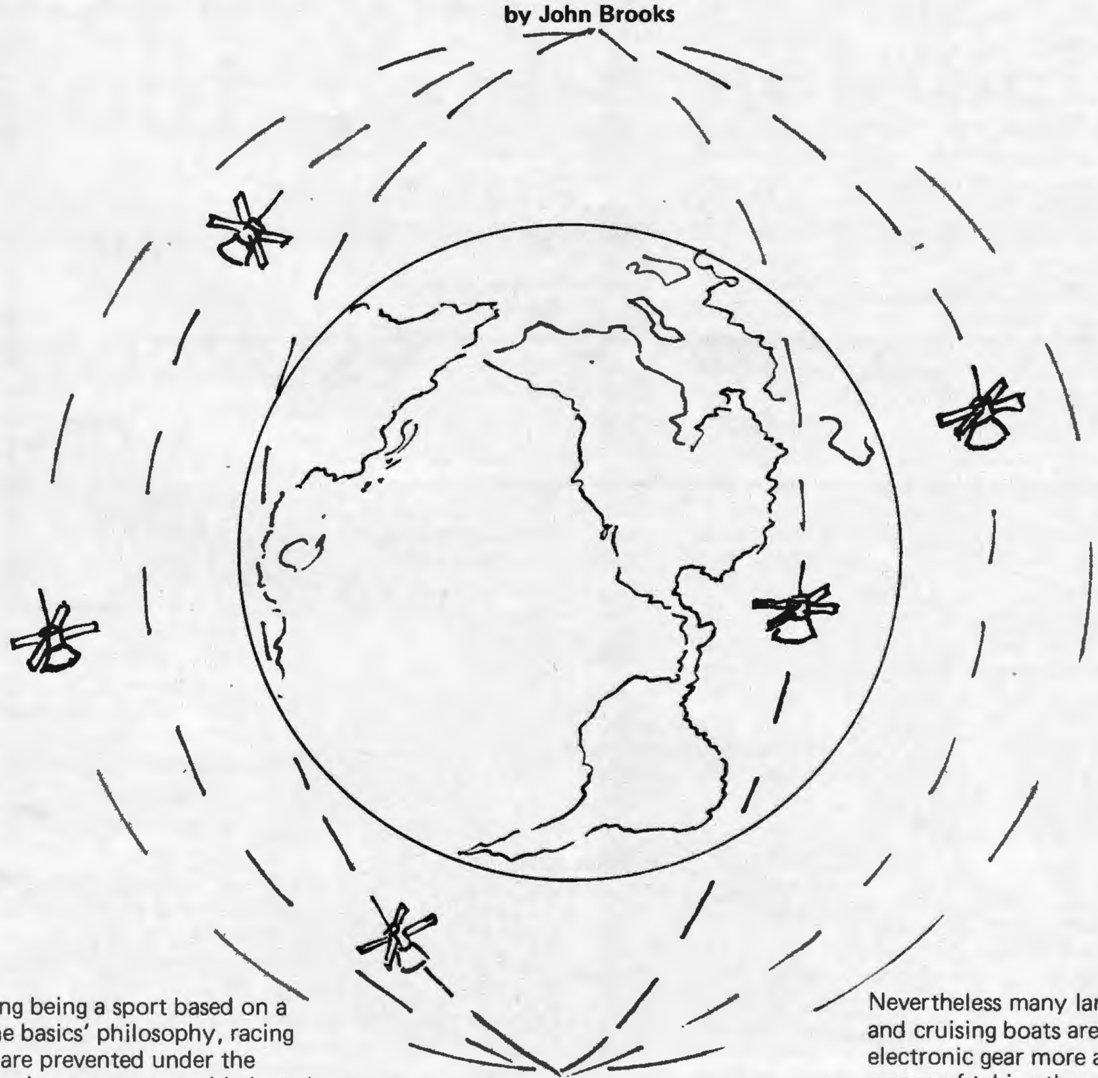


"Seeing you discovered it, Harry, the least we can do is name it after you".

Modern Aids to Yacht Navigation

by John Brooks



Ocean racing being a sport based on a 'back to the basics' philosophy, racing navigators are prevented under the rules from using any more sophisticated outside aids to navigation than the manual radio direction finder, a fairly primitive aid and of doubtful use when compromised by the many errors which can beset it, for instance, off the east coast of Australia.

So, once out of sight of land, the naviguesser works hard at ensuring an accurate D.R. plot and hopes constantly for a visible horizon and some clear patches of sky at twilight for a celestial fix. He views R.D.F. bearings with some distrust and transferred sun position lines with scepticism but uses them both, if necessary, along with educated gúesses at set, leeway angles and log error. If, after all this, he pinpoints his position at sea within 3 miles he is either a shrewd, experienced yachtie with a bit of luck or a shrewd, inepxerienced yachtie with a lot of luck.

Meanwhile, in the air about him float sophisiticated radio signals which, if he were allowed to use them, could pinpoint, within 200 meters, his actual position at any time of the night or day. He would need only one more thing than the compliance of the I.Y.R.U. — that is a healthy bank balance, because to receive, decode, process and present all this information in a usable form requires complex electronic equipment. That does not grow on the trees of your local electrical appliance discounter.

Nevertheless many larger racing yachts and cruising boats are installing modern electronic gear more and more as a means of taking the guesswork (and, especially, the time-consuming calculations) out of navigation, thus ensuring fast, safe passages. All of the well-known maxi yachts install at least one of the modern radio aids, and 'Ballyhoo' probably went to the top of the class when she had a 'Transit' (satellite navigation) system fitted.

The available radio signals take various forms and they originate from many sources. But without exception they are available to all who take the trouble to fit the appropriate receiver. The cost of the equipment for any system varies greatly depending on the extent of accessory equipment included in the package, but typical figures would be from $5,000 for a basic receiver (you do all the work) through to $25,000 for receiver, computer, speed and course inputs and digital co-ordinate readouts which present you with your actual position co-ordinates almost at the flick of a switch. The systems for which equipment is easily purchased by the yachtsman are LORAN (Long Range Aid to Navigation), OMEGA, and TRANSIT (satellite navigation system).

LORAN is designed to provide fast accurate positon lines by measuring the difference in arrival times of radio signals transmitted from two LORAN stations. A LORAN net consists of groups of ground stations transmitting in pairs, each pair comprising a master station and a slave station. The signal originates from the master station and travels simultaneously to the boat receiver and a slave station which is then triggered to transmit its own signal; the slave signal will obviously arrive at the ship after the master signal, the exact time difference depending on the position of the boat relative to the stations.

For a given position the time difference between the arrival of the two signals is constant, but there is more than one position having the same time difference and these points are plotted on a LORAN chart where a line joining these points forms a hyperbola. When the time difference is measured by the on-board equipment, the hyperbola representing that time difference is found on the chart and becomes a LORAN position line; to establish a LORAN fix a second position line crossing the first must be obtained from a second pair of LORAN stations.

LORAN has a generally accepted accuracy offshore of one mile for every 1,000 miles range from the station. So in Australian waters, where the nearest LORAN stations are thousands of miles away (and bearing cuts can be narrow) LORAN accuracy is less than that which can be hoped for by an amateur weilding ye olde marine sextant. Around the north Pacific and Atlantic oceans LORAN stations abound, especially around the U.S. where the new improved LORAN 'C' coverage is virtually complete and is a relatively cheap, dependable and accurate aid to navigation.

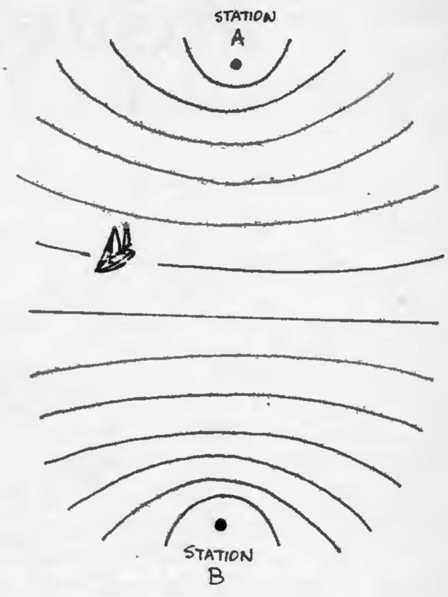
OMEGA is a word that can be counted on to reduce some Australian politicians to semi hysteria. One of the more moronic pressure groups with which this country is afflicted decided that an Omega Station would be a prime nuclear target because it is used by American missile submarines for navigation, and no one has been able to get any sense out of the politicians concerned ever since. In fact, there is no evidence to suggest that the American nuclear submarines use OMEGA as a primary navigation aid. OMEGA is not accurate enough to provide the sort of precision required of I.C.B.M. targeting, and the Americans would hardly offer the system to the Russians for commercial use if it were of strategic value. The Americans did, however, and OMEGA is available to anyone who cares to use it, including Russian submarines.

OMEGA is a long range very low frequency system which will provide global coverage for ships and aircraft, and the only thing that makes it suspicious to our more paranoid pols is that it is one (but not the only nor the most accurate) of the few navigation systems a submarine may use while still submerged. Its great advantage from an international point of view is that it provides world wide coverage using only eight stations, hence it is relatively inexpensive to build and maintain.

OMEGA signals consist of continuous wave pulses transmitted in sequence from each station (on frequencies of 10.2, 13.6 and 11.3 KHz) and propogated over an enormous range so that up to five stations may provide a useable signal at one time in any part of the world. The receiver measures the phase of the signals against a reference provided by an internal oscillator. The navigator corrects the resultant for skywave error and plots the position line on an OMEGA chart in the same manner as for LORAN. The same process is repeated with another group of stations to produce a position fix.

More sophisticated equipment runs continuous phase comparisons on all useable stations and passes the information to a digital computer which processes it into an instant readout of position co-ordinates. This type of equipment is currently fitted to Australian registered aircraft mainly for off-airway work. OMEGA has great potential around the vast, sparsely equipped Australian coastlines and adjacent seas, and it really is a great pity that our politicians ever heard of OMEGA in time to prevent or, at the very least, delay the construction of an OMEGA station in Australia. The system was scheduled for completion in 1974 but now awaits the Australian station to be fully operational (in Australian waters it is quite useable now).

OMEGA accuracy is on the order of 1 to 2 miles, and eventually with all stations on line and the system fully calibrated, it will do even better. The errors include radio propogation variation, skywave error (predictable within limits) and station synchronisation error.



TRANSIT SATNAV (Satellite Navigation system) is probably still in the exotic, over-expensive class for most yacht owners. It is one of the most fascinating navigation aids available to pleasure craft.
Developed as a navigation aid to the U.S. Navy's nuclear submarine fleet and off the secret list since 1967, TRANSIT SATNAV is available to commercial shipping and even to yachtsmen, which only makes one wonder what the Yank submarines really use for navigation these days that OMEGA protesters know nothing about.

In its early days the high cost of on-board equipment put TRANSIT SATNAV right out of the reach of all yachtsmen. Increasing commercial use and technical advances are reducing costs dramatically ('Ballyhoo's' system cost U.S. $27,000, installed). Eventually it could become the very best and most cost-effective system available with some outstanding advantages for yachts.

In 1973 the heart of the TRANSIT SATNAV system consisted of five satellites circling the earth in polar orbits (i.e. around the poles from north to south). They orbit at a height of 1075 kilometers, circling the earth every 107 minutes at a speed over the surface of 26,400 k.p.h. The satellites provide a 'cage' coverage within which the earth rotates so that, to a vessel on the surface, one of the satellites will be above the horizon at least 16 times a day offering position fixing signals. This coverage has since been increased by the addition of a sixth satellite.

Each satellite transmits signals on 150 mHz and 400 mHz frequencies which makes them immune to local weather interference or sunspot activity, thus providing an all-weather capability, which is not necessarily the case with LORAN and OMEGA. The satellite transmits information in the form of orbital parameters, which allows the position of the satellite to be accurately determined as a function of time. The position of the ship relative to the satellite is then determined from a series of frequency-shift measurements on the doppler principle. All these calculations are, of necessity, highly complex, so a digital computer is employed to process them.

Even when a satellite is below the horizon, the TRANSIT SATNAV system continues to plot positions by automatic D.R. based on the last satellite fix and subsequent ship velocity information. SATNAV accuracy is phenomenal. The manufacturer's claim of within 0.2 miles was found, on 'Ballyhoo', to be without exaggeration. Static tests using a fixed antenna of known position yielded an average radial error of 34.3 meters. Inherent errors are ionospheric refraction, caused when the signal penetrates the earth's ionosphere, and equipment error, both of which are reduced to minimum by the manufacturer. The most significant error is due to unknown ship's motion during the position fixing process as the satellite pass occurs (due to incorrect boat speed and course data put into the computer). This can be calculated at 0.2 miles error for every knot of unknown ship velocity and, in practice, could be negligible for a slow-moving yacht over a fiftenn minute sequence (provided boat speed and course measurement was of reasonable accuracy).

For the amateur yachtsman, position fixing within 200 meters is accuracy of a very high order indeed, and combined with the ease with which these results can be obtained, the art of navigation becomes something that can be accomplished over a cup of coffee during the change of watch. It can also run the unsuspecting yachtie into a phenomenon that the professionals call 'datum shift', which, very briefly, is when you are tied up at the C.Y.C.A. marina but SATNAV is giving you position co-ordinates which the chart says are on Garden Island. The trouble is the satellite is right and it is your chart which is wrong. The example is an exaggeration but you get the idea. In Tokyo a datum shift of 465 meters was measured by satellite survey. Fortunately yachtsmen do not require offshore accuracy of such a high order that datum shift could ever be a problem.

In summary, the TRANSIT SATNAV system provides highly accurate navigation data with a facility that is not matched by any other system. It has truly global coverage (no other system can claim this), needs no special charts, is immune to weather and severe propogation conditions and requires a power supply which is less demanding on a small vessel than LORAN or OMEGA.

You could be fogiven for thinking that all this talk of sophisticated electronic aids is largely academic (from the average yachtie's point of view), but you can be sure that, as technology and yachting continue to advance, the availability and use of these systems, or something based on them, will proliferate to the benefit of all, especially the cruising yachtsman. If you consider the increasing cost of a well-equipped cruising yacht of any size, – $150,000 is no exaggeration for anything in the 45-50 foot class – And anyone who spends that kind of money on a yacht obviously wants to spend as much time as possible enjoying it. Generally he would prefer not to spend a lot of time studying and practising navigation, and this is where the modern aids come into their own. In those terms they are not at all that expensive and will become relatively cheaper.

In North America LORAN 'C' fills the need perfectly; further afield OMEGA provides, or will eventually provide, wide coverage when the Australian station comes on line. To my mind the pick of them all is TRANSIT, an electronic aid so accurate it can literally prove your chart wrong.

"It's a rude starfinder all right – I keep getting Linda Lovelace".

Friday Night

Enjoy our best in food and service, with stunning harbour views
and superb entertainment by the C.Y.C. Trio.

Saturday Night

"Super Cool" provides disco entertainment for the young at heart. This form of entertainment is now foremost in the world — but the C.Y.C. style is a little different — not just for the young, but something for everyone. A good fun night.

Your Club is providing excellent Cuisine, and something for everyone.
To use your Club benefits all.

Don't be confused about yacht prices!

If you are used to a "completed" yacht costing around $1,000 per foot just look at the Compass prices, they must represent the best value for money in Australia today.

Compass 29

$25,750

Fully fitted, completed yacht launched and commissioned Kogarah Bay.

Compass 28

$21,500

Fully fitted, completed yacht launched and commissioned Kogarah Bay.

All these items are included in the price. Spinnaker gear — Optional extra.

(1) Twin cylinder 15 H.P. diesel (29), 8 H.P. diesel (28).
(2) Spars, rigging, winches and deck hardware.
(3) Pulpit, pushpit, staunchions, etc.
(4) Bilge pump.
(5) 2 Air vents.
(6) Fire extinguisher.
(7) Interior electrics and Nav. Lights.
(8) Anchor chain and line.
(9) Antifouling.
(10) Interior cushions.
(11) Main, No. 2 Genoa and Jib.
(12) VDO sumlog.
(13) S.S. boarding ladder.
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The manufacturers reserve the right to change the above specifications without notice.

GWA 1864

Charts – are they off course?

by John Hawley.

Not too many things are free in this life and those which are tend to be treated with some contempt. Perhaps if 'Australian Notices to Mariners' had a price tag they would be more respected and more carefully read. This is not to recommend that a charge should be made, but they certainly appear to be largely ignored by the yachting fraternity, and for those of you who never read them, I must draw attention to weekly edition 12 of 24 March 1978, Notice Number 155.

The effect of this is that navigators will have to transfer these corrections to the charts as soon as they are purchased, and this would be a good opportunity to start regular correction routines of all charts held by that yacht from current 'Notices to Mariners'.

There can be nothing more confusing than entering a strange harbour and searching for a buoy which may have been moved a year earlier or worse, at night seeing a light Gp.Fl.(3)20 secs. where none is shown.

I

155. AUSTRALIA—Maintenance of Australian Charts.

1. From 1st May, 1978, stocks of Australian charts maintained in the Hydrographic Office will cease to be corrected by hand. From that date all charts will be issued to both agents and other users with a correction slip showing all corrections which should be applied by the purchaser.

2. In order to avoid lengthy correction slips, the reproduction material from which the chart is printed, will be kept continuously in date for Notices to Mariners, and charts will be reprinted at frequent intervals. Whenever a chart is reprinted, a new correction slip will be commenced.

The correction slip will show the following:

(a) Chart Number.

(b) Last Notice incorporated at printing.

(c) Number of latest Weekly Edition of Notices to Mariners included on the slip.

(d) Copy of all Notices affecting the chart published in the period from (b) to (c).

An example of a correction slip is attached.

3. Mariners are advised that "A" Class Agents will be required to insert additional Notices extant at the time of sale, on to the correction slip before selling the chart, which must be accompanied by the updated correction slip. "B" Class Agents will be required to do no more than provide the chart and slip as received from the Hydrographic Office, and inform purchasers of any additional Notices affecting the chart.

(24th March, 1978)

Hydrographic Service, R.A.N. Sydney. *(A.H. 39/52.)*

Such a light has been established in Twofold Bay within the last three months and could cause a great deal of worry to a yacht, perhaps dismasted in a Sydney-Hobart Race and heading for Eden in inclement weather. The notice in question is reprinted not because it is of any greater importance than most of the others but to draw attention to Notice 126 which precedes it regarding Australian chart paper.

I have inspected a Port Jackson chart printed on this cheap paper and believe this to be a retrograde step which should be challenged. Whether it is a governmental economy procedure or a decision taken within the Navy, surely there should have been some consultation with the people who buy and use charts.

We live in an age when inflation is accepted and a price increase would have been unchallenged, but an item which, by it's very nature, will be regularly doused with sea water whilst spread on chart tables or in the cockpit of small yachts seemingly should be printed on the most durable paper available (within reasonable cost), and I for one, question the decision.

I was discussing this matter with John Ivemey of Boat Books in Crows Nest, who has been appointed an "A" class Chart Agent. He points out that he is so disappointed with the quality of the paper that he is already producing plastic coated charts which are fully waterproof (at $7.80), and I was impressed with their quality (one could use chinagraph pencils on them for laying off courses, which could be wiped off after use). Unfortunately, it does not appear that corrections can be made to these charts, as coffee, claret and other stains wipe off with a damp cloth, so your corrections would disappear too! Chart Aus. 197 "Approaches to Port Jackson" would be an obvious choice for everyone who races in the short ocean races points score to have in this plastic coated version.

I

126. AUSTRALIA—Australian Chart Paper—Printed Charts.

It is planned to print Australian and Facsimile Reproductions of British Admiralty charts on lightweight paper, when present stocks of the heavy chart paper are exhausted, about mid 1979.

In the interim period, selected charts will be printed on the lightweight paper to familiarize Mariners with the new medium.

(*3rd March, 1978*)

Hydrographic Service, R.A.N. Sydney. (*A.H. 14/66.*)

John Ivemey also reports that he proposes to continue correcting charts sold through his agency for at least six months during which period he would like to hear the views of Members of the C.Y.C. regarding (a) the continuation of this new chart service, for a small fee or (b) possible interest in an old-chart correction service.

Letters on this subject would be welcomed by 'Offshore'. Ed.

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127 (T). AUSTRALIA—NEW SOUTH WALES—Twofold Bay—Waverider Light-buoys established.

Yellow spherical waverider light-buoys *Gp.Fl.(3) 20s* have been established, with bearings and distances from the light (37° 04.6′ S., 149° 54.8′ E. approx.) as follows:

(a) 115° 4.7 miles;

(b) 244½° 410 metres (1345 feet).

The inshore buoy (b) will remain on station about 1 year, and the offshore buoy (a) indefinitely.

(*10th March, 1978*)

Chart temporarily affected.—Aus. 191 (b) (plan, Twofold Bay)—Aus. 806.

N.S.W. Public Works. (*A.H. 61/80.*)

URGENTLY WANTED

MEMBERS MALE OR FEMALE INTERESTED IN ASSISTING IN SAFETY INSPECTIONS

PLEASE RING OUR OFFICE AND GIVE NAME AND ADDRESS

Weather-Rail Naviguessing

by David Hocking

Crew has always sat to weather going to windward in a fresh breeze, but recent design trends have required the navigator to abandon his chart table and join his peers on the weather rail; Dividers and parallel rules get lost on deck, and charts get soggy when wet, so the boffins have designed some new equipment, a good example being the 'Plotmaster Navaid'. The Navaid consists of a clear plastic rotating protector disc mounted on a white plastic baseboard which has a graph-paper-like grid pattern punched on it.

Let us assume David Goode has signalled course Tango 130. Plotting this on chart AUS 197 (Approaches to Port Jackson) shows mark C to be 4.9 miles from south reef on a magnetic bearing of 126 deg. Taking the Navaid, set the top disc with 126 deg. against the indicator on the base board and with a soft lead pencil mark south reef 2.5 major divisions (miles) from the centre away from the indicator and mark 'C' 2.4 major divisions (miles) from the centre towards the indicator. Thus mark C is 4.9 miles from south reef on a bearing of 126 deg. Each minor division then represents one tenth of a mile, and as most yachts sail to windward at around six knots, each minor division also represents one minute in time.

Upon rounding south reef the helmsman can steer 090, and six minutes elapse before a tack is required to clear wind. Rotate disc to 86 deg. (allow for leeway) and draw a line six minor divisions up the grid. After three minutes on 170 and two minutes on 165 a further tack is required. The disc is rotated to 174 deg. (leeway) and three minor divisions drawn, then 169 deg. and two minor divisions drawn. In this manner course and distance are plotted until the weather mark is in visual range.

I have not allowed for set because of its variables of speed and direction depending on distance offshore. Provided it is considered in planning the approach to the mark it does not present a problem. In this example, with a probable southerly set, the approach is from up set.

Now to the vectors to select the spinnaker. As we approach mark C, our course is 165 deg. and boat speed six knots. Set disc to 165 deg. and draw a line six units towards indicator and mark with a single arrow, the recommended symbol for course. Apparent wind is 30 degrees to bow and 20 knots. Set disc to 135 deg. and draw a line 20 units towards indicator and mark with two arrows, the recommended symbol for apparent wind. Align disc so that a line between the ends of both vectors is parallel to the vertical axis of baseboard. Angle of disc and length of new vector represent true wind angle and speed. A closed arrow is the recommended symbol for true wind. The course to mark D is 345 deg. and estimated speed will be 8 knots. Set the disc to 345 deg. and draw a line eight units away from indicator. Re-align the true wind vector and re-draw from the centre of the disc towards indicator. The new apparent wind is the line between the end of the new course vector and the redrawn true wind. Draw in, label and read the angle and speed. In this example it is 100 deg. to bow and 11 knots apparent — a 1.5 oz spinnaker and tallboy would be recommended.

After rounding mark C you can relax for a few minutes before preparing the vectors for the gybe at the wing mark D. For the second beat mark A has been marked on the disc 3.5 miles from mark C at 310 deg. (the reciprocal of the course 130 deg.). The record of wind shifts on the first beat is useful data for the second beat.

I have found the Navaid well worth the $12-50 (December 1977) investment. It can also be used to plot celestial intercepts and this is described in the booklet supplied.

Plotmaster Navaid

The Plotmaster Navaid is constructed of flexible P.V.C. sheeting and comprises a white baseboard 10" square to which a transparent circular protractor is centrally mounted so that it is free to rotate. The baseboard has a square graticule immediately beneath the protractor, while on the reverse side is a drawing showing the spacings of the meridians of longitude at various latitudes. The protractor has a surface specially treated for use with soft lead pencils and on it a wide variety of navigational plotting can be carried out.

The unit sold consists of a Navaid, an instruction booklet printed on waterproof paper and a heavy duty plastic envelope for storage. The basic concept of the device is simple.

(a) The baseboard graticule theoretically consists of 64 squares each sided 1¼" but in production the squares outside the plane of the protractor surface have been omitted for clarity. Each square is divided into 100 minor units being 10 such divisions in each direction. The primary intention is that each major square represents 10 minutes change latitude with each minor division being 1 minute change latitude, one nautical mile or one knot, as appropriate, and when used in conjunction with the longitude scale on the reverse side of the base board, a Mercator projection for any particular latitude can readily be produced.

(b) With the protractor set to a particular heading against the lubber line at the top of the board, any line drawn on its surface parallel to the baseboard graticule must be either on that heading or 90 degrees out of phase.

The following are common uses of the Navaid

1. Knowing yacht speed and course and apparent wind speed and direction, to determine true wind speed and direction (triangle of velocities problem of this nature can be quickly solved with a Navaid).

2. Knowing true wind speed and direction, yacht course and estimated speed, to determine apparent wind speed and direction on a new heading. (This is important as it accurately determines the apparent wind speed and direction relative to the yacht's projected course, enabling correct selection of the sail type and weight.

3. To plot the course to a distant mark. (This enables the yacht racing offshore to be plotted accurately right to the mark, and with the use of lay lines prevents overlaying it. The Navaid was used on Gretel II at Newport in 1977 in this manner to complement and as a check on the electronic plotting devices, it being particularly useful as it provides a visual representation of the craft in relation to the course.)

4. Two bearing running fix. (Having two bearings of a single shore feature and knowing the distance covered between taking of the sights, the position can be found very quickly on the Navaid. The advantage of this device is that the plotting is carried out as though from the yacht and not from the chart which involves reciprocal position lines, one of which must be transferred.)

5. Simultaneous sights of two conspicuous shore features. (If the bearing and distance between the land marks is known together with the sights taken from the yacht, the Navaid will readily solve the position).

6. Dead reckoning plotting. (When short tacking to windward the individual courses can be plotted on this device and the resultant position change transferred by a single line to your chart. This is a considerable time saver and the plotting can be done in the cockpit).

7. Plotting celestial sights. (The Navaid was designed with a longitude scale in order that the triple sight worked results can be plotted to produce the observed position in a minimum of time. When the observed position is required quickly, as for example for a radio schedule position report, this device will be found particularly useful).

8. To determine a craft's position in relation to prominent shore features or a particular FISHING SPOT' (With the use of a simple template, the Navaid and a compass, the boat owner can accurately determine the position of his craft in relation to a number of previously plotted landmarks and as such it holds considerable promise to the offshore fisherman.Its use in this form is much more effective than visual sightings, transits etc. which have been relied upon in the past, and as the carrying of a compass is now a mandatory requirement, its use in conjunction with a Navaid is recommended).

The Navaid enables much of the primary navigation to be carried out by the crew on watch while in the cockpit, this is of great benefit on smaller yachts where frequent visits to the chart table may disturb other members of the crew.

Coastal Navigation Course

Gordon Marshall will be running a Coastal Navigation Course for Club Members commencing 25th July. An application form is enclosed with this copy of *Offshore* and additional forms may be obtained from the C.Y.C.A. office.

Gordon has been running celestial classes for Club Members for many years, but this will be the first time he has agreed to run one on Coastal Navigation. For those interested in ultimately studying celestial, this will be an ideal introductory course, since you should understand coastal before undertaking celestial study.

The course will run over eight consecutive weeks on Tuesday evenings; the hours will be 7.30 p.m. to 10.30 p.m. and the venue will be the C.Y.C.A. Blue Water Room.

Fill in your application form and promptly return it to the C.Y.C.A. office (we anticipate an excess demand for berths in this course, and first come first served will be the selection method). Successful applicants will be advised by mail, and details of the equipment required will be enclosed with that advice.

URGENTLY WANTED

MEMBERS MALE OR FEMALE INTERESTED IN ASSISTING IN SAFETY INSPECTIONS

PLEASE RING OUR OFFICE AND GIVE NAME AND ADDRESS

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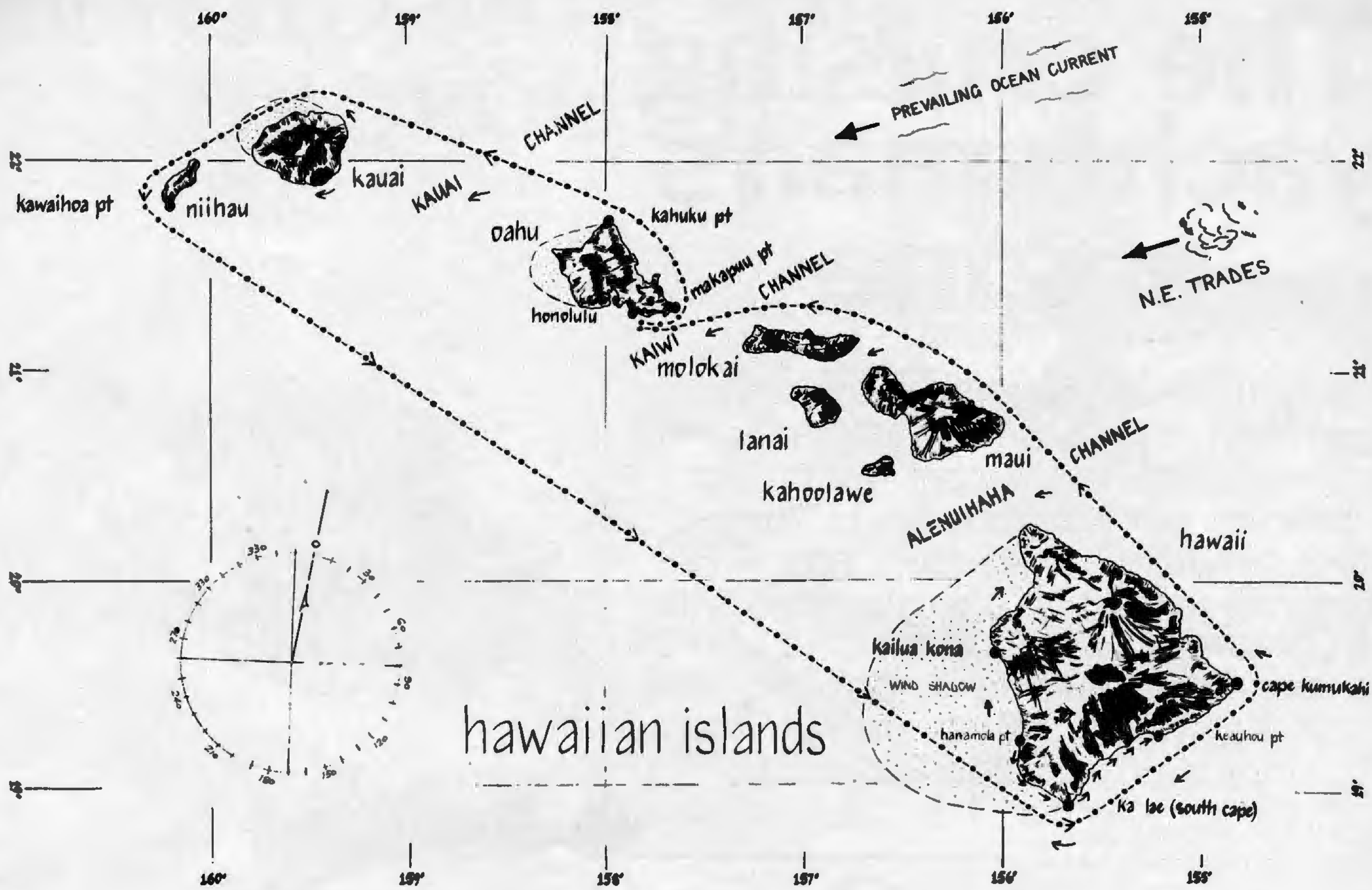


HAWAII

by Dick Hammond

Hawaii offers a smorgasbord of scenery and adventure, and as a 'blue water' sailing area I could not think of one more fitting. It is thanks to the perserverance of Dick Gooch that an international series has been born. In Dick's own words "My cloud is clearing — I can see all those boats". I think Dick's cloud has cleared, for he informed me just a few days ago that he expects over 80 starters in the Pan Am Clipper Cup Yacht Series during August 1978.

The series will consist of five races starting on the 5th of August with an event to be sailed around the island of Oahu in a clockwise direction, a distance of just over 100 miles. The next three races, designed around Olympic courses of 30 miles, will be sailed off Waikiki on the 8th, 9th and 10th of August. Finally, on the 12th of August, the Royal Hawaiin Cup, an around the State of Hawaii race of 780 nautical miles, will decide the winner of the series.

Boats from Australia, New Zealand, U.S.A., Canada, Hong Kong, Singapore, Japan, Mexico, Sweden, Tahiti, Guam and the Netherlands will compete — a truly international gathering.

Hawaii was a Polynesian Kingdom until 1893, then briefly a republic before being granted an annexation to the United States in 1898 and given a territorial form of Government in 1900. Hawaii officially became the 50th of the United States of America in 1959.

To sail in Hawaiian waters is an experience never to be forgotten, and the introduction of this great series will produce some unsurpassable yachting memories of competition, comradeship, excitement and fun.

The major islands are mountainous and of volcanic origin, the island of Hawaii having two volcanoes that are still active. Elevations range from seal level to nearly 14,000 feet, with numerous peaks in excess of 2500 feet.

The 20 fathom depth contour is seldom more than a mile from shore and usually is not far from the coral reefs that fringe much of the coastline of the islands. Great depths of water surround the islands, as the bottom rapidly pitches off from a narrow coastal shelf, and the few off-lying dangers are usually indicated by breakers or a change in colour of the water. Under normal conditions the water changes from a deep blue in the open ocean to a blue-green between 10 and 15 fathoms. The water is clear and clean, and bottom forms become visible at 6 to 7 fathoms.

The outstanding climatic features of the islands are the dominant northeasterly trade winds, the remarkable variations in rainfall over adjacent areas and the uniform temperature range, which varies between 73°F and 80°F throughout the year. Thunderstorms are infrequent and practically never severe. Hail seldom occurs. Occasionally local storms are accompanied by winds of sufficient force to do damage, but severe storms, such as hurricanes or tornados, are rare. So-called thick weather is almost unknown and is usually confined to mist and rain rather than fog.

The prevailing trade winds are more persistent in summer than in winter and stronger in the afternoon than at night. They may blow unceasingly for long periods, particularly in summer, but at times they remain absent for weeks.

In some local areas deciations from this general pattern occur because of topography.

In coastal areas on the 'leeward' side of the islands, and where mountains to the east rise high above sea level, as they do, the trades are cut off, resulting in generally prevailing southwesterly winds with land and see breezes in evidence. These effects may be rather general in some areas and extremely local in others. These southerly winds are known as 'Kona' weather, the name being Polynesian for 'leeward'.

The climate of the Hawaiian islands is unusually pleasant for a tropical area. Considering the latitude of around 21°N, there is relatively little uncomfortable heat. The discomfort that is occasionally experienced usually occurs when the trades are temporarily displaced by light variable or southerly winds which are accompanied by comparatively higher humidities. The warm months of August and September are usually good because of the persistency of the trades.

Tidal currents are generally weak and are influenced by the winds and oceanic movements. There is a prevailing westward oceanic drift in the vicinity of the larger islands. Such currents are mainly reversing channels between the large islands, but they are rotary in more open waters, particularly around the western islets, and they shift direction continuously in a clockwise movement. The periodic tides around Hawaii average only 1 to 2 feet.

Unlike England and Admiral's Cup racing, with tidal ranges of up to 20 feet, with extremely light and variable winds, currents of up to 6 knots, with an abundance of fog and poor visibility, navigating in Hawaiian waters is relatively easy. However, a real and interesting challenge exists, and like any ocean race, a whole new series of uncertainties unfold.

Local knowledge is limited especially in sectors of the Around the State Race due to the relatively few such races that have been sailed to date. Although not an expert, I suppose having sailed in two out of six races and locally out of Honolulu has given me some knowledge of the problems to be faced in August.

I competed in 1974 in 'Chutzpah', twice winner of the Transpac, and again in 1976 in 'Ballyhoo'. We were forced to withdrawn in 'Chutzpah' at Ka hae (South Cape) the southernmost point on the island of Hawaii some 520 miles along the race track. Although any retirement is a disappointment, this particular incident allowed me the opportunity of sailing close inshore along the leeward side of Hawaii to observe first hand the extent of the 'lee', local breezes and currents. We stopped over at Kailua Kona on this coastline, thence sailed the 80 miles across the Alenuihah Channel. The journey was packed with tranquility, turmoil and pleasure untold. I had doubted the pre-race bar talk describing the enormous 60 mile 'lee shadow' of Hawaii, but it does exist, and this trip most certainly proved the stated extent of it not to be extravagant.

Prior to competing in my first jaunt, I collected charts, read the appropriate 'Pilot', studied data on surface winds and currents, talked to past competitors and read an article by Richard Johnston written following the inaugural Around the State Race of 1972. He wrote "The south Kona and Kace Desert coasts of Hawaii don't have hazards to navigation – they are hazards. The broken tips of giant lava flows, poured down from Mauna hoa over the centuries, form inhospitable barricades and promise destruction to any boat tacking too near. There are no sage harbours. South Cape is a lonely place. The great mass of Mauna hoa cuts off radio contact, and the only sizeable landfall is Tahiti 2,000 miles due south".

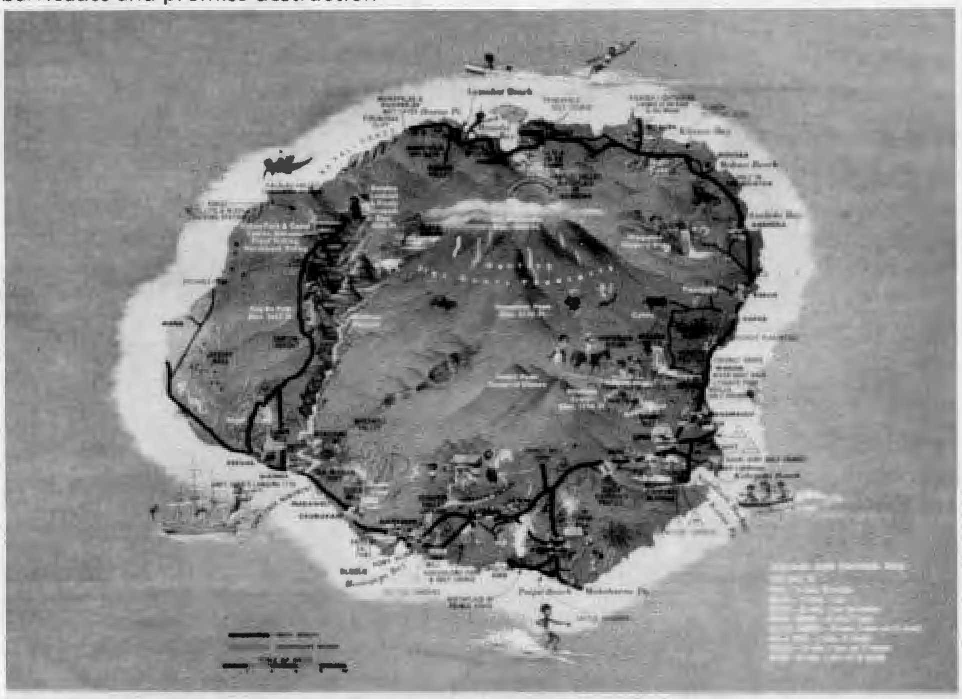
Don Johnson, skipper of 'Altercation', who sailed in this same race, talked of erupting volcanoes, winds of 60 knots and waves of enormous height moving in unpredictable directions in the pitch black of night.

It sounded frightening, to say the least, but it is not all that bad, although be prepared.

The three 30 mile inshore races will be sailed off Waikiki and with normal weather northeast trades ranging from 15 to 30 knots should prevail. These should be a true contest of hard sailing in waters deep blue in colour, hopefully against a background of sunlit skyscrapers and purple velvet clouds atop the Koolau Ranges.

Clockwise around Oahu should be an excellent warm up for the Around the State Race and will typify the condition to be found on a differing scale on the leeward and windward sides of the other islands. Oahu is the third largest of the eight major islands with an area of 600 square miles and two major mountain ranges rising to just over 4,000 feet. In comparison the 'Big Island' of Hawaii has an area of just over 4000 square miles, just on twice that of all the other islands in the Hawaiian State, whilst the volcanic mountains rise to heights of about 14,000 feet.

(more) ▶



The Island of KAUAI

The Around the State Race

This event, having taken on a truly international flavour, will hopefully be preceded by the 'Ship-A-Hic! Hic! Hic! traditional pre start breakfast of steak and eggs, hash browns hot rolls and free champagne! With a dixie land band providing some great music, it sets the mood for the race, quite unlike most other regattas where competitors are sullen faced and don't really seem to be able to enjoy themselves.

Out to the start off Waikiki beach at 1200 hours with the sun shining and a nice 15 knot noreaster.

A 15 mile beat to windward to Makapuu Pt. on the eastern extremity of Oahu, the gathering phase, tacking inshore to avoid the westerly current and taking advantage of the easterly inshore counter-current, is followed by a 30 mile shy spinnaker reach along the windward shore to Kakuku Point, where poles are squared for an 80 mile run to Kauai, the 'Garden Island', fourth largest and most beautiful. It covers an area of 550 square miles, with mountain peaks rising to heights over 5,000 feet, nearly always cloud covered and difficult to see from any distance.

The trade winds divide on the eastern side following the north and south coasts and uniting again some distance west of the island. It is a temptation to sail the shortest distance close in around the western shore only to find calm or light variable airs and see boats sail a wider longer course in stronger winds and disappear over the horizon. The distance off is a real test of skill and alertness, and it should be remembered that the early morning trades are usually light until 0900 and again decrease in strength about 1600 hours. Occasionally Kona winds displace the normal trades and a land and sea breeze pattern can be expected close inshore.

This is the first taste of the wind shadows effect. A southwesterly course for 60 miles takes us to the 'Forbidden Isle' of Niihau, where the trades blow directly across this comparatively small, low, last stronghold of the pure Hawaiians.

Skirting Kawaihoa Point, the next leg of our course is a 300 mile tight reach to Hawaii.

The records reveal that boats that keep to the north of the shrub line to South Cape, making a landfall well north of this point, have proven to be correct. Winds can tend to veer to the east on this leg and sagging off to the south can be disastrous. Fresh breezes of 25 to 30 knots can be expected as the wind funnels through the Kauai and Alenuihaha channels (pronounced 'olly' as in 'jolly', 'nooey' as in 'hooey', and 'haha' as in rubber crutch). In Hawaiian "ale" means to swallow or engulf, "nice" means larger or great and "haha" means to breathe hard or pant, so watch out.

Approaching Hawaii the wind quite suddenly lightens some 60 miles off the coast as we come into the influence of the vast wind shadow created by the towering volcanoes rising to 14,000 feet above sea level.

There appears to be a couple of good reasons to make a landfall somewhere along this coast, well north of Ka Lae (South Cape), as a sea breeze usually sets in around 0900 hours and continues until displaced by a land breeze that usually springs up after sundown, whilst the northerly current offshore is displaced by a southerly counter-stream close inshore from Hanamola Point some 20 miles northwestward from Ka Lae. This counter-current extends some 35 miles up the western

coast to Keauhou Point. Some boats have been known to make a landfall some 50 miles north of Ka Lae in the vicinity of Kailua Kona but this does seem a little way out to me. A direct course from Nihah to Ka Lae or to the south of the shrub line appears to be plagued by light variable winds and adverse currents.

Approaching Ka Lae induces a new scene as 50 knot gusts of wind funnel over the cliffs and around the corner, and an easterly counter-current stands up the seas and produces a few hours of constant sailchanging in bumpy walls of water. At night this is a navigator's nightmare, as there is only one small light with a 9 mile range, and visibility may be less than desirable.

Around the Cape in steady northeast trades 20 to 30 knots for an exhilarating beat 65 miles to Cape Kunukahi, the northeastern extremity of Hawaii. This rugged shoreline is without lights, and to take advantage of the inshore counter-current (and avoid the prevailing southwesternly offshore current) it is necessary to short tack for its entire length. At night it is excitement plus and in daylight an exhilarating experience.

How close to go in? — 'Bamboo' Opperman, our local knowledge expert aboard 'Ballyhoo', in 1976 said "till you can see the whites of the cows eyes". He was right, for to venture too far off shore was disastrous. Luckily, we rounded South Cape at 0500 hours in 'Ballyhoo' and with double-reefed main and charging along at 9 knots with spray that pleasantly cooled the hot sun and a vista of scenery, this leg of the course became a memorable experience. If this lee shore is sailed during the hours of darkness it will have the entire crew on their toes and will test the best of nerves.

Clearing Cape Kemukah, sheets can be eased for a close 100 mile reach with the breeze veering to permit the popping of a 'chute'. It is advisable to ease away from the windward side of Hawaii to take advantage of the fresher offshore trades and avoid the ever present lighter winds along the shoreline.

The wind usually strengthens as it funnels through the Alenuihah Channel and a wild ride may be in store. Passing Maru the 'Valley Isle', the course bends slightly allowing poles to be squared for Mohokai, the 'Friendly Isle' and, finally, a smoking run down the Kaiui Channel to the finish off Waikiki in an accelerating breeze.

All this followed by a trophy presentation and banquet on August 19 will hopefully make the Pan Am Clipper Cup Yacht Series an event to remember.

The Island of Molokai

The Island of Lanai

B/GGLES' COLUMN

(by John Brooks)

In April the Offshore Racing Council came out with a little number deceptively entitled 'Bulletin #22' which was a report on the International Technical Committee's latest recommendations to the O.R.C. concerning changes to the I.O.R.

These recommendations form the basis for O.R.C. deliberations on the nature of the I.O.R. for 1979 and, if adopted, will come into force next January. Already they have caused something of a stir. Certainly the changes suggested would have the most far reaching effect on ratings since the introduction of the I.O.R. itself.

Understandably, rumours have already started circulating about sensational rating changes for certain boats. In fact, few boats will undergo any really wild changes in rating except perhaps for some Whating ½-tonners which appear to suffer more than most. In a subtle way the changes are extensive because while some of the modern light displacement/tall rig yachts receive what appears to be a modest penalty, the older designs will lower their ratings by an even larger amount. Locally, my own feeling is that what the older boats gain is not enough for them to get on even terms with some of the light displacement machines we have out here in anything like their favoured conditions, which on the N.S.W. coast seems to be most of the time.

When you think about it some of the Farr boats and the latest three Peterson 1-tonners out here have been footing it with two tonners and larger, so to neutralise them on handicap you would have to add something in the order of four feet to their ratings. No rule change could possibly contemplate such drastic surgery. Nevertheless some closely calculated level ratings will go out the window to the chagrin of the owners. This time, however, some older boats will improve their position in the handicap quagmire and it may drop a few more into a level rating arena for which they could not previously qualify.

All of this has been brought about by the arrival on the scene of the 'ultra' light displacement machine, in pargicular the 1-ton centreboarders. The safety furore leading up to last year's Sydney-Hobart and the savage retirement rate which the lightweights suffered in the race itself served to reinforce the previously-held doubts of some influential yachting administrators. In January the O.R.C. further directed the I.T.C. to look at modifications in the MR formula (amongst others) of the I.O.R. which would halt or reverse the light displacement design trend and make safety and self righting capability a major issue around the world.

Whether or not they have succeeded in calculating changes to the I.O.R. which will, in fact, achieve any of these aims remains to be seen. It will be interesting to see what the designers make of all this. Of one thing we can be sure, and that is that obsolescence is still built into the I.O.R. with all the disadvantages which that entails. One prominent C.Y.C.A. member would like to see the I.O.R. frozen for five years regardless of what design trends or loopholes develop from the I.O.R. in 1979, and maybe that is not such a bad idea.

It is a forlorn hope, though, because O.R.C. policy is quite the opposite, and to quote the Chairman of the O.R.C., " . . . the Council may wish to be free to modify the rule to take account of any design trends which may develop. In fact, if a handicap rule is to be able satisfactorily to rate older boats equitably with the new designs, it is desirable to modify the rule at reasonably frequent intervals in order to take account of the latest design trends and compensate for design obsolescence." That sounds reasonable, but I would think that it places us on a treadmill by making obsolescence self perpetuating.

One thing that all of this seems to guarantee is the demise of the level rating classes in Australia. Already because of rule changes and the fact that these days a competitive ton class boat is not much good for anything else, level rating has become such a can of worms that no one outside wants to get into it at any price if it means building a new boat. Anyone already in the class is driven mad trying to make his boat rate, keep it rating and remain competitive, all the while bedevilled by staggering depreciation costs. Well, he will not have to worry much longer. The extensive nature of the new proposals will probably put him out of his agony once and for all unless some form of rule freeze for level rating classes is introduced.

The story of Columbus having trouble with his crew because they thought the 'Santa Maria' would tumble over the edge of the world is only a fable. Columbus's own account shows that the sailors had a much more sensible and prosaic reason for their complaints; when half the ship's food is eaten it's time to go back.

Columbus used an astrolabe. He also used the cross-staff which was soon to supersede the astrolabe. These gave him latitude; longitude was by dead reckoning all the way. Perhaps that was why he thought he'd reached Asian waters.

Over the years the backstaff took the place of the cross-staff but the next significant breakthrough came with the invention of the reflecting quadrant, in 1730. The sextant came on the scene in 1731 and rivaled the quadrant for about a hundred years before it took over completely. In essentials it was no different from the present-day sextant. With the coming of the sextant and the quadrant the backstaff joined the astrolabe and the cross-staff in the museums. So did the octant which, invented by Sir Isaac Newton, had enjoyed a short term of popularity.

The steering wheel came on the scene at about this time. Until then ships were steered by tillers, often controlled by a lever-like device called a whipstaff. The wheel and an improved compass made it possible to hold a steady course for hour after hour, which gave the navigator a chance to produce a more reliable dead reckoning. Actually D.R. stands for deduced reckoning, but let it be. Everyone calls it dead reckoning.

Dead reckoning was never completely trustworthy, especially in those days when there was no sure means of measuring a ship's speed or distance run. The log used in English ships was a wooden triangle weighted with lead along one edge so that it floated upright and offered the greatest resistance to the water. Attached to a line on a reel, it was thrown overboard every so often. The line was knotted at 25-foot intervals if a 15-second timeglass were to be used (50-foot intervals in the case of a 30-second sandglass) and the number of knots that ran out in a 15-second (or 30-second) period was equivalent to the number of nautical miles the ship would travel if she maintained that speed for an hour. It became customary to refer to a ship's speed in knots, but

MARINA NEWS

by Jack North

The ketch 'Calypso', designed by Luders, is another Choy Lee yacht from Hong Kong. Her vital statistics are 47 feet by 12 ft 2 ins and she draws 6 ft 8 ins. A 3 cylinder Volvo gives her auxiliary power.

She wears the South African flag, and after Alan Richards took delivery of her, he sailed the yacht from Hong Kong to Capetown. In January, 1976 he entered 'Calypso' in the race from Capetown to Rio de Janeiro, finishing 72nd over the line. There were 128 starters.

From Brazil the yacht sailed for the West Indies where she stayed for nine months or so; this was partly because she was dismasted in the Caribbean. Eventually leaving the Virgin Islands, 'Calypso' passed through the Panama Canal in January, 1977. Her trans-Pacific stepping-stones were Mangareva, Tahiti, Suvarov, Fiji, New Zealand and Lord How Island.

'Calypso' and crew spent a pleasant four months pottering about in French Polynesia and another six months in New Zealand. Alan Richards claims his long stay in New Zealand was because he wanted a break from the sea for a while. The yacht arrived at the Rushcutter Bay marina on the 5th May.

All things considered, her cruise has been blessed by the weather. There were various crew changes, of course, but Alan prefers to sail with about five hands. The yacht is now somewhere up on the Barrier Reef on a leisurely passage to Darwin. From Darwin the idea is to cross the Indian Ocean, touching in at an island here and there, to reach Durban early in 1979. Three years, Capetown to Capetown, is the projected time for this round-the-world voyage.

From the plastic correctness of a fibreglass yacht we turn to the grace and dignity of a past age. 'Osmunda' was built in 1906. An English yawl, 40 ft by 8½ ft by 5½ ft, she must be one of the most beautiful little ships to visit the marina. The chainplates are outside the hull, those for the main rigging being extended by small channels.

Obviously her rig has been changed from gaff to bermuda; the only other change, at first glance, is the addition of a doghouse. And this has been added with thought and care. There is also a Volvo 25 diesel down inside her somewhere.

Phillip Pleydell does not know who designed the yacht. He sailed her from England ten years ago or thereabouts and has been cruising ever since, on a tour that included five years in Florida.

'Osmunda' entered the Pacific by way of the Panama Canal and spent some time cruising French Polynesia before heading for Tonga, Fiji and New Zealand. She tied up at the marina on the 17th May, 1978, having crossed the Tasman with a crew consisting only of her owner and one hand, Mary Ellen Dacosta. They will probably go up to the Barrier Reef, but have not planned anything beyond there.

Another yacht to reach the marina on the 17th May was the 'Kite' of Melbourne. There is no plastic rightness about 'Kite'; nor is there any Edwardian elegance. Yet she has solid good looks of her own.

Converted from a Tasmanian cray-fish boat which dates back to before 1948, she is a comfortable yacht, and sea-kindly. Rigged as a cutter, 'Kite' is 38 ft by 11 ft by 5 ft and full in the bilge. She was three months on passage from Melbourne because she pulled into a lot of ports on the way and stayed a long time in those that took the fancy of her crew. The crew consists of Kevin Grose and his teen-aged son. They propose to continue up to the Reef, spending a lot more time in any place they like.

From Kevin's remarks it seems that the 'Kite' sails well on a reach or downhill although, like many boats of her type, she is slow to windward. But with a Perkins 4108 diesel to push her along, this doesn't seem to matter very much. Incidentally, the hull is built of huon pine.

Last Boxing Day when most yachts leaving Sydney were bound for Hobart Norman Rydge's cruiser 'Koomooloo 11' hit the trail for New Zealand instead. That was a rather stormy period and 'Koomooloo 11' had bad weather all the way. But she never faltered; the auto pilot did all the work while the crew just lounged around leading the life of Riley. It sounds incredible but Adrian Gray assures me it was so.

Arriving after a six day crossing, 'Koomooloo 11' pulled into Nelson and went visiting the sounds of South Island. Then, cruising up the east coast of North Island, she entered Auckland before setting out for home. She reached Sydney on the 23rd February after another six day passage in which the sea was like glass.

It is a matter of history that the cable on one of the offshore buoy marks snapped a couple of seasons back, and although the buoy was recovered the anchor remained on the bottom eighty fathoms down. The following week another mark was laid in its place and when 'Marabou' raised the buoy and anchor after the race, the ground tackle lost a week previously came up with it. This was proof of remarkably accurate navigation in laying the marks and the mark-laying party felt quite pleased about it.

An even wierder thing happened very recently. The wing-mark was laid for the Rubber Kellaway trophy, and when 'Marabou' went to retrieve the buoy after the race it just wasn't there. A wide sweep failed to locate it and everyone felt a bit glum about the whole affair. The buoy must have sunk and would be in Davy Jones's locker forever, it seemed.

In the short ocean race of 15th April 'Marabou' put down the buoys again. She laid Mark D (the wing-mark) and Marks B and C (way, way out on the wide blue yonder) and came in to set Mark A near North Head. But there was already a mark there, exactly in position, and nobody knew where it came from.

Of course it was the buoy that had gone missing from positon D, miles away, a couple of weeks earlier. Heaven knows where it wandered to during that time, dragging its chain and anchor, or what induced it to set itself up in the exact position for Mark A.

Some funny things happen at sea.

Elsewhere in this issue, I understand, John Hawley has reviewed Sheila Martin's book about the world-girdling voyage she and her husband, Norman, made in 'Shebassa' some years ago. As recorded in 'Offshore' for February, 1973, 'Shebassa' and her husband-and-wife crew were at the marina for some weeks. The yacht is a 42 foot ketch-rigged motor sailer with a clipper stem and the highlight of the passage as far as Sydney was an encounter with Hurricane Bebe at Fiji.

And mention of John Hawley reminds me that, when this goes to press, 'Geronimo' should be well and truly on her way. John is taking her over to Hawaii, following a most unusual route. Although he means to skirt Lord Howe and the Three Kings, the first port-of-call should be Rarotonga. From there Tahiti, Moorea, Bora Bora, Christmas and Fanning Islands are the probable steps, and 'Geronimo' should arrive long before the race starts on the 4th August.

John's reasoning is that, by making use of the prevailing currents, he should gain an extra knot over the ground. Allowing for a pessimistic hundred miles sailing a day, this is equivalent to an extra hundred miles or so every four days.

BOOK REVIEWS

Sea Wanderers to Australia

by Sheila Martin

192 pages, MacMillan, $10.95*

Norman and Sheila Martin's children had grown up and launched into their own lives when Sheila and Norman were 59 and 48 respectively. They took delivery of a 42 foot steel Trewes ketch to cruise the world. It was not their first boat, but everything was opportune for them to take off.

This story of their five year circumnavigation is written by Sheila Martin, who will be remembered by many member of the C.Y.C. from their visit in 1973. Of the Club Sheila says, "The C.Y.C. gave us tremendous help and hospitality, with free berthing, although they were full with yachts competing in the One Ton Worlds and, later, in the Sydney-Hobart Race starting on Boxing Day.

"The C.Y.C. must be the ultimate for any yachtie — a safe mooring, a shop fifty yards away and a lovely swish clubhouse with every comfort imaginable".

It is a book which must be read by all thinking of attempting long distance cruising and those who prefer to do it all from the comfort of their own fireside, brimming with interesting cameos and cautions of the pitfalls for the unwary.

Apart from Sydney, the Martins avoided the cities and encountered the most fascinating people living in their own small environment, mostly untouched and unspoiled by the sophistication of urban life.

This book was first published in England a year ago as 'Seatramps', a better title as Australia is only one place of call somewhere in the middle of their journey. It must have been decided that 'Sea Wanderers to Australia' would have more appeal to the Australian market.

I recommend that no male member allows his lady to read this book unless he wants to go cruising.

J.H.

"We CAN'T be abeam of Cabbage Tree Island; this is the Montagu".

Significant dates in navigation (continued from inside front cover)

1450's

Astrolabe and Quadrant go to sea; these were simplified astronomical shore instruments for observation of the Pole Star.

1484

John II of Portugal convened a commission of mathematical experts to formulate a method of finding Latitude by Solar Observation.

1492

In the year of Columbus' famous voyage, Martin Behaim constructed the earliest known Terrestrial Globe.

1500-1600

Compasses were greatly improved, with well-made pivots, gimbal suspension of bowl and glass covers. In 'Rutters', 'kennings' were abandoned in favour of miles or leagues; use of pegged traverse boards and slates spread; large printings of rutters, tidal almanacs and charts. Navigators came to realise that the Magnetic Variation could only be ascertained by observation and, as voyages covered more of the world, so their recording of Variation increased its coverage.

1502

The Portuguese add a central meridian to their charts with degrees of Latitude marked thereon. This was a magnetic meridian but sometimes a second, True Meridian was shown.

1509

Earliest known copy of 'Regimento de Astrolabio e do Quadrante', a manual of navigation and nautical almanac, containing an improved, directional Traverse Table. Also about this time Schools of Navigation were established in Lisbon and Seville, to train and licence navigators for trade to Indies. Amerigo Vespucci and Sebastian Cabot served as principals of the Seville School.

circa 1510

The Cross-staff went to sea, a rule was evolved for dinding Latitude by the Southern Cross. Regional charts of newly discovered areas produced; Pedro Reinel's being particularly noteworthy. 'World' charts increase in accuracy.

1514

John Werner of Nuremberg proposes the finding of Longitude by Lunar Distances but the mathematics involved in constructing suitable tables makes progress slow and it is 200 years before the method comes into use at sea (See 1767).

1537

Jewish Cosmographer, Pedro Nunes of Portugal, devises the ancestor of the azimuth mirror and writes a treatise to explain its use in finding Variation.

1541

Gerardus Mercator constructs an accurate instrumental globe.

1550

First records of measured leeway; charts used in Northern Europe. From about this time Ptolemy's incorrect continental proportions began to be finally rejected.

1551

Martin Cortes' Manual of Navigation.

1569

Mercator produced his famous 24 sheet map of the world on his new projection.

1574

William Bourne published his book "A Regiment for the Sea" — a notable navigation treatise.

circa 1580

The Backstaff, Davis or "English" Quadrant invented, making Solar observations easier. The "chip" log appeared.

1580-1600

Specialist Astro-Navigators appeared; port pilots began to be used by larger vessels strange to the port.

1581

Michiel Coignet's Manual of Navigation.

1583

'The Mariner's Mirrour' is published — named 'Waggoner' by the English, after its originator Lucas Janszoon Waghenaer; it contained charts, altreatise of navigation, sailing directions and astronomical data.

1590

'The Great Rutter' or 'Safegarde of Saylers", translated from the Flemish appears in England.

1599

Edward Wright clarifies the theory of Mercator's Projection, providing a table of meridional parts and refinements. Charts drawn from these date gradually gain acceptance.

1612

'Light of Navigation' published; it included altitude correction tables with an explanation.

1671

John Seller published 'The English Pilot'.

1675

King Charles II founded Greenwich Observatory.

1676

The Meridian of London came into wide use as the prime one.

1700-1800

Accurate Tidal Streams datea began to be available for North Western Europe Mercator charts became universal; the finding of Longitude by observation of the eclipses of Jupiter's satellites but never became very popular at sea; the same was true of the method of the occultation of fixed stars by the moon. Board of Longitude est. 1714.

1735

John Harrison preludes the perfecting of the marine timepiece by inventing the gridiron pendulum.

circa 1750

Doctor Gowin Knoght F.R.S. improved the magnetic compss by designing a scientifically correct card and needles and by constructing binnacles carefully without magnetic materials. Hadley's Quadrant became universally used.

1761

Harrison's third chronometer tested on a round trip to Jamaica from Portsmouth during which it was only 01m. 53s. in error over a five month period.

1767

The First Nautical Almanac published, including a table of LUnar Distances.

1794

The Greenwich Meridian became universally Prime (Vide Capt. James Cook's charts of New Zealand, etc.).

1795

The British Hydrographic Dept. of the Admiralty founded with first hydrographer a civilian — Alexander Dalrymple.

1808

Capt. Thos. Hurd R.N. succeeds Dalrymple; first servuce hydrographer, this tradition being maintained ever since.

circa 1820

Metal sextants with accurate details of construction and standardised; good quality chronometers of convenient size became common in all well found vessels of ocean-going tonnage and their prices were within the reach of the Masters of the day.

1837

Capt. Sumner of the U.S. Merchant Marine discovers by practical observation the significance of position circles and formulates his method of their use.

1875

Sir William Thomson (Lord Kelvin) carries out research and further improves the magnetic compass to its present standard. Marc St. Hilaire sets out the Intercept Method, streamlining Sumner's method and making it more suitable for everyday use.

1898

First permanent radio station in a ship established in East Goodwin Light Vessel.

1900-12

The Gyro Compass invented and made practicable for merchant and war ships.

1907

The last Natucial Almanac to give Lunar Distances.

1914-18

Radio Direction Finding developed; Micrometer Sextants.

1920's

Echo (Sonic) Depth sounding machines developed.

1939-1940

Sir Robert Watson Watt and others invent and improve Radio Direction and Ranging (Radar).

1940-45

Hyperbolic Navigation and other radio/electronic aids developed and improved; pre-computed Altitude and Azimuth Tables become common; bubble sextants are mass produced and are common equipment in aircraft.

1950's

True Motion Radar display produced.

1960's

Inertial Navigation comes into use. Very few Vernier Marine Sextants left at sea. Financial cost now the only barrier to completely automated navigation in all but the closest waters.

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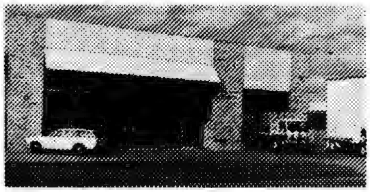
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