

PROPULSION

INTERNATIONAL CONFERENCE ON NEW DEVELOPMENTS IN WARSHIP PROPULSION

BY

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This Royal Institution of Naval Architects conference on new developments in warship propulsion was held at the Heathrow Penta Hotel on 14 and 15 November 1989. I attended as a DGME project officer for Surface Ship Propulsion Concepts.

The conference consisted of 17 presentations from a range of international authorities, industries and consultants. Topics covered a wide range of interests from mathematical modelling of flow through ducts to a report on Type 23 propulsion trials. There was a distinct sales pitch air from some equipment manufacturers.

The three current methods of powering warships are diesels, electric motors and gas turbines. Considering that there is a trend away from gas turbines for low power applications (below 20 knot) the diesel lobby was surprisingly poorly represented. There were no papers by diesel manufacturers and diesel propulsion was only covered with reference to control of a CODOG layout for Standard Flex 300 of the Royal Netherlands Navy and with reference to a joint Delft University/West German industry paper on propulsion noise control.

The Canadian Department of National Defence presented a paper on their development of an a.c. electric propulsion system for frigate size ships. Their aim is to produce a cost-effective alternative to the CODOG system installed in the Canadian Patrol Frigate and the concept is now looking promising. Power is controlled by varying frequency using a cyclo-converter. Developments in this technology represent a significant advance over the tried and tested d.c. systems used in most electric propulsion systems to date. The concept has been developed from the a.c. electric propulsion technology used in the Canadian Coastguard icebreaker programme; electric propulsion is particularly attractive for icebreakers where there is a need for high torque at low revs.

The gas turbine lobby was well represented; presentations on developments in gas turbine technology were made by Textron Lycoming (3–4 MW), Rolls Royce (18–22 MW) and General Electric who presented a paper on the use of gas turbines for ship propulsion. GE's paper opened with 'The marine gas turbine has emerged as the dominant choice of prime movers for naval propulsion systems'. Development in this field, particularly with respect to complex cycle engines, looks promising for the future; the efficiency gap between intercooled regenerative gas turbines and diesels is very much less than that for simple cycle gas turbines, while maintaining the considerable space and weight advantage enjoyed by gas turbines.

Papers by KaMeWa (Sweden) and the Swedish Defence Material Administration addressed means of getting propulsion power into the water for high speed craft. The two propulsors of greatest consequence are water jets and partially submerged propellers. Interestingly, Gentry Eagle of transatlantic fame has two diesel-driven waterjets (KaMeWa) and a gas turbine driven

partially submerged propeller. The most suitable choice is very much dependent on the user's requirement; the propellers are cheaper but are not well suited to slow speeds. Water jets have been installed in ships of up to 360 tonnes.

The Swedish Defence Material Administration presented a video of a self-propelled model Surface Effect Ship (SES) using both the above propulsion methods. The trials were reported to be successful even with the test tank wavemaker in operation. Textron Lycoming reported that they had built a waterjet propelled SES (SES 100A) in the 1960s which had a recorded maximum speed of 100 kt; this was a small boat powered by four 3 MW gas turbines, two for lift and two for propulsion.

An American Consultant, Mr D. Raines of Decision Engineering, presented an interesting paper on the need for and the cost of high top speed. All top speeds were in the 26 to 30 kt range with power being provided in units of LM2500 (what else?). A unit order of 100 30 kt ships over 20 years was taken as a standard, and calculations showed that up to 110 26 kt ships could be purchased and operated for the same price. Although the quantities were well out of the R.N. league, it was clear from the parameters considered that the changes to the propulsion system did not have a great impact on the through-life cost of the class; changes to the weapon fit and signature reduction techniques were shown to have a much greater effect on costs. A point of detail is that both the presentation and the paper appeared to suggest that the Americans drive their ships at maximum continuous speed at all times.

Other topics covered included presentations on a low-powered nuclear reactor for a hybrid SSK(N) submarine system from the Canadian consultants Power Systems Inc., propulsion systems of Autonomous Underwater Vehicles from RNEC Manadon and the University of Calgary, the Impact of Information Technology on Machinery Control and Surveillance from BMT CORTEC Ltd., and a presentation on uptake and downtake design from Industrial Acoustics Ltd.

The list of papers addressed above is by no means complete and any omission is not intended as a reflection on the degree of interest generated by the speakers. In summary, the conference was a very interesting series of presentations on the theme 'To Move', but there was a strong bias towards gas turbines from the opening hour of Day 1 to the chairman's summing up on Day 2.

A volume containing the full text of the papers presented at the conference, and the discussions can be obtained from the Royal Institution of Naval Architects at 10 Upper Belgrave Street, London SW1X 8BQ.
