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MILITARY STANDARD

INTERFACE STANDARD FOR SHIPBOARD SYSTEMS

FSC 1990

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DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND

Washington, DC 20362-5101

Interface Standard for Shipboard Systems

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2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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FOREWORD

Purpose. The purpose of this standard and the supporting sections is to define standard interface characteristics and constraints applicable to the design of ships and shipboard equipment to ensure interface compatibility within the shipboard environment.

Background. The need for interface standards for shipboard systems and equipment has become apparent as ships have grown more complex and the number of activities (SYSCOMs, Project managers, contractors, and subcontractors, etc.) involved in ship and equipment design has proliferated. Standardization requirements, likewise, have mandated the need to define ship and equipment interfaces. This standard has been developed to meet this need.

General considerations. Interfaces, when considered from a system viewpoint, present the design engineer with complex and intricate problems. Solution of these problems requires the determination of the spectrum of shipboard interface characteristics and the design constraints imposed on equipment which may be affected by these interfaces. This standard specifies technical requirements and engineering guidance regarding the various shipboard interfaces.

Concept. This standard was developed in depth over a period of time by means of supporting sections to cover the spectrum of shipboard interfaces. Additional sections will be issued as the need arises. Each section is self-sufficient in technical coverage. They must be applied, however, with consideration of the policies and procedures expressed in the basic document to be implemented effectively. Adherence to the procedures set forth herein is necessary so that problems concerning interface areas not addressed by individual supporting sections are recognized and resolved in a timely manner. This standard establishes the procedures which will initiate the necessary early dialogue among the various activities involved and lead to resolution of conflicts and problems early in the ship design.

Benefits. This standard, with supporting sections, is a significant factor in the realization of the following:

(a) Identify the characteristics of the shipboard equipment environment.
(b) Specify constraints on equipment design imposed by the shipboard environment at the interface.
(c) Relate interface considerations to applicable Expanded Ship Work Breakdown Structure (ESWBS) primary 3-digit elements as defined in publication, NAVSEA S9040-AA-IDX-010/SWBS 5D.
(d) Encourage early dialogue among personnel concerned.
(e) Achieve more effective ship configuration management.
(f) Improve cost-effectiveness of ship design and other engineering processes by promoting interface compatibility.
(g) Achieve interface compatibility of installed equipment and thereby improve efficiencies of operational and supporting ship systems.

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1. GENERAL, SCOPE, INTERFACE, AND APPLICABILITY

1.1 General. This standard consists of a general basic document (MIL-STD-1399) and supporting sections. Each section addresses a specific interface area. When an individual interface area is under consideration, the section which addresses that particular interface and MIL-STD-1399 shall be viewed as an integral single document.

1.2 Scope. This standard establishes interface requirements for shipboard equipment to ensure compatibility between such equipment and the shipboard environment in which they will be installed.

1.3 Basic interface. The basic interface, its characteristics and constraints are shown on figure 1. This symbolical presentation is detailed in each of the supporting sections as it applies.

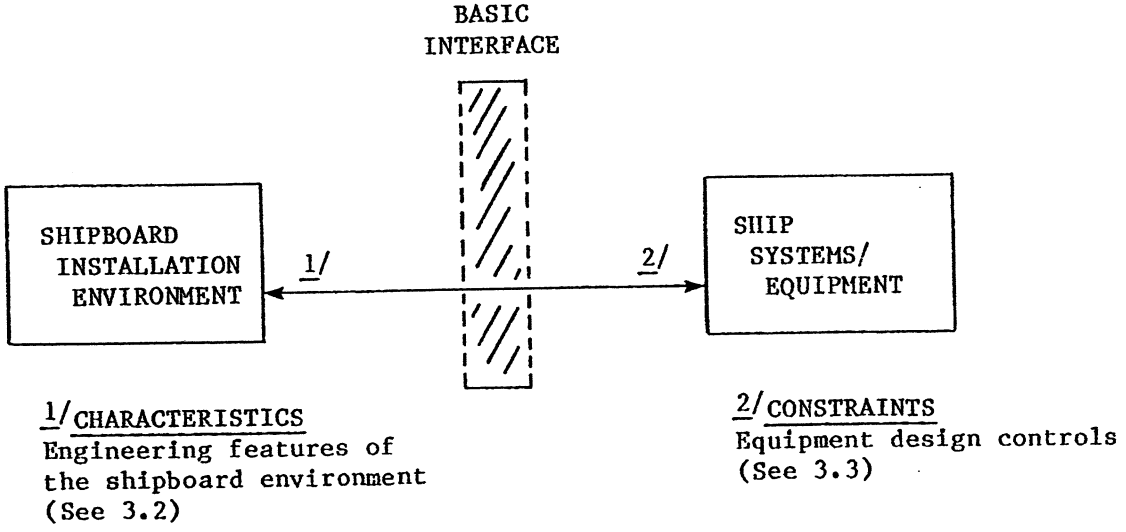

FIGURE 1. Interface.

1.4 Tailoring. The criteria established in individual supporting sections apply to all Naval ships where that particular interface is of concern. Circumstances may arise where incorporation of requirements and constraints is considered impractical, or the expected shipboard environment will be less stringent than the postulated "worst case". In such a situation, it may be desirable to tailor the section requirements to be cost-effective. Such tailoring shall not be done unilaterally. In any such case, the procedures established in section 6 "Deviations" of this standard shall be followed.

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2. REFERENCED DOCUMENTS

2.1 Government document. The following document, of the issue in effect on date of invitation for bids or request for proposal, forms a part of this standard to the extent specified herein.

PUBLICATION

MILITARY
NAVSEA S9040-AA-IDX-010/SWBS 5D - Expanded Ship Work Breakdown Structure.

(Copies of publications required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Order of precedence. In the event of a conflict between the text of this standard and the reference cited herein, the text of this standard shall take precedence.

3. DEFINITIONS

3.1 Interface. An interface is a ship system component boundary through which flows functional information, or a physical action occurs, or a relation exists which causes such ships, systems, or system components to be unilaterally dependent or mutually responsive.

3.1.1 Environmental interface. An environmental interface is a boundary between the environment and a ship system component where the interface relationship is essentially physical and which causes such ship system component to be dependent or responsive to the environment. It is primarily concerned with the surroundings on board ship in which the installed equipment must function and operate.

3.1.2 Functional interface. A functional interface is a boundary between ship system components through which flows functional information which causes such components to be dependent or responsive in operation. It is primarily concerned with the effective transmission of information and control signals through the interface boundary.

3.2 Characteristics. Characteristics are those engineering features of the shipboard environment that are measurable at an interface (see 5.1). Interface characteristics are firmly established and are not subject to change except by use of the deviation procedure (see 6.2).

3.3 Constraints. Constraints are specified controls or limits placed on the design of equipment to ensure operational compatibility of such equipment with the characteristics at the shipboard interface. Internal design features of equipment which do not interface with the environment and which are not influenced by that environment are not included.

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3.4 Equipment. Equipment, for the purpose of this standard, are hardware entities which can encompass an integral system grouping of associated and related units and components, or may only relate to a single "black box".

4. GENERAL REQUIREMENTS

4.1 Application. This standard applies to all activities involved in ship and equipment design, production, and installation and requires that interfaces be given priority consideration by such activities. This standard shall be adhered to by SYSCOMs, Project managers, contractors, and all others engaged in any aspect of ship design including equipment design, production and installation. Figure 2 is a graphical presentation of the various applications of this standard, depending on the nature of the particular interface involved and the circumstances existing at the time.

4.1.1 Invoking this standard. It is mandatory that Principal Development Activities (PDA) invoke this standard in Development Proposals, Ship Project Directives, Ship Design Manuals, and procurement specifications for equipment destined for shipboard installation.

4.1.2 Consideration of the interface. Interface requirements shall be carefully considered by all Naval activities and contractors involved in ship construction/modernization/conversion throughout the entire ship life cycle.

4.2 Interface areas not covered. Interested activities, in consonance with the objectives of this standard, shall establish a dialogue in a timely manner which will bring into focus and resolve any interface and deviation problems which may require attention during the early design stage of shipboard equipment (see 6.1).

5. DETAILED REQUIREMENTS

5.1 Interface sections.

5.1.2 Interface groupings. Interfaces covered by this standard fall into two broad groupings: environmental interfaces and functional interfaces. Within these two groupings, interfaces are broken down into general areas and specific sub-areas which comprise the subject material for the individual supporting sections of this standard.

5.2 Environmental interface group.

5.2.1 Support services. Support services include interface inputs required by equipment to meet specified requirements. Examples are electric service for primary power, compressed gases, water, and waste disposal.

5.2.2 Controlled design characteristics. Controlled design characteristics are interfaces that are responsive to or dependent on ship design. Examples are inside temperature and humidity, size and weight allowances, space allotments, ventilation, and handling devices.

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5.2.3 Uncontrolled environmental characteristics. Uncontrolled environmental characteristics are interfaces that are independent of ship design. Examples are wind, icing, weather temperature and humidity, and sea state.

5.2.4 Operational characteristics. Operational characteristics are interfaces that are generally unpredictable in occurrence or magnitude. Examples are shock, blast, and electromagnetic radiation.

5.3 Functional interface group.

5.3.1 Electronic information characteristics. Electronic information characteristics are monitor and sensing signals of a functional nature. Examples are signals associated with search radar, sonar, and communications.

5.3.2 Weapons control characteristics. Weapons control characteristics are monitor, sensing and control signals of a functional nature associated with weapons systems. Examples are signals associated with missile guidance, tracking, and gun orders.

5.3.3 Electrical information characteristics. Electrical information characteristics are electrical monitor, sensing and control signals of a functional nature at direct current and power frequencies. Examples are signals associated with synchro, servo, and scalar devices.

5.3.4 Mechanical information characteristics. Mechanical information characteristics are mechanical transmissions or signals of a functional nature. Examples are transmissions or signals associated with shaft position or rotation, linear linkage, and fluid control or sensing devices.

5.4 Supporting section scope. Individual supporting sections of this standard cover discrete, finite, and manageable interfaces which identify the characteristics and constraints associated with that particular interface. Interface areas of potential interest are identified in table I. Since coverage of each section is restricted to interface requirements, and the overall policies are not repeated in the individual section, each section and the basic document must be viewed as a single integral document. Internal design features of equipment which are independent of, and not influenced by, external interface characteristics are not included in the sections. Such internal interfaces are properly included in the individual equipment specifications. Where applicable, individual sections may provide for the acquisition of pertinent interface data through the preparation of a Contract Data Requirements List (DD Form 1423) for use with an acquisition contract or purchase order.

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TABLE I. Shipboard interface section coverages.

Environmental	Functional
Support services Compressed gases Cooling water for electronics Dry air for electronics Electric power Fresh water Hydraulics Salt water Steam Waste disposal Etc.	Electronic information (signals) Audio CW Digital Interface function parameters Teletype Video Etc.
Controlled factors Air conditioning Cables and connectors Heating Maintenance access Shape Size Ventilation Weapons handling Weight Etc.	Weapons control (signals) Acquisition Interface function parameters Missile guidance Tracking Weapon orders Weapon selection Etc.
Uncontrolled environment Humidity Icing Ship motion/attitude Temperature Wave impact Wind Etc.	Electrical information (signals) Alarm Scalar Servo Status indication Synchro Etc.
Operational factors Blast Electromagnetic fields Magnetic fields Noise (acoustic) Shock Vibration Etc.	Mechanical information (signals) Counters Cut-out cams Limit switches Position indication Stops Etc.

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5.5 Relationship to the Expanded Ship Work Breakdown Structure (ESWBS). The ESWBS has been promulgated as publication NAVSEA S9040-AA-IDX-010/SWBS 5D to provide a common denominator for the diverse areas of endeavor associated with shipbuilding and establish a single language to span the entire ship life cycle. The ESWBS consists of a structured 5-digit numeric system. Sections of MIL-STD-1399 are identified by the first 3 digits of the ESWBS number corresponding with the primary element influenced by the interface under consideration. In case of subject duplication, to distinguish between sections related to the same primary ESWBS element, they will be identified as SECTION XXX-PART 1, 2, etc. Where a section covers several ESWBS elements such sections will be numbered at the sub group or group level. The application of this numbering system to sections of MIL-STD-1399 will not be applied retroactively, (i.e.) older sections will have their numbers changed to comply with the ESWBS only when they are revised and reissued.

6. NOTES

6.1 Deviations.

6.1.1 Conditions. In achieving the purpose of this standard it is recognized that some flexibility of application is required. During the early design stage of shipboard equipment, it may become apparent that significant advantages in the overall design or operation of such equipment can be achieved by deviating from one or more of the interface requirements. In such instance, a cost-benefit analysis of the proposed deviation shall be performed. When the analysis leads to a conclusion that a more cost-effective ship design will result from adoption of such deviation, the PDA must forward the analysis with a report to the Naval Sea Systems Command (NAVSEA) justifying the deviation. The report must specifically weigh the benefits of adoption of the deviation against the negative effects such as increases in supporting subsystem weight, space, current and life cycle costs, logistics or compromise in reliability, with conclusions based on system effectiveness.

6.2 Procedure. When requesting a deviation in accordance with 6.1, each section should be considered individually, and such request must be submitted as directed in the section involved. Should contractual actions be involved, the procedural requirements of the applicable contract must be adhered to.

6.3 Subject term (key word) listing.

Electronic information characteristics
Mechanical information characteristics
Operational characteristics
Weapons control characteristics

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6.4 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Review activities:
AS, OS, EC

User activity:
YD

Preparing activity:
Navy - SH
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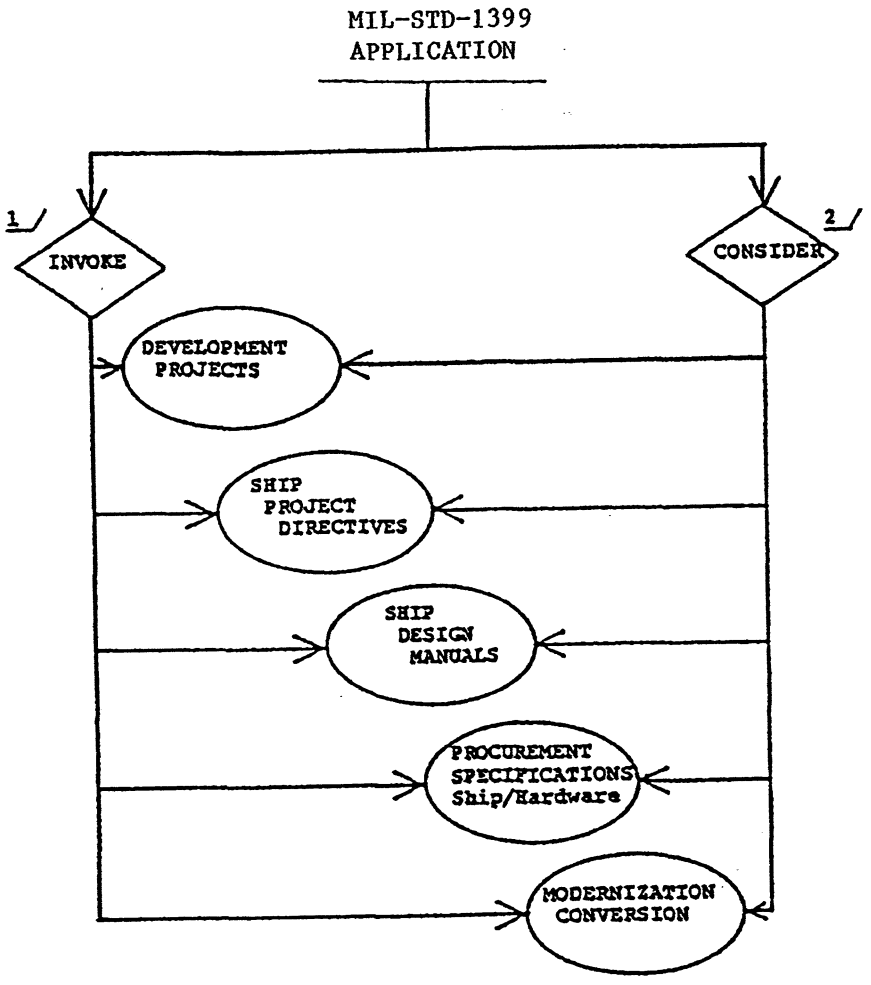

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1/ INVOKE - by the PDA, always, when applicable.
2/ CONSIDER - by all Naval activities and contractors throughout the entire ship life cycle.

FIGURE 2. Application of MIL-STD-1399 to the ship acquisition process.