# UNIVERSITY COLLEGE LONDON POST-GRADUATE PROJECTS

## MARINE ENGINEERING (ELECTRICAL) AND NAVAL ARCHITECTURE

Summaries of the projects on the 1990–91 MSc courses at University College London are given below. The full reports are held at the University and further information may be obtained from the Professor of Naval Architecture, Naval Architecture and Marine Engineering Office, Department of Mechanical Engineering, University College London, Torrington Place, London WC1E 7JE.

### MARINE ENGINEERING (ELECTRICAL)

*Simulation of Correlated Sea Clutter*
by W. J. Wessels, MSc

The objective of this project was to implement, on a computer, a novel model of non-Rayleigh radar sea clutter with arbitrary autocorrelation properties.

The report provides a detailed description of the k-distribution model of radar clutter and also of the supporting software. The report contains examples of the initial results obtained.

*Short Range RMCW Radar*
by A. M. Hassan-Adde, MSc

This project describes the design and build of a simple FMCW (Frequency Modulated Continuous Wave) radar based on a commercial Doppler intruder alarm module. The report describes the evaluation procedures and provides test results, including photographic evidence of performance.

The report provides a useful account of the subject of FMCW radar.

*Television Based Bistatic Radar*
by J. J. Pienaar, MSc

The goal of this project was to demonstrate the feasibility of using television transmissions as the 'illuminator' for a bistatic radar system aimed at aircraft detection.

The report covers the electronic design of the system and includes initial trial results obtained using the system.

### NAVAL ARCHITECTURE

*The Need for Time-Dependent Damage Stability Criteria*
by K. A. Mason, MSc, NAVSEA US Dept. of Defense

Rapid capsize phenomenon—difficult to predict, impossible to legislate. Or is it? By the use of time domain flooding simulation this terrifying event can now be predicted, thereby giving the designer the opportunity to improve potentially fatal design configurations.

A brief history leading up to current damage stability criteria for surface ships is presented and the possibility of new, time-dependent damage stability criteria is explored. In the case of a passenger ship, these criteria are consistent with current rescue equipment and evacuation procedure. In the case of the warship, the time history created can be used to assess the potential for sustained combat effectiveness.

*Seakeeping—A Novel Approach*
by D. M. Kramer, MSc

Seakeeping considerations and aspects were first recorded as long ago as 1861, but not until the 1950s were any practical applications available. In the past, seakeeping analysis was left until the vessel's main parameters had been decided upon. After this was finalized the vessel was looked at to assess its seakeeping performance. This was inadequate and since then the need to quantify the seakeeping aspects of the vessel in the concept stage has become essential. In the very early stages of design there is still no method to appraise these qualities of a ship. It is therefore necessary to assess what criteria are required in the concept stage and to design these considerations in when carrying out this phase of the design.

*Function and Algorithm Specification for a Damage Stability Program using the Surface Pressure Integration Technique*
by Lieutenant T. D. Gates, MSc, Royal Australian Navy

The current criteria for assessing the stability of surface vessels in both the intact and damaged conditions depend on the ability to calculate two characteristic quantities: the metacentric height; and a set of righting moment curves for the vessel. These quantities are dependent on the hydrostatic forces acting on the vessel.

There are two general approaches available to calculate the hydrostatic force and resulting moment acting on a floating body: the volumetric integration technique; and the surface pressure integration technique. The general approach of these two methods is presented and they are compared in terms of their accuracy, complexity, ease of application and the ease of incorporating additional non-static effects. This comparison results in the identification of the surface pressure integration method being the better of the two.

A program algorithm and specification are developed for the implementation of the surface pressure integration technique to carry out damage stability assessment.

*A Hybrid Panel Construction for FRP Ship Superstructures*
by K. M. McLeod, MSc, U.K. MOD

This report describes the investigative work undertaken in the design of FRP (Fibre Reinforced Plastic) ship superstructures. The study is centred around the simple superstructure arrangement of standard size FRP panels mounted on a steel portal framework, the design of the FRP panels and the associated problems forming the core of this report.

Various material combinations are investigated, taking into account fire-resistance, electromagnetic screening and fabrication, and an optimum material combination is arrived at, together with recommendations for further study.

*Primary Structures for SWATH Ships—A Comparison between Trusses and Conventional Designs*
by J. P. Groom, MSc, U.K. MOD

This report covers the evaluation of trusses as an alternative type of SWATH primary structure. A range of ship sizes was tested. The results show that there are significant weight savings at small displacements. Additionally, trusses offer better accessibility and easier design.

*Double Hull Submarine Design*
by Lieutenant M. Shahid, MSc, Pakistan Navy

The strength of submarines represents one of the most interesting areas to challenge the skill of the structural designer. A submarine is usually a complex

structure consisting of cylindrical and conical shells with spherical or torispherical ends and bulkheads, etc. There are numerous possibilities of modes of failure due to buckling, yield, stress concentration, dynamic effects or fatigue.

This report seeks to investigate these modes of failure for a double hull design, and to show the benefits of this type of submarine pressure hull.

*Alternative Design Methodologies for Marine Vessels*
by J. M. Whatmore, MSc, U.K. MOD

This report covers the investigation of alternative design methodologies as applied to engineering artefacts and, in particular, to ships. It reports on many aspects of current engineering design, concentrating on the application of computers to the early, or conceptual, stages of design.

*Determination of Bulkhead Positioning in Surface Warships*
by Lieutenant (N) D. Lloyd, MSc, Canadian Forces

This report investigates the means of determining the positions of bulkheads in surface warships. It commences by discussing the project's objectives and procedures. Procedures are then amplified by developing a generic frigate, and discussing the positioning of bulkheads based on structure, layout and damage survivability respectively. The results of these discussions are then analysed and arguments are put forward defending the use of margin lines/floodable length curves in warship design. The report then goes on to develop a procedure to position bulkheads in warships.

*The Consideration of Large Angle Stability at Concept Design*
by S. Knight, MSc, U.K. MOD

This report describes the investigations into the effects of variations of the major dimensions of hullforms on their GZ curves. From an explanation of stability and attempt to relate the features of a hullform to its GZ curve, a box shaped hull is gradually distorted into a warship and the effects on the GZ curve observed. The intermediate steps include parabolic and elliptical waterline canoe forms, as well as a rise of floor hullform. All hullforms tested have a constant displacement and main hull density. The validity of comparisons of different hullforms based on GZ curves alone is discussed and an alternative comparative parameter which is not centre of gravity dependant is devised.

The emphasis of the report is on giving a fundamental understanding of stability and of the features of a hull promoting good stability at large angles.

---