

SHIP DESIGN IN THE RE-ORGANIZED SHIP DEPARTMENT

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In the December issue of the *Journal* the principles upon which the Ship Department has been re-organized were explained. The purpose of this article is to enlarge on the activities of the Ship Design Groups responsible to the Director of Ship Design and Engineering for major new ship or refit designs undertaken by Ship Department.

The Deputy Director Ship Design leads three groups with the following titles:

Forward Design under Assistant Director Design 1 (ADD1)

Design Services under Assistant Director Design 2 (ADD2)

Contract Definition under Assistant Director Design 3 (ADD3)

Together they total about 180 professional and technical grades.

The ship design process, from initiation of a design concept to ship order, is, under the new organization, divided into four progressive phases:

Concept Studies

Feasibility Studies

Ship Design

Contract Definition

The sequence of these phases and submissions for approval by MOD central committees is shown in FIG. 1. The general object of the new organization is to enable wide searches to be made for possible design concepts followed by their testing as regards technical feasibility and the cost and resources required to realize them. Options will thus be narrowed and one design developed in Ship Design. Shipbuilder involvement is expected from the feasibility stage onwards and the purpose of Contract Definition is to specify the design so that it can be built with less assistance (which to many has seemed more like interference!) than has been needed hitherto. The aim is more rapid, cost-conscious ship design to more systematic standards.

Forward Design

The Forward Design Group consists of five sections organized first to explore a wide range of ship concepts drawing on intelligence gained from examining other naval developments, then to test the feasibility of the more promising options and, thirdly, in the Ship Design phase to develop the most suitable design to a point where its technical validity has been established. At that stage the design is handed over to the Contract Definition Group whose job it is to define and specify the ship to a degree sufficient for a shipbuilder to be able to tender for building and after that to develop the design in detail.

The five sections have the following individual responsibilities and tasks:

Concept Studies Section (D111)

Broad options and ideas, wherever they may be initiated, are explored in this Section which consults with other Ship Department Sections, with the Weapon Department and with the Naval Staff in investigating their potential in meeting concepts of future Naval operations and likely threats. Many of these concepts will wither under investigation but any which appear to have promise will be

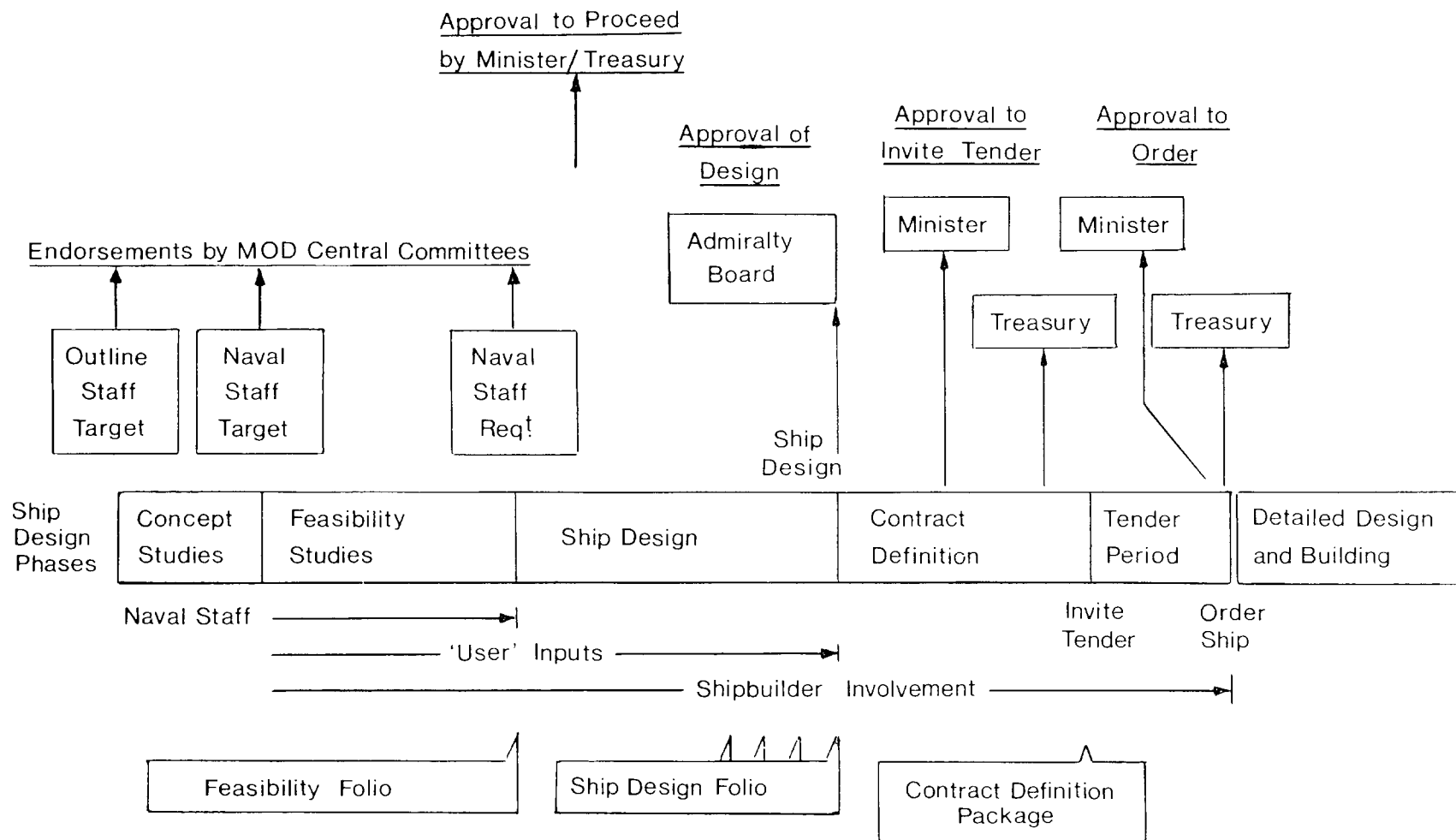


FIG. 1—PHASES OF SHIP DESIGN AND MAIN SUBMISSIONS

studied as concepts under the direction of D.G. Ships or the Ship and Weapon Co-ordination Group (SWDCG). Concepts tend to be studied intermittently, being laid aside while they, or their implications, are considered by the Naval Staff, the Weapon Department or by CER assessment groups. The design options finally developed will be offered to the Naval Staff in support of a Naval Staff Target (NST).

Intelligence Section (D112)

Throughout all the Design Phases, but particularly in support of Concept studies, the Intelligence Section provides latest data on commercial and overseas warship designs and related matters. This Section deals with all foreign collaboration and is in the ideal position to advise, pro and con, on innovations by other navies.

Feasibility and Ship Design Sections (D113, D114, D115)

The two or three design options agreed with the Naval Staff to be the most promising in responding to a NST are offered to the Naval Projects Committee before being submitted for endorsement by the Operational Requirements Committee. When endorsed they enter the feasibility phase of design in which they are developed to greater depth. This phase, which takes about one year concludes with the compilation of a Folio of Feasibility Studies for each option which forms the basis of a submission to the Central Committees for approval of the Naval Staff Requirement. This approval permits one selected option to pass into the Ship Design phase for full design development by the three Sections D113, D114 and D115 which are respectively constructive, marine engineering and electrical engineering professional sections. They carry out the main formative design of the ship under ADD1, the Design Manager for the vessel. Throughout the Feasibility and Ship Design Phases assistance will have been sought from the Systems Directorates of the Ship Department. Sections D114 and D115 collaborate with D113 by providing the mechanical and electrical elements of the ship design, drawing on the expertise of the Systems Directorate. They also initiate special project activities in anticipation of future designs. The object of the Ship Design phase is to prove the technical validity of the design by producing in a Ship Design Folio:

- (a) a physical definition of the ship as a whole;
- (b) description of every system which constitutes the ship;
- (c) expected performance of the ship, its cost, and programme;

in sufficient detail to satisfy the Director General Ships that the proposed design is realistic technically and as regards estimated cost and programme. The submission to the Admiralty Board for approval of the design is based on information in this folio.

At the end of the Ship Design phase this information is passed to ADD3 in the case of a new ship design for Contract Definition or to Director Post Design (Ships) in the case of a major refit for amplification into a Major Refit Definition package.

Design Services

The four Design Services Sections under ADD2 have been formed to provide advice to the Department on subjects related to ship design. These subjects include: ship structural engineering, ship hydrodynamics, weight estimating, ship stability, material engineering, and technical computing. The responsibilities of the Sections are as follows:

D121—Hydrodynamics, hydrostatics, weight estimation, and ship stability.

D122—The use of computers for design calculations and the influence of design on cost.

D123—The properties and uses of materials except textiles, plastic films, wood, some materials used only in electrical systems, and material for minor divisional bulkheads.

D124—Structure and survival. The latter includes vulnerability, shock, noise, magazine safety, and damage control.

These sections are responsible for establishing principles and standards, publishing factual information, and defining standard methods of calculation. They are responsible for monitoring their application throughout the Department. They do not deal with equipments or ships directly and do not in general provide a calculating service although they are available to assist with calculations where specialist knowledge is required.

The principles and standards will be issued in the form of Naval Engineering Standards, B.R.s., etc. and, in the main, the use of this information will be described in the following manuals which are being prepared:

- (a) Structures.
- (b) Hydrodynamics.
- (c) Weight and Stability.
- (d) Vulnerability.
- (e) Materials.
- (f) Design Cost.

These manuals will guide designers by providing a design philosophy, methods of calculation, and sources of data on materials and equipment. The intention is that the information will be sufficient for designers to deal with most problems and only the most difficult should need reference back to the Design Services Sections.

Standards throughout the Department will be monitored by:

- (a) involvement of design services sections in design;
- (b) checking stability statements for individual ships and on annual audit of the stability state of the Fleet;
- (c) checks on weight returns of ships building;
- (d) random checks on designs.

It is an essential feature of the new ship design procedures that costs of proposals and options should be studied at each stage. All proposals whether dealing with ships, equipment, or practices must contain relative costs of options. To pursue cost-conscious design, DSDE Sections are concerned with cost effectiveness judged upon the relative cost of options. DNSP remains responsible for the estimation of costs to be quoted outside the Ship Department. The price which the MOD pays for a ship depends on many factors over which the ship designer has no control. The Design Cost Manual will therefore deal only with those aspects which the designer can expect to influence, the materials used, methods of fabrication testing and quality assurance. The Manual will provide methods of cost estimating and data suitable for comparative studies.

Contract Definition Group

The Contract Definition Group of four sections under ADD3 has been formed to produce for each developed ship design a building specification known as the Contract Definition Package. This package defines the vessel in such detail that it can be ordered and built with minimum reference back to the initial Design Group, allowing the next designs following those in course of building to proceed unhindered by retrospective questions from shipbuilders. To this end, it is the responsibility of three sections, D131 (constructive), D132 (mechanical) and D133 (electrical) to amplify by drawing together guidance information and

specification the definition of the ship design in their respective areas. Much of this amplification will be based on naval engineering standards (NESs). The fourth section of the Contract Definition Group, D134, comprised of all three specializations, prepares the statements of requirements for auxiliary and fleet-support ships procured by design-and-build contracts.

After a contract has been placed for a major warship, the authority for the design of the vessel passes to DNSP (Director of Naval Ship Production). To provide continuity, some of the design staff from the Contract Definition group involved in drafting the Contract Definition package will move to DNSP to continue with the project. Similar staff movement is envisaged between other Directorates for the same reason as well as to broaden individual's experience.

Conclusion

The processes described in the preceding paragraphs should enable the Ship Department with limited resources to provide a continuous throughput of new designs and refit packages to time, to cost, and to more consistent material and design standards. New designs and refit packages should be better defined so that builders and dockyards can do their work with less interference through to acceptance, the procedures for which are themselves in process of rationalization.