or reduce the unusual, i.e. very large or very small errors, or unusual combinations of them? May not the many judgments he has to make be biased by his preconceptions or hopes concerning the errors? The navigator may also tend to make and record observations in a slightly biased way, reducing apparent errors.

Is it not possible that these sources of inaccuracy in the measurement of navigational error may considerably alter the shape of the tails of the frequency distribution?

Mr. J. B. Parker comments:

It is true, as Captain Proctor points out, that post-flight analysis may be a somewhat subjective process. On the other hand, the evaluation of navigational errors by means of a monitoring device of high accuracy in the aircraft would be unsatisfactory. First the amount of data obtained would be extremely scanty, but, more important, the navigator's judgment and the 'operational' nature of the results would probably be prejudiced if he knew that he had a high accuracy monitoring device to fall back on if he were in serious difficulty.

It seems then that post-flight analysis is the only effective way to measure the accuracy of dead reckoning errors in actual operations and the question arises as to how the inaccuracies in determining true position, mentioned by Captain Proctor, will influence the results.

If these inaccuracies are random, and small compared with the navigational errors themselves, the effect will be negligible. The case of consistent biasing, the post-flight analyst tending, perhaps subconsciously, to reject extremely large or very small errors, is more serious and, if the bias existed, the results may be misleading. I can only point to two factors which lead me to believe that the post-flight analysis has been done in a manner as free as possible from bias:

(*a*) The distribution of errors found was markedly non-Gaussian, the proportion of large errors being higher than would be expected if the Gaussian law operated. This suggests that the large errors referred to by Captain Proctor were in fact not excluded.

(*b*) A perusal of the observations themselves (a copy of which Captain Willis had the kindness to send me) indicates that the post-flight analyst was not being unreasonably influenced in favour of the navigator.

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The Pelorus

Commander W. E. May, R.N.

(*National Maritime Museum*)

In 1854 a bearing plate was invented by Matthew Curling Friend and William Browning to facilitate the taking of bearings where the compass was inconveniently situated for observation.

Friend was born at Ramsgate on 21 January 1792 and entered the Royal Navy as a First Class Volunteer at the age of 14½. Though continuously employed in ships, which carried him to Africa, the West and East Indies and to China, he does not seem to have caught the eye of his superiors for he did not obtain his lieutenant's commission until February 1815. He subsequently served in the *Bucephalus*, 32, one of the ships which escorted Napoleon Bonaparte to his exile at St. Helena. While on board the *Bellerophon* in Plymouth Sound, waiting for the great powers to decide his fate, the fallen emperor used to exhibit himself daily at the gangway and the populace came out in boats and thronged round to see him. On the day that he was transferred to the *Northumberland* for his voyage there was an even greater press of boats than usual and one was capsized, throwing its occupants into the water. Lieutenant Friend dived overboard and rescued a lady, for which gallant act he received the thanks of the Royal Humane Society and a handsome silver cup from the fair one's husband.

After leaving the *Bucephalus* in 1816 Friend was never employed in the Navy again and so turned to other pursuits. In 1817 he constructed a meridian line in the Clock House at Ramsgate Harbour, receiving the thanks of the directors and a piece of plate. In 1820 he was elected a Fellow of the Royal Society and in 1822 he entered Sydney Sussex College, Cambridge. In 1827 he was awarded the Gold Medal of the Medico-Botanical Society and soon after received the Diploma of the Royal Statistical Society of France.

No one could say that he had wasted his time on half-pay, but he wanted something more permanent and in 1832 he managed to secure the post of Port Officer, Port Dalrymple, Tasmania, one which carried with it the appointments as Magistrate and Coroner. There he stayed for twenty years until he had to resign because of total blindness, said to have been brought on by hard work. The merchants and others of the colony showed their esteem by adding a piece worth 100 guineas to his collection of plate.

Friend returned to settle in Greenwich and lived until 1871. He had been superannuated with the rank of Commander in 1861. There was no machinery at the time for invaliding him when he became unfit for service years before.

William Browning described himself in the Patent as a Philosophical Instrument Maker of 111 Minories. He was a member of a firm which had a long history as makers of navigational instruments going back to the eighteenth century. To judge by the number still about they must have been particularly prolific makers of octants. Formerly known as Spencer, Browning & Rust the firm was in 1854 trading under the name of Spencer, Browning & Co. It was a family business, the Spencers and Brownings having apparently intermarried.

Friend and Browning christened their instrument a Pelorus after the navigator of Hannibal in about 201 B.C. When Hannibal left Italy for Carthage at that time he had with him as pilot a man called Pelorus. They were carried by the current into the straits of Charybdis and Hannibal, seeing a cape in the distance asked Pelorus its name. On being told that it was one of the capes of Sicily he suspected his pilot of trying to mislead him so that he could be betrayed into Roman hands, and put Pelorus to death. Finding too late that the pilot had been right, he gave him a magnificent funeral and renamed the cape Pelorus. In later times it bore a tower to guide seamen and it is now called Cape Faro. Some say that the whole tale is false and that the cape was known as Pelorus long before the time of Hannibal.

A few years after the production of the Pelorus, another inventor named his

instrument the Palinurus after the pilot of Aeneas when he sailed in search of the empire promised him by the oracle. It is perhaps fitting that the instrument named after Palinurus is now forgotten, for his character does not bear comparison with that of Pelorus. He fell overboard when asleep and was three days in the water before he reached shore, only to be murdered by the inhabitants for the sake of his clothes. According to the ancient Roman religion no one whose body lay unburied could cross the Styx, but Aeneas when visiting the infernal regions met him and was able to promise him a magnificent monument and that the promontory should be called Palinurus after him, honours which he hardly seems to have deserved.

Some instrument makers still market 'Friend's Pelorus' and the name became transferred to most bearing plates similarly designed.

During the early years of this century some navies, particularly those of of France and the United States, designed the bridges of their warships in such a manner that it was difficult to take bearings from the standard compass except over a very limited arc. In consequence they fitted a Pelorus in each wing of the bridge in a metal column which, in America, naturally became called the Pelorus stand.

When the Sperry Company designed its first gyro-compass equipment for production they found it convenient to take the U.S. Navy Pelorus stand as a model and made the repeaters of such dimensions as to fit into it. The name Pelorus then became transferred from the stand to the repeater which it contained. This was first called the Pelorus Repeater and later simply the Pelorus. When Sperry started selling their compass equipments in Great Britain they brought the name back to its country of origin and it became established in its new role.

Chartwork in Small Craft

from J. Vendrell

(Master Mariner)

1. HAVING had for some time to navigate small craft in all weather in the western approaches to the Clyde and on the west coast of Britain, the writer would like to submit for the consideration of other small-craft navigators some modification in chartwork which has proved useful, especially in rough weather when parallel rulers are an abomination and flying dividers can be lethal.

2. On a violently moving platform the navigator can only work with maximum efficiency when he is himself chocked off in a position in which he is sheltered, has the widest possible field of view, can take bearings and can brace himself securely to leave both hands free to carry out a limited amount of geometrical plotting with reasonable accuracy. The obvious position is of course the fore part of the wheelhouse, where there is very seldom sufficient room for a full-sized chart table with all the frills and trimmings.

3. In his own craft, the writer, having selected a position suitable for everything but chartwork, set about to find an alternative to a full-sized chart table and instruments which could be used with convenience and accuracy in this position. The answer was found in (*a*) chart frames; (*b*) a 5-in. Douglas protractor;