Weather Routeing Procedures

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A number of articles have appeared recently on the subject of weather-routeing and these have suggested computerized mathematical solutions. Motte and Calvert[1] put forward a rather complicated package aimed at on-board routeing and having read it I feel that Masters should know some basic facts.

The principles of weather-routeing based on seasonal climate were laid down by Maury about a hundred years ago and have been amplified in the Admiralty's Ocean Passages. Shore-based weather-routeing began in the USA soon after the Second World War and was taken up afterwards by various other countries. In the early stages the accent was on time-saving, hence the theory of time-fronts (James and others). With experience it was learned that time-saving could have undesirable side-effects, such as heavy weather damage. It was also learned that avoidance of heavy weather damage and fuel economy were more attractive to ship-owners than time-saving.

Experience has also shown that good weather-routeing has two primary requirements, a reliable set of prognostic weather charts (progs) and an experienced mariner to advise on routes. If the progs are wrong, the routeing fails and the cleverest program will not put it right. So an extension of the first requirement is to have a meteorologist who can assess the progs and advise the mariner as to their reliability. There is quite a wide range of progs available by radio facsimile from various meteorological services and it is a meteorologist who is best qualified to determine which model will function best in a particular synoptic situation. Quite the best of these is that from the European Centre of Medium Range Forecasting (ECMWF) but sadly this is not available directly from ECMWF. The duration of reliability of a prog is also dependent on the synoptic situation and this again needs a meteorologist.

It is not correct to say that 'progs are only available up to a maximum of 2 or 3 days'. They are generally available on radio fax for up to 6 days ahead.

I have never quite understood why weather-routeing theorists go to great lengths to convert wind speeds into significant wave heights to feed into their programs. Ships do not usually report sea-state quantitatively and it is universally agreed that individual estimates can be of variable quality. They are not usually used in computer programs deriving wave progs because of those doubts. Very few mariners could define a 'significant wave height'. In any case, swell wave is more of a problem since wind-wave is directly related to an existing wind field but swell-wave is not, and swell-wave does not figure separately in wave progs after the first 36 hours. All ships report wind direction and speed reasonably well.

It is difficult to relate the Motte/Calvert statement that 'As accurate or prevailing sea data are not normally available' (p. 419) with their statement that 'data used are accurate observation and predicted hindcast data' (p. 421). A predicted hindcast is a contradiction in terms.

Scott's empirical formula (p. 426), derived from a Darbyshire relationship, was as quoted, except that it had to be used in feet and there was a constant of 5 added (5 ft being the average wave height in the North Atlantic). That rather crude formula has been

superseded by more sophisticated graphs derived by Bretschneider, Pierson-Moskovich, US Corps of Engineers *et al.*, which include fetch and duration in the equation.

An on-board router can never hope to achieve the experience of a shore-based router, who handles many routeings each day, nor can the average mariner acquire sufficient meteorological expertise to understand how to treat machine progs. At the same time the average meteorologist cannot hope to acquire sufficient knowledge of seamanship to be able to make the right course recommendations in each and every case. Having spent 6 years as a full-time shore-based weather router and the past 12 years (but not regularly) in the weather-routeing of towages and heavy-lift vessels, including 'staged tows', interspersed with both on-board weather forecasting, and with on-board reliance on an on-shore weather service, I am quite convinced that on-board routeing cannot hope to match the 24-hour continuous surveillance and the mass of relevant data that a shore-based service has available – always assuming that a good seaman is there to select the route.

REFERENCE

[1] Motte, R. and Calvert, S. (1988). Operational considerations and constraints in ship-based weather routeing procedures. This *Journal*, **41**, 417.