WARSHIP '90

INTERNATIONAL SYMPOSIUM ON THE FUTURE FOR SURFACE WARSHIPS

BY

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The Warship '90 Symposium, organized by the Royal Institution of Naval Architects, was held at the Heathrow Penta hotel between the 4th and 6th of June 1990. The audience was truly international, with marine engineers, naval architects and defence staffs from all NATO countries along with representatives from the Middle East, Japan, Taiwan, Singapore and South Africa. Also for the first time there was a representative from Eastern Europe; perhaps this will become very much the norm in the evolving scene of world politics.

The title of the symposium 'The Future for Surface Warships' was particularly relevant to the current emerging political and defence environment: is there a role for surface warships and if so will they continue to evolve along the lines of present designs? The papers tried to identify the main criteria for future ships' designers to consider—typically, minimum through-life costs, greatly reduced manning requirements, and greater flexibility of operation. Other papers considered developing technologies as tools for the designer in achieving their goals.

In this article the papers are summarized and commented upon from the personal viewpoint of a project officer from a DGME Surface Ship Propulsion Concepts section.

Tactical Deterrence-'Why'-'How'-'What'
by G. H. Fuller of British Maritime Technology Ltd.

It was quite correct that this the first paper should address what the role of a surface warship might be in the future. It pointed out that for an effective Tactical Deterrence a surface warship should be:

- Visible to an enemy—deployed at the right place and time.
- Credible in military terms—when used it can win.
- Will not bankrupt the owner.

While air and underwater platforms can achieve these in part, only the surface warship can achieve all three. The paper then investigated the range of hull-forms and construction materials that can be used, highlighting the advantages and disadvantages of each.

A New 'Poussière Navale'?
by V. di Sambuy, chairman of C. Gavazzi Controls of Italy.

This was a different kind of paper in that the author developed a scenario for a Mediterranean conflict based on the Southern and Eastern Islamic nations challenging the European countries of the Northern Mediterranean. I am sure these were personal views rather than those of the Italian government. The paper skimmed through new technologies that are available to counter the threat, from magneto-hydrodynamic propulsion to the 'wing in ground effect' hull-form. Each technology was discussed briefly, with little

explanation of why it should be developed for this new scenario in preference to any other.

Requirements Capture and Analysis
by G. Mason of Vickers Shipbuilding and Engineering Ltd.

Mr Mason developed the case and a methodology for a structured approach to defining control system requirements and controlling their implementation. This appeared logical and I am sure was well understood by all working in the field.

Towards Affordable Solutions For Warship Ownership
by S. J. Wade and N. P. Pattison, Vickers Shipbuilding and Engineering Ltd.

This paper demonstrated how novel thinking can be applied to a ship design to achieve a low cost vessel for a given set of requirements. The requirements are derived from a number of recent frigates and OPVs and the result is an AAW capable escort with a limited ASW capability—obviously more tailored for export rather than the Royal Navy. The cost target was £50M, which was achieved by new approaches in the following areas:

- Novel design features—particularly electric propulsion and a telescopic hangar.
- Application of military standards only where essential.
- Manning levels (10 officers and 80 ratings) and upkeep policy.
- Through-life financing—including considerations for leasing.

Strength in Size
by N. H. Cross, Consultant.

The Soviet Union's maritime doctrine was examined and how it is evolving from a strength of numbers philosophy to strength of capability. It covered how technical changes, particularly in complete weapons systems, are quickly implemented within their ship classes; a facet that few other navies manage to achieve. The conclusion is ' . . .while the Soviets are scrapping and laying up large numbers of surface combatants, even the current build construction efforts will provide a significantly more capable surface fleet, centred on several aircraft carriers and battle cruisers.'

The Advanced Technology Frigate
by D. K. Brown, Consultant.

The author showed how advanced technology can be applied to modern surface warship designs to give improvements in operability whilst reducing manning and maintenance requirements. Three types of ship are considered—a Type 23 equivalent, a larger 6000 tonne ASW destroyer and a corvette. For the Type 23 equivalent, the design incorporates a midships helicopter flightdeck to increase air support availability by reducing deck movement due to seaway motions. To give a good approach for landing the after superstructure is small and arranged carrier style on the starboard side. To make maximum use of the flexibility of layout with this arrangement electric propulsion has been selected. This also has advantages for obtaining vulnerability improvements. The other 2 types of ships considered would be part of a 'Hi-Lo' mix of ships with large (about 6000 tonne) ASW destroyers with 4 EH101 helicopters each, and 2000 tonne corvettes with landing but no hangar facilities. The design concepts presented show how an effective fleet could be produced to a limited budget and, whilst the whole philosophy may not be adopted, this paper certainly contains ideas that warrant serious consideration. The final sentence of the paper is an accurate statement on modern warship design 'With a limited budget, only technically advanced

ships can offer the right combination of economy and effectiveness.' This paper was one of the best of the symposium and is reproduced in this issue of the *Journal* (pp. 411–426).

The Future of Naval Command and Control systems
by C. D. Byrne, W. L. Larkin and J. A. H. Miles of ARE Portsdown.

A research programme at Portsdown investigated the use of 'Knowledge-Based' techniques to increase the level and quality of automated support which is thought to be essential for future command and control systems. The paper shows how the delays affecting the Type 23 command system may have created a window of opportunity to incorporate these techniques.

Ships for the Protection of International Maritime Assets
by P. D. Forrest of Swan Hunters

The evolving political scene together with the greater awareness of the economic resources of the ocean are seen as requiring a new breed of surface warship to patrol the 200 mile Exclusive Economic Zone. These new ships are 85 m Off-shore Patrol Vessels, of various types and all capable of operating a Lynx size helicopter. The designs are primarily intended for the Third World export markets or those with only coastal interests. They are not suitable for blue water operations even as part of a larger group.

Standard Flex 300-an Innovation in Warship Construction
by Rear-Admiral I. B. Roldholm of the Royal Danish Navy.

Whilst again this was a paper concerned with small ships—the Flex 300 ships are all 54 m long and of displacements around 300 tons—the concept of modular design and construction is one that also offers advantages for larger ships. The Flex 300 concept is to have a fleet of common hulls that by fitting various modules of weapons and upper deck machinery can specialize as surveillance, missile attack, minehunter or minelayer. An advantage of changing their roles as the situation dictates was also proposed, for example in transition to war the surveillance craft may be readily reconfigured to fast missile boats. Of much more interest would be the use of modularized construction on larger frigate size vessels to give different roles on the same baseline hull. The Danes are looking at this as part of the StanFlex 2000 Programme but unfortunately only few details of this emerged during question time. It will be very interesting to compare this development with the German, Blohm and Voss, MEKO concept.

Yeoman—A New Approach for Command and Control Systems
by H. J. Agnew and R. K. Woolley of QUBIT.

This was a sales pitch for a Yeoman electronic 'puck' (a computer 'mouse' with a hole for lining it up on charts), used with a computer system to assist navigation.

Preliminary Design Considerations for Fast Warships
by R. G. Heather of Vosper Thornycroft.

This very comprehensive paper considered the advanced hull forms that are possible for fast (30 knot?) surface warships, their 'Design Iteration' problems, and the role of the ship designer. The paper covered all the major aspects from setting the requirements, the type of design process, the size of margins, hydrodynamics and hull form selection, hull construction, weight estimation/control, manning, habitability and vulnerability. Another aspect covered in detail was the effect of helicopter selection. The paper contained a useful table giving the platform requirements for a number of NATO helicopters. It was proposed that there is no role for a large frigate/destroyer or a small patrol vessel, so that capable light frigates will be required. This

paper, together with its comprehensive list of references, will be useful to future ship designers.

The Developing Scene in Active Techniques for Ship Noise and Vibration Control
by M. Purshouse of YARD Ltd.

Dr Purshouse discussed the possibilities afforded by the adoption of active cancellation techniques to reduce shipboard noise and vibration. However, the big question of how much such a technique would cost to compete with, or better the best of passive measures on a shipboard equipment was not covered. With such techniques being developed for many diverse applications, the technical base of knowledge is growing and when it is shown that passive control has reached its limits then the risk and cost associated with the adoption of active measures will need to be addressed.

'IRIS'—A New Generation of Coastal and Escort Anti-Aircraft Defence Ships
by M. Chevalier, Project Manager of Thomson-CSF and M. Nahon of A. Mauric Design and Engineering, France.

This paper was very interesting, not from the point of the ship design presented but the method of its conception. The design is for a 46 m patrol boat of 210 tons which puts 8 Crotale surface-to-air missiles at sea to defend coastal installations or shipping. Its inception was by the weapon manufacturer Thomson-CSF who saw a market for such a ship to put their Crotale Missile system to sea as a result of the Gulf conflict. The use of high value warships to escort tankers in coastal waters risks the warships then becoming a major target. This logic led Thomson to produce a small, low-cost but highly specialist class, the P140 class, to fit the coastal escort role. The first ship *Iris* is now at sea as result of this private venture programme.

The French Navy are now operating the ship for evaluation and for a global deployment to seek export orders. It would appear that the AAW weapons system, with a crossing capability and limited area defence protection, and a twin 35 mm Oerlikin gun will give this small craft a ready market among navies primarily concerned with coastal defence. Let us hope other weapons manfacturers follow Thomson-CSF's lead and take such private venture risks, perhaps with a U.K. shipbuilder to produce a U.K. export winner.

The 'Test-Rig' Vessel—A Consequence of Futuristic Ideas
by Captain L. Salomonsson and M. Bergman of the Swedish Defence Material Administration and J. Nilsson of Karlskronavarvet AB, Sweden.
and
The 'Test-Rig' Development of Swedish SES Technique for Future Naval Craft
by Captain L. Salomonsson of the Swedish Defence Material Administration and P. Ottosson of SSPA Maritime Consulting, Sweden.

These two papers covered the design and production of the test craft *Test-Rig* which was produced to verify a number of design features for a future Swedish Navy coastal corvette. The design features demonstrated were;

- Stealth optimization.
- New Weapon, Communications and Sensor systems.
- the Surface Effect Ship principle.
- GRP sandwich construction.
- Waterjet propulsion.

For the very particular Swedish requirement of Western Baltic operations where many passages are only open to shallow draught vessels, the Surface Effect Ship has many advantages. The programme to develop such a design using a novel hull-form and construction technique is impressive. It is clear how closely the Swedish Defence Ministry works with their consultants and shipbuilders to produce such a competent national programme without any apparent drive to competition.

The Resilient Warship
by A. G. Begg, W. Paton and J. S. Whiteford of YARD Ltd.

YARD have taken their 50 man frigate design of last year's RINA Symposium and incorporated many features to reduce its vulnerability. The design exercise then proposes all the features that they consider are necessary for a high survivability frigate, including more use of vulnerability modelling in the design phase and the application of technology to a comprehensive damage control monitoring system with more automation. The paper does not address the cost impact of applying such features to a design, especially if the baseline design already achieves all given vulnerability requirements.

Trends in Combat System Design and their Effect on Ship Design
by J. Stuart Scott of Plessey Naval Systems Ltd.

Although this paper was presented at the meeting, the text has never been submitted.

The Application of Very High Performance Integrated Circuits (VHPIC) to Towed Array and Sonobuoy Signal Processing
by J. Beresford of Plessey Naval Systems Ltd.

The author explained how the latest micro-chip technology can be used to carry out the very specialized task of towed array signal processing, and covered the architecture and processor design as well as aspects such as beam-forming and adaptive noise cancellation.

Realizing the Potential—Full Electric Propulsion for Surface Warships
by P. T. Norton and M. Murphy of MOD (PE), Bath.

Printed on pp. 441–457 of this issue of the *Journal*.

Some System Integration Questions of the Canadian AOR Re-engining Project
by J. Hensler of ECS/German and Milne, Canada.

The Canadians are investigating the feasibility of re-engining their AORs, by replacing the steam propulsion plant with a modern electric propulsion system. The paper covered aspects of electro-magnetic interference and compatibility of the proposed installation, and discussed techniques for reduction of their effects.

Integrated Air Defence into the 21st Century
by J. Wood of Airship Industries Ltd.

The United States is funding a programme to place a long range surveillance radar inside an airship to act as the radar picket for a Battle Group. The very large radar is mounted inside the main airship structure with a small cabin for the crew, electronics and propulsion units underslung. Based on the existing Skyship 600 the programme has less risk than one might at first expect and the potential for long radar range and endurance on task (limited by only the crew) gives it several potential advantages.

In Conclusion

The Warship '90 symposium covered a wide range of topics and aspects of warship design. The major points to emerge were that future ships will have to be highly effective and of constrained costs. To do this the task of the designer is going to be ever more complicated, with a drive to utilize the latest technological innovations. There is a strong case for developing smaller more specialized warships but these tend to be for coastal or enclosed sea operations. Electric propulsion was advocated as worthy of consideration by both ship designers and marine engineers, and may have advantages for the future. To quote David Brown, surface warship designs need to '*Innovate or Die*'.

Copies of the papers presented at the Symposium, and the discussions can be obtained from the Royal Institution of Naval Architects at 10 Upper Belgrave Street, London SW1X 8BQ.