

sophistication. The Sietas Optimal Brücke is one successful design, and there are also other concepts in use.

There is certainly a need for painstaking experimental work of the kind described by Schuffel, Boer and van Breda, but operational experience is the ultimate testing ground for new bridge designs and operational procedures. Considerable experience has been obtained in recent years and this needs to be properly evaluated and taken into account in the continued evolution of bridge design.

## REFERENCES

- <sup>1</sup> Pettersson, Benny (1988). Possibilities and limitations in navigation with radar and positioning systems in narrow waters. *Proc. NORNA 88*, Strömstad, September 1988.
- <sup>2</sup> Larjo, Kari (1987). Advanced bridge systems for navigation in restricted waters. *Proc. Third Int. Conf. on Bridge Design and Ship Operations*, Oslo, October 1987.
- <sup>3</sup> Breedveld, D. (1988). Radar simulator training for inland waterway shipping. *This Journal*, 41, 25.

## ‘Weather Routeing Procedures’ The Authors Reply

We would like to thank Mr Blackham for taking the trouble to comment<sup>1</sup> on our recent paper.<sup>2</sup>

Most of what Mr Blackham has written is uncontentious, stating, as he does, that weather routeing should embody a combination of skills from two professions, that of a meteorologist in parallel with an experienced ship master. Since the principal author is qualified in both of these camps, we would not take issue with him, and indeed, we support this philosophy. Our paper was not intended to contravene this, but attempted to extend the boundaries of knowledge on the subject in general in support of ship routeing. The old ideas of onboard routeing and shore-based routeing no longer offer a distinct interface. Modern communication techniques facilitate a system whereby expertise from ashore can be transmitted on board, enabling a ship master to make choices depending upon the characteristics of his vessel, and based on the environmental information he receives. (We have always advocated using shore expertise in maintaining a level of decision-making on board ship.) The dynamical models are intended as a link between these two features.

As weather forecasts improve globally, so these models will improve in their application. We are attempting at Plymouth to make some small contribution in extending the thinking in this area away from the more subjective analyses currently offered. This philosophy does not diminish the role of the ship master but affords him an additional tool in order to more effectively complete his task in a seamanlike way. The committed reader will note that the two or three days ahead statement was made in reference to predicted sea wave fields only.

## REFERENCES

- <sup>1</sup> Blackham, A. (1989). Weather routeing procedures. *This Journal*, 42, 307.
- <sup>2</sup> Motte, R. and Calvert, S. (1988). Operational considerations and constraints in ship-based weather routeing procedures. *This Journal*, 41, 417.