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AUSTRALIAN NAVAL CLASSIFICATION AUTHORITY MANUAL (VOLUME 2)

DIVISION 3: SHIP RULES

CHAPTER 09: NAVIGATION

PART 1: ANC RULES

This document is issued for use by Defence and Defence Industry personnel and is effective forthwith.

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3 https://www.legislation.gov.au/Series/C2004A03712

4 http://drnet/AssociateSecretary/security/policy/Pages/dspf.aspx

AUSTRALIAN NAVAL CLASSIFICATION RULES

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Division 3: Ship Rules
Part 1: ANC Rules

Chapter 09: Navigation

Contents

Australian Naval Classification Rules

Rule 0. Goal

Scope and Application

0.1 The ship shall be designed, constructed and maintained so that, while at sea, it can:

0.1.1 Be independently navigated;

0.1.2 Provide alerts of all navigation hazards, fixed or mobile;

0.1.3 Measure and interpret environmental data; and

0.1.4 Assist other ships, vessels, aircraft, units or persons in distress.

0.2 The ship shall be able to manoeuvre to minimise risk of grounding, collision and negative environmental impact;

0.3 The navigation systems shall be designed, constructed, operated and maintained to:

0.3.1 Provide high reliability and minimise the risk of incorrect operation in all Foreseeable Operating Conditions, accidents and emergencies;

0.3.2 Maintain uninterrupted essential safety functions after a minimum of one single operational error and/or system/equipment fault;

0.3.3 Maintain uninterrupted essential safety functions regardless of any sensor or processing demands or deficiencies from the ship's combat systems; and

0.3.4 Include automation features to maximise ship performance, efficiency, and minimise crew workload.

Rule 1. General

Functional Objective

1.1 The purpose of this Rule is to outline the principles and framework of Chapter 09 *Navigation* and its application.

Purpose

1.2 The ability to be deployed to any area of interest defined in the Operating and Support Intent (OSI) shall be maintained and the navigation equipment and sensors fit and on-board personnel shall provide:

1.2.1 The capability to conduct safe navigation as required by SOLAS, the COLREGs and, where applicable, the HSC Code;

Note: Chapter 04 *Engineering Systems* of the ANC Rules supplements this Rule with additional requirements applicable to navigation equipment and systems.

1.2.2 On-board safety communications including internal communications, main broadcast, Bridge Navigation Watch Alarm System (if fitted) and portable communications equipment; and

1.2.3 Qualified personnel certified to operate and, if required, maintain the equipment providing Maritime Safety Information (MSI).

Note: Chapter 8 *Safety Communications* of the ANC Rules supplements this Rule with additional requirements for MSI and Search and Rescue (SAR) equipment.

Scope

1.3 Division 2 Chapter 01 *General Requirements* applies to all chapters of the ANC Rules, as applicable to the design, and therefore in order to meet the Chapter 09 *Navigation* goal, the requirements of both this chapter and Division 2 Chapter 01 *General Requirements* shall be met.

1.4 The ANC Rules excludes training requirements. Chapter 09 *Navigation* assumes all embarked persons have an appropriate level of competence for the operation of the installed systems.

General Performance Requirements

1.5 The ship's navigation systems shall be operated and maintained throughout the life of the ship as defined by the OSI.

Rule 2. Bridge Working Environment

Functional Objectives

2.1 The Bridge shall provide a working environment that facilitates the effective and safe navigation functions.

Performance Requirements

2.2 The ventilation, temperature and humidity of the Bridge and associated compartments shall be maintained within a comfortable range.

Note: Chapter 04 *Engineering Systems Rule 19* of the ANC Rules supplements this Rule with additional requirements applicable to Heating Ventilation and Air Conditioning (HVAC).

2.3 The Bridge, associated compartments, and systems installed on the Bridge, shall be provided with lighting and illumination systems that enables Bridge personnel to perform all Bridge tasks, including maintenance and chart work, by day and night, ensuring that lighting systems required shall be designed such that they do not impair safe navigation or Mission Critical Functions.

Note: Chapter 04 *Engineering Systems Rule 14* and Chapter 12 *Habitability Rule 2* of the ANC Rules supplements this Rule with additional requirements applicable to lighting and illumination systems.

2.4 The effects of direct and indirect glare are to be reduced to a minimum.

2.5 Where multiple consoles or workstations are to be installed in the Bridge they shall be of a common design.

2.6 The arrangement of workstations remote from the Bridge, but having the same functionality as those used by Bridge operators, shall be the same to prevent incorrect operation.

2.7 Noise levels within the Bridge during good weather are to be sufficiently low as to enable operators carrying out navigation duties to concentrate for long periods of time and comfortably hold conversations with Bridge personnel for the sustained conduct of safe navigation.

2.8 A means shall be provided to monitor Bridge activity and detect operator disability, which could lead to marine accidents, and shall automatically alert other operators through a combination of alarms and indications.

2.9 The ship's Bridge shall be arranged such that access to the workstations, movement around the Bridge and escape from the Bridge is unobstructed and hazard free.

Note: Chapter 07 *Escape, Evacuation and Rescue Rule 16* of the ANC Rules supplements this Rule with additional requirements applicable to access.

2.10 Safety equipment stored on the Bridge shall be readily accessible.

2.11 Facilities to promote the efficiency and alertness of the Bridge operators are to be provided on the Bridge or on the same deck adjacent to the Bridge.

2.12 The main access to the Bridge shall be internal to the ship. Secondary external access shall be provided, if practicable.

2.13 The Bridge shall be designed to enable personnel to move or stand safely in all sea states defined in the OSI.

2.14 The Bridge shall be provided with a voyage planning area for the ship's navigation team to review and plan voyages, which provides:

2.14.1 Allocated space and workstations for the navigation team to conduct voyage planning activities;

2.14.2 Secure access to the ship's navigation systems and the facility to plan and input voyages to the Electronic Chart system; and

2.14.3 Portable means of displaying and charting voyage plans from the Electronic Chart system.

Rule 3. Bridge Workstations

Functional Objective

3.1 The design and arrangement of the workstations shall ensure that the operators are enabled to perform expeditious, continuous and effective information processing and decision making for maintaining a proper lookout and the conduct of safe navigation.

Performance Requirements

3.2 The design and arrangement of the workstations within the Bridge shall promote effective and safe Bridge Resource Management by facilitating the tasks to be performed by the operators in making full appraisal of the situation and in navigating the ship safely under all operational conditions.

3.3 The Bridge shall allow the OOW to have proper field of vision to maintain visual awareness for safe navigation and where appropriate the monitoring of:

3.3.1 Small craft launch;

3.3.2 Swimmer of the watch (SOW) positions;

3.3.3 Aviation operations;

3.3.4 Replenishment at Sea (RAS) positions; and

3.3.5 Consort activities and manoeuvres.

3.4 The workstations shall enable the operators to have convenient and continuous access to essential information which is presented in a clear, unambiguous manner, using standard symbols and coding systems for controls and displays to allow for expeditious, continuous and effective information processing and decision making for the conduct of safe navigation and additional Bridge functions.

3.5 The design and arrangement of the workstations within the Bridge shall prevent, or minimise, excessive or unnecessary work and any conditions or distractions on the Bridge which may cause fatigue or interfere with the vigilance of the operators and minimise the risk of human error and detect such error, if it occurs, through monitoring and alarm systems, in time for the operators to take appropriate action.

3.6 The primary navigation workstation shall:

3.6.1 Be located on the Bridge and used for route monitoring;

3.6.2 Be arranged to enable efficient operation by one person under normal operating conditions;

3.6.3 Be sufficient to allow at least two operators to use the equipment simultaneously; and

3.6.4 Allow the operator(s) to carry out all tasks relevant to deciding, executing and maintaining course and speed in relation to navigation hazards and traffic.

Rule 4. Alternate Conning Position

Functional Objective

4.1 Where required by the OSI, the ship shall have an alternate conning position that enables operators not situated on the Bridge to perform expeditious, continuous and effective information processing and decision making for maintaining a proper lookout and the conduct of safe navigation.

Performance Requirements

4.2 The alternate conning position shall enable operators to safely navigate the ship independent of the personnel on the Bridge.

4.3 The alternate conning position shall allow the OOW to have proper field of vision to maintain visual awareness.

4.4 Navigation systems fitted at the alternate conning position shall be common with those used on the Bridge so as to avoid confusion and incorrect operation.

4.5 The design and arrangement of the alternate conning position and its workstations shall facilitate the tasks to be performed by the operators in making full appraisal of the situation and in navigating the ship safely under all conditions while providing the same functionality as that available on the Bridge.

4.6 The alternate conning position and systems installed at that position shall be provided with lighting and illumination systems that enable personnel to perform route planning, route monitoring, monitoring, conning and communication functions, by day and night.

4.7 The effects of direct and indirect glare are to be reduced to a minimum.

4.8 Noise levels at the alternate conning position are to be sufficiently low as to enable operators to carry out navigation duties and will not interfere with verbal communications between themselves, Bridge and with control stations, and will not mask audible alarms.

4.9 Personnel safety equipment stored at the alternate conning position shall be readily accessible.

4.10 The ventilation, temperature and humidity of the alternate conning position shall be maintained within a comfortable range.

Rule 5. Emergency Conning Position

Functional Objective

5.1 The ship shall be fitted with an emergency conning position that enables operators, without access to primary navigation functions, to identify a place of refuge and safely navigate the ship to that location.

Performance Requirements

5.2 The emergency conning position, without reliance on primary navigation functions, shall enable operators to navigate the ship to a place of refuge whilst maintaining limited lookout.

5.3 The design and arrangement of the emergency conning position shall:

5.3.1 Facilitate the tasks to be performed by the operators in making full appraisal of the situation and in navigating the ship safely under emergency conditions; and

5.3.2 Allow the OOW to have proper field of vision to maintain visual awareness.

5.4 The emergency conning position and systems installed at that position shall be provided with lighting and illumination systems that enable personnel to perform route planning, route monitoring, conning and internal communication functions, by day and night. Lighting systems shall be designed such that they do not impair safe navigation.

5.5 Noise levels at the emergency conning position are to be sufficiently low as to enable operators carrying out navigation duties to concentrate for long periods of time and safely communicate between themselves and with control stations.

5.6 The emergency conning position and access to and from the emergency conning position shall be so arranged as to enable personnel to move or stand safely in all weather conditions.

5.7 Personnel safety equipment stored at the emergency conning position shall be readily accessible.

Rule 6. Navigation Safety – Geospatial, Temporal & Environmental Awareness

Functional Objectives

6.1 The ship shall be provided with sufficient sensors and systems to continuously and accurately determine, display and record its present time, position, orientation and movement in relation to the Earth and the rate of change of the parameters measured to ensure safe, independent navigation.

6.2 The ship shall be provided with appropriate sensors and processing equipment to adequately measure, analyse, assess, display and record its physical environment for the conduct of safe navigation and, where specified, Mission Critical Functions.

Performance Requirements

6.3 The ship shall be provided with sufficient sensors and systems to:

6.3.1 Ensure continuous monitoring of position, velocity and time;

6.3.2 Generate a precise time reference continuously for intended voyage;

6.3.3 Determine and input heading information, pitch and roll information, and rates of turn;

6.3.4 Correct heading and bearings to True at all times;

6.3.5 Determine and input speed and distance travelled in the water;

6.3.6 Determine and input depth of water;

6.3.7 Establish and update the ship's position and course;

6.3.8 Identify and monitor weather and sea conditions; and

6.3.9 Measure, display, record and analyse, in real time, the ship's behaviour in the prevailing conditions of wind and sea.

6.4 The ship shall be provided with sufficient sensors and systems to determine true and relative wind speed and direction.

6.5 The ship shall be provided with sufficient systems to display ship's information, surrounding environment, radar and other critical overlays.

6.6 Where required by the OSI, the navigation display system shall be capable of the display and application of Additional Military Layers (AML) to enhance situational awareness.

6.7 Navigational systems shall interoperate with the navigational systems of organic small craft, and small craft Situational Awareness systems.

6.8 The ship shall be able to store and distribute geospatial data in the required formats to systems that require geospatial data for correct functioning/operation.

Rule 7. Operation and Control Systems

Functional Objective

7.1 A ship shall be provided with appropriate means to control propulsion and manoeuvring, navigation and other systems from the Bridge, alternate conning position (where provided) and the emergency conning position for the conduct of safe navigation, collision avoidance and operational evolutions.

Performance Requirements

7.2 The Commanding Officer or authorised delegate shall when conning the ship:

7.2.1 Have means to control the direction and speed of the ship;

7.2.2 Control the means by which the ship displays its manoeuvring intentions or limitations; and

7.2.3 Be aware at all times of the ship's limitations.

7.3 Manoeuvring characteristics and information on the ship's current condition as it affects manoeuvring shall be available at all times when in-service.

Note: Chapter 04 *Engineering Systems Rule 5* of the ANC Rules supplements this Rule with additional requirements for manoeuvring control.

7.4 The OOW shall control the means by which the ship displays its lights indicating navigational disposition.

7.5 The ship shall have means to communicate with other ships or aircraft by day and night.

7.6 The ship shall have means to alert others that the ship is in distress.

7.7 There shall be a means to communicate with those in charge of essential safety functions and with all embarked persons in the event of an emergency.

7.8 The OOW shall have means to communicate with control station operators.

7.9 Where required by the OSI, the ship shall have autopilot capability and/or Dynamic Positioning capability.

Rule 8. Resilience and Continuous Availability

Functional Objective

8.1 The ship shall be provided with sufficient means to assure that there is resilience and continuous availability in navigation related systems and equipment.

Performance Requirements

8.2 The ship's spaces, systems and equipment essential to the maintenance of a proper lookout and the conduct of safe navigation shall be so arranged as to ensure high reliability and minimise the risk of incorrect operation.

Note: The measures to ensure continuous availability shall be appropriate to the size, operational role, area of operations and maximum speed of the ship.

8.3 Machinery, equipment and systems essential to safe navigation shall be so arranged that, as far as is reasonable and practical, they will continue to function correctly and/or be easy to restore in the event of a minimum of a single operational error and/or system/equipment fault.

8.4 Equipment necessary for the safety of navigation shall be capable of being accessed for the purpose of routine maintenance to keep it in efficient working order.

8.5 There shall be reversionary methods of controlling propulsion and manoeuvring systems from the Bridge, alternate conning position (where required by the OSI), machinery control position and manoeuvring equipment control stations.

Note: Chapter 04 *Engineering Systems Rule 10 and 13* of the ANC Rules supplements this Rule with additional requirements applicable to electrical equipment and distribution.

8.6 Means shall be provided to continuously power the navigation system and equipment in the event of loss of main electrical supply in the form of Uninterrupted Power Supply.

Note: Chapter 04 *Engineering Systems Rule 10* of the ANC Rules supplements this Rule with additional requirements applicable to electrical distribution and equipment.

Rule 9. Integrated Bridge

Functional Objective

9.1 An Integrated Bridge System (IBS), Integrated Navigation System (INS), or both Integrated Navigation Bridge System (INBS) shall present all relevant information necessary for the conduct of safe navigation, manoeuvring and collision avoidance to ensure that additional hazards are not introduced as a result of installing or operating the system.

Note: Unless otherwise noted or clear from the context of the requirement, the term 'INBS' used in the following paragraphs of this Rule refers to both an IBS and INS.

Performance Requirements

9.2 The INBS shall be designed, constructed and able to be maintained so as to support the proper and safe integration of navigational and control functions and information required to maintain a proper lookout, sustain safe conduct of navigation and manoeuvre as required, in particular:

9.2.1 To allow the installation and use of an INBS instead of stand-alone navigational equipment on-board ships;

9.2.2 To promote safe procedures for the integration process;

9.2.3 To ensure its performance is at least equivalent to the performance required of the individual components and sub-systems by this Chapter; and

9.2.4 To alert operators of any degraded condition such that the OOW and pilot can understand the nature of the failure and its consequences.

Note: All other Rules of this Chapter are applicable to the INBS.

9.3 Navigation systems shall not be rationalised by sharing functions or by inter-switching.

9.4 INBS equipment utilising programmable electronic systems shall be robust, resilient to operator errors and able to continue functioning in extremis (e.g. experienced as a result of environmental conditions in excess of the defined foreseeable conditions and for which the ship is required to survive). The NVO, with the approval of the ANC Authority, or the ANC Authority shall identify the degree of functionality that should remain in these circumstances.

Note: Chapter 04 *Engineering Systems Rule 15* of the ANC Rules supplements this Rule with additional requirements applicable to electrical protection arrangements of INBS.

9.5 The INBS shall be so arranged that it is not dependent upon ship's combat systems being available and will allow rapid removal of Combat Management System (CMS) sourced tactical data for the purposes of safe navigation.

Rule 10. Data Communication

Functional Objective

10.1 The ship shall be fitted with equipment and systems in order to receive, transmit, record and analyse data, in recognised formats, relevant to safe navigation.

Performance Requirements

10.2 The ship shall be fitted with a means for recording all navigation related data for a period of at least 12 hours such that the sensor presentations, internal and external voice

communications, decision making process and the ship's movements might be adequately re-constructed if necessary.

10.3 The ship shall be provided with equipment and systems to support the regular reporting of its position and movement to the appropriate command, with due regard to the ANC Authority's requirement for protection of classified information.

10.4 Irrespective of size, the ship shall be capable of the automatic transmission and reception of specified navigation and safety-related information to and from appropriately equipped ships, aircraft and shore stations. The system shall:

10.4.1 Monitor and track ships; and

10.4.2 Be so arranged that information exchanged shall be available to both the Bridge, alternate conning position (where required by the OSI) and the Operations Room and/or equivalents, where provided.

10.5 Where required by the OSI, the ship shall be capable of the automatic transmission and reception of specified navigation and safety-related information to and from appropriately equipped ships, aircraft and shore stations and able to process that data as part of naval operations. The system shall:

10.5.1 Be able to be controlled from the Operations Room and/or equivalents where provided, alternate conning position or the Bridge and may be interfaced with, or an integral element of, the Combat System provided that independent operation is possible;

10.5.2 Be capable of providing (at the Commanding Officer's discretion) to similarly fitted ships, aircraft and shore stations the ship's identity, position, course, speed, navigational status and other safety related information;

10.5.3 Receive automatically such information from Automatic Identification System (AIS) fitted ships;

10.5.4 Monitor and track ships;

10.5.5 Exchange data with Warship-AIS equipped ships and shore-based facilities; and

10.5.6 Display dynamic and static data in text and/or graphic format.

10.6 The ship shall be able to receive automatically MSI and SAR information.

10.7 The ship shall be provided with sufficient communications facilities to be able to send and receive, by at least two separate and independent means, distress alerts, SAR co-ordination communications, MSI, general radio-communications and Bridge-to-Bridge communications.

Note: Chapter 08 *Safety Communications* supplements this Rule with additional requirements applicable to the equipment and systems used for the transmission and reception of MSI and SAR information.

10.8 Not used.

Rule 11. Collision Avoidance

Functional Objective

11.1 The ship shall be provided with sensors, systems and equipment to enable the crew to determine the risk of collision, signal the ship's condition and intentions and manoeuvre to avoid collisions in the prevailing circumstances and conditions.

Performance Requirements

11.2 The ship shall be able to exhibit by day and night, in all weathers, appropriate lights and shapes in order to indicate size, orientation, activity and limitations so as to facilitate the determination of risk of collision by other mariners.

11.3 The ship shall be able to generate, by day and night, in all weathers, sound signals, in order to indicate its size, orientation, activity and limitations so as to facilitate the determination of risk of collision by other mariners.

Note: Chapter 8 *Safety Communications Rule 20* of the ANC Rules supplements this Rule with additional requirements applicable to signalling devices.

11.4 If the ship is equipped with external operational lighting for military purposes, it shall be possible to revert to ordinary navigation lights in a time sufficient to avoid a collision. Lights for operational purposes include dimmed and deceptive lighting.

11.5 The ship by day and night, in all weathers, shall be able to detect the presence of nearby vessels, understand their intentions and take measures as required to avoid a collision.

11.6 The ship shall be able to track other vessels to determine risk of collision, independent of any tracking capability that is part of the combat system.

11.7 The ship shall always have sufficient power and a means of manoeuvring available to ensure proper control.

11.8 The Commanding Officer or authorised delegate shall be provided with information pertaining to the manoeuvring characteristics of the ship to assist in the avoidance of collision and groundings. The content of this information shall contain as a minimum:

11.8.1 The turning characteristics including initial turning;

11.8.2 The stopping and accelerating characteristics;

11.8.3 The effect of squat, heave, and manoeuvring in shallow water;

11.8.4 The effect of wind on manoeuvring; and

11.8.5 The minimum manoeuvring speed.

Note: Examples of Collision Avoidance Operational Information are: i) ANEP-79 – Controllability and safety in a seaway; and ii) IMO resolution A.601(15) – Provision and display in manoeuvring information on board ships.

Note: Chapter 04 *Engineering Systems* Rule 4 and Rule 5 supplements this Rule with additional requirements applicable to propulsion installation and manoeuvring equipment.

Rule 12. Controllability

Functional Objective

12.1 The ship in all Foreseeable Operating Conditions shall have adequate controllability to maintain speed and heading when underway in order to avoid normal shipping hazards.

Performance Requirements

12.2 The ship shall have a system that allows its velocity (speed and direction) to be manually controlled by the OOW to avoid normal shipping hazards.

12.3 Crash stop, turning circle and initial turning predictions and manoeuvring trials shall be conducted to confirm the ability of the ship to avoid normal shipping hazards.

12.4 Controllability prediction, Zig-zag, and spiral manoeuvre trials shall be conducted to confirm the ability of the ship to control heading and identify any control dead band.

12.5 Operator Guidance pertaining to the manoeuvring characteristics as defined in Rule 11 shall be made available for approval by the ANC Authority.

12.6 All ships shall have adequate manoeuvring for the full range of operating loading conditions required by the OSI.