PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A MATHEMATICAL, PHYSICAL & ENGINEERING SCIENCES

Concluding Remarks

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Concluding remarks

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I believe that those who have been present at the whole of this discussion meeting have found that it did succeed in putting across an integrated techno-economic view of the marine industries' future. A still more detailed account will, of course, become available in the written version.

Mr Denholm explained at the outset what a big contribution to the balance of payments the shipping industry makes, and will continue to make if and only if costs can be kept competitive. From this he concluded that research for the shipping industry should above all be directed towards matters such as planned maintenance systems, techniques for ship routing, and methods for modifying and adapting existing vessels. These are important matters but, as Mr Meek later reminded us, shipowners have been the real technical pioneers in the past for many new ship developments and no doubt will continue to be in the future.

Dr Hurst made a projection of the world demand for ships in the 1980s, in which he forecast some definite expansion of demand in connexion with certain existing shipping uses, together with the appearance of some new uses such as the transport of semi-finished goods mass-produced in the developed countries for assembly in areas of cheap labour. He ventured to forecast a world demand for new ships of some 50 million tonnes dwt per annum. He expected an increasing tendency to specialization of roles, while Dr Taylor has just forecast a similar tendency to specialization of shipyards. He envisaged a rather more inflexible pattern of operation for the ships of the 1980s. He expected the adoption of factory methods of production, and Mr Takezawa has just given us a brilliantly comprehensive vision of the form these methods may take.

Dr Hurst referred also to computer-based design, a theme expanded in more detail later by Mr Atkinson and Mr McCallum. They discussed methods such as the evaluation of loading spectra and inference from these of the statistics of structural response through use of transfer functions. There was general enthusiasm for finite-element techniques for structural analysis. A major difference of view on computer-aided design emerged, however, between Professor Chryssostomidis, who saw the design problem being split up into sub-problems in each of which the design decision would be taken by a human being, and Mr Atkinson who envisaged the computer being itself used to integrate up the results emerging from its own analysis of all the different sub-problem areas.

Mr Lorentzen explained that it would be exceedingly difficult to reduce ton-mile costs significantly in the 1980s; he and others agreed on how unpromising appear the possibilities of such reductions whether from changes in ship sizes, speeds or materials. It is restrictions on draught that above all limit size, and in this connexion many speakers from the floor emphasized the great importance of adequate ports to the shipping industry. (One of them advocated the construction of a new large Europort affording 30 m of draught.) Attention was frequently drawn to wave-induced vibration as one of many other important design criteria militating against further size increase. Others saw, however, some real possibility of increasing displacement through width rather than through draught.

Mr Lorentzen pointed out that ton-mile costs might indeed have to *increase* in real terms to meet higher standards of safety for ships, for crew and for the environment, while speakers from the floor argued also that ship *prices* in real terms must rise if the shipbuilding industry is to survive. On the matter of regulatory actions to achieve these higher safety standards, there were eloquent pleas to the governments of the world to embark on such actions in a reasonable degree of unison, and to avoid going overboard (metaphorically!) on any one particular aspect, such as the oil pollution matters of which Mr Prosser spoke. Some existing regulations are badly in need of revision, like the archaic load line laws referred to by Mr Meek. Looking to the future, we should be thinking of effective monitoring measures for various purposes, including perhaps identification of tankers through transponders feeding data to some general surveillance system. Where specially hazardous cargoes were concerned, more stringent regulations might have to be imposed, such as the collision barriers suggested by Professor Caldwell.

There was some difference of approach on design between Professor Chryssostomidis, who advocated separate processes of optimization in his different sub-problem areas, and Mr Paffett, who saw the areas of resistance and propulsion as inextricably interacting with one another, which led him to advocate the future use of specialist designers of 'stern systems' as a whole. Mr Paffett foresaw also some important further developments in the control of ship motions, going beyond the current use of roll dampers into matters such as slamming avoidance.

A speaker from the floor enquired whether for all these purposes our industries employ enough first-rate scientists and other specialist personnel. Certainly Mr Takezawa made it clear how the answer is 'yes' in the Japanese shipbuilding firms, with their numerous 'fresh university graduates' and other 'capable employees'....

In the machinery field we heard about the recovery of the steam turbine as a widely used alternative to diesels. There was some dispute about the future of marinized aero gas turbines. seen as promising in merchant ships by Dr Hurst and Admiral Dymoke but not by Mr Munton. There was more general agreement about the future civil applicability of homopolar electrical machines with superconducting field coils, while one feature common to this meeting and to that on building technology was reference to sewage disposal, as well as to desalination of water by reverse osmosis!

Finally, Dr Taylor reminded us of the grave dangers facing the U.K. shipbuilding industry from its completely inadequate rate of capital investment. From another point of view, however, Mr Meek reminded us that life in the marine industries was exciting in the 1960s and in all probability will be exciting in the 1980s. Certainly Mr Takezawa showed us many ways in which it will be exciting in his country, and the concluding words of Admiral Dymoke's lecture were 'Ship technology in the 1980s will not be dull!'

After that very inadequate summary of our proceedings it is my final pleasant task to thank all of you for coming, and especially to thank all the speakers for giving us such exceedingly interesting presentations, and all contributors from the floor for putting forward such thought provoking questions and comments, which combined to make this such a memorable event for all those taking part. Thank you.

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