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DIVISION 3: SHIP RULES

CHAPTER 09: NAVIGATION

PART 2: SOLUTIONS TO THE ANC RULES

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

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AUSTRALIAN NAVAL CLASSIFICATION RULES

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Division 3: Ship Rules
Part 2: Solutions to the ANC Rules

Chapter 09: Navigation

Contents

Solutions to the ANC Rules

Rule 0. Goal

0.1 The Goal for this Chapter is contained in Part 1.

Rule 1. General

Solutions

1.1 The Naval Vessel Operator (NVO) shall present and justify a solution for demonstrating compliance to Part 1 of the ANC Rules.

1.2 For naval ships with a Post Damage Capability requirement, equipment provision and system routing may be impacted by Chapter 01 *Integrated Platform Survivability* Rule 2 *Post Damage Capability*.

1.3 All Rules, Regulations, Codes and Standards used shall be the latest versions as amended at the time of drafting the ANC Basis unless a specific version date is specified in the text.

Rule 2. Bridge Working Environment

Solutions

2.1 The NVO shall present and justify a solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

2.2 The Bridge shall be designed in accordance with:

2.2.1 IMO SOLAS Convention V/15 – *Principles Relating to Bridge Design, Design and Arrangement of Navigational Systems and Equipment and Bridge Procedures*;

2.2.2 IMO SOLAS Convention V/22 – *Navigation Bridge Visibility*; and

2.2.3 IMO Resolution MSC/Circ.982 – *Guidelines on Ergonomic Criteria for Bridge Equipment and Layout*.

Note: The Bridge working environment should align with the design for mission operational effect as well as navigational safety.

2.3 The Bridge and associated compartments shall be provided with Heating, Ventilation and Air Conditioning (HVAC) that complies with IMO Resolution MSC/Circ.982 – *Guidelines on Ergonomic Criteria for Bridge Equipment and Layout*. The HVAC system shall also comply with Part 1 Chapter 04 *Engineering Systems* Rule 19 *Heating, Ventilation and Air Conditioning*.

2.4 The Bridge, associated compartments, and equipment shall be provided with lighting that complies with IMO Resolution MSC/Circ.982 – *Guidelines on Ergonomic Criteria for Bridge Equipment and Layout*.

2.5 Means shall be provided to prevent the sudden flooding of light into the Bridge from passageways, accommodation areas and the chart table area.

2.6 Where a lighting system is required outside the bridge which could have an impact on safe navigation, facilities are to be provided to ensure their safe use.

2.7 In accordance with IMO Resolution MSC/Circ.982 – Guidelines on Ergonomic Criteria for Bridge Equipment and Layout, utilisation of dark coloured, non-reflective or matt surfaces shall be made for bulkheads, deckheads, consoles, chart tables and other major fittings in order to reduce indirect glare so that the information presented on visual display units and instruments shall not be obscured in any lighting conditions.

2.8 The design of navigation workstations or consoles shall be common throughout the ship so as to avoid confusion and incorrect operation.

2.9 The design and fitting out of the Bridge shall be such that noise levels comply with IMO Resolution MSC/Circ.982 – *Guidelines on Ergonomic Criteria for Bridge Equipment and Layout* and IMO Resolution MSC.337(91) – *Code on Noise Levels on Board Ships*.

2.10 The ship shall be provided with a Navigation Watch Alarm System that complies with IMO Resolution MSC.128(75) – *Performance Standards for a Bridge Navigational Watch Alarm System (BNWAS)*. This system shall also comply with Part 2 Chapter 08 *Safety Communications* Rule 7 *Main Broadcast and Alarm System*.

2.11 The Bridge shall be provided with non-slip deck surfaces free of trip hazards, and handrails, hand grabs or other means in accordance with IMO Resolution MSC/Circ.982 – *Guidelines on Ergonomic Criteria for Bridge Equipment and Layout*.

2.12 All external doors shall comply with the requirements of Part 2 Chapter 07 *Escape, Evacuation and Rescue* Rule 16 *Escape Routes and Escape Exits*, and shall:

2.12.1 be operable with one hand;

2.12.2 be fitted with 'holdbacks';

2.12.3 be lockable from the inside (without a key); and

2.12.4 not be self-closing.

2.13 Where the ship has Bridge wings, access to the Bridge from the upper deck shall be possible via both Bridge wings;

2.14 The Bridge design shall include appropriate stowages for personnel safety equipment required by Chapter 07 *Escape, Evacuation and Rescue* Rule 9 *Escape, Evacuation and Rescue Equipment Stowage*, Rule 20 *Emergency Escape Breathing Devices*, Rule 25 *Life-Jackets* and any other personnel safety equipment required by the ANC Authority.

2.15 Sufficient provision for the temporary, secure stowage and immediate access to equipment such as personal protective equipment shall be made.

2.16 Provision shall be made for temporary stowage in the Bridge of not less than 12 hand launched, rocket parachute distress flares in accordance with Part 2 Chapter 08 *Safety Communications* Rule 9 *Survival Craft Communication Equipment*.

2.17 Stowage arrangements with sufficient capacity for a box of flares in their primary packaging shall be provided in accordance with Chapter 10 Dangerous Goods (Explosives).

2.18 Design of the Bridge deck shall include toilet facilities, and the means of making warm or cold drinks, on the Bridge or immediately adjacent to it in accordance with ISO 8468, *Ships and marine technology – Ships Bridge layout and associated equipment – Rules and guidelines*. These facilities shall also comply with Chapter 12 *Habitability* Rule 06 *Hygiene*.

2.19 The main access to the Bridge shall be by means of an internal stairway/ladder. Secondary external access shall be provided if practicable. Protection and sufficient warning of stairway openings shall be given special consideration. Stairs/ladders shall also comply with Chapter 03 *Buoyancy and Stability* Rule 07 *Preservation of Life*.

2.20 A Voyage Planning Area shall include the following:

2.20.1 Space and power for a navigation planning workstation to accommodate Bridge staff in voyage planning.

2.20.2 A backup navigation planning workstation shall be provided.

2.20.3 Secure Network access to the Navigation Display System (NDS) and any required peripherals.

2.20.4 A display screen that can be connected to a navigation planning workstation or the NDS network for the purposes of displaying and manipulating voyage planning information.

2.20.5 Be able to print/display chart data to a medium which is portable.

2.20.6 Time indication.

2.21 The Voyage Planning Area shall securely share navigation planning data with Warship Electronic Chart Display and Information System (WECDIS). This shall be achieved via either networked or serial communication.

2.22 The WECDIS shall permit any voyage/route to be edited including but not limited to the following:

2.22.1 Waypoint Position;

2.22.2 Lines; and

2.22.3 IMO Standard Display.

2.23 The navigation planning workstation shall have the capability to plan a route for a complete voyage, which can then be saved for future use, having a storage capacity for at least 10 voyages.

2.24 The following inputs to the navigation planning workstation can be specified:

2.24.1 Waypoints;

2.24.2 Leg types;

2.24.3 Leg lengths;

2.24.4 Planned speeds;

2.24.5 Cross track corridors;

2.24.6 Estimated Time of Arrivals (ETAs);

2.24.7 Estimated Time of Departures (ETDs); and

2.24.8 Stopovers.

2.25 The navigation and manoeuvring workstation shall be capable of enabling all navigation functions, including:

2.25.1 Query;

2.25.2 Intervention;

2.25.3 Control; and

2.25.4 Recording of navigation data.

2.26 Whilst providing NDS functionality, the navigation planning workstation is not required to meet the IMO ECDIS display standard.

2.27 The navigation planning workstation shall be portable so as to provide the following functions:

2.27.1 Chart presentation on the Bridge, should the primary screen fail.

2.27.2 Connectivity to a portable Global Positioning System (GPS) set.

2.28 Time indication at the navigation planning workstation shall be derived from the same system as used at the primary navigation and manoeuvring workstation.

Rule 3. Bridge Workstations

Solutions

3.1 The NVO shall present and justify a solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

3.2 The Bridge and arrangement of navigation systems shall be designed so as to comply with:

3.2.1 IMO SOLAS Convention V/15 – *Principles relating to bridge design, design and arrangement of navigational systems and equipment and bridge procedures*;

3.2.2 IMO Resolution MSC/Circ.982 – *Guidelines on ergonomic criteria for bridge equipment and layout*;

3.2.3 IMO Resolution MSC.128(75) – *Performance standards for a bridge navigational watch alarm system (BNWAS)*;

3.2.4 ISO 22555 – *Ships and marine technology – Propeller pitch indicators*;

3.2.5 ISO 22554 – *Ships and marine technology – Propeller shaft revolution indicators – Electric type and electronic type*;

3.2.6 IMO Resolution A.526(13) – *Performance standards for rate of turn indicators*;

3.2.7 IMO Resolution A.694 (17) – *General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids*;

3.2.8 IEC 61162 – *Maritime navigation and radiocommunication equipment and systems – Digital interfaces series*;

3.2.9 IMO SN.1/Circ.288 – *Bridge Equipment and Systems*;

3.2.10 IMO Resolution MSC.302(87) – *Bridge Alert Management*;

3.2.11 ISO 8468 – Ships and marine technology – *Ship's bridge layout and associated equipment – Rules and guidelines*; and

3.2.12 MIL-STD-461G – *Requirements for The Control of Electromagnetic Interference Characteristics of Subsystems and Equipment*.

3.3 All navigation related equipment installed shall be Type Approved against the appropriate International Standard, or a standard agreed by the ANC Authority.

3.4 It shall be possible to control the manoeuvring and propulsion from the Bridge in accordance with Rule 7 *Operation & Control Systems*.

3.5 The Bridge shall be arranged such that an operator has immediate access to the ship's internal and external communications networks. Access shall also comply with Part 1 Chapter 08 *Safety Communications* Rule 2 *GMDSS Equipment* and Rule 6 *Internal Communications*.

3.6 At least two independent methods shall be provided for communicating orders from the conning position to the position in the machinery space or control room from which the speed and direction of thrust of the propellers are normally controlled; one of these shall be an engine-room telegraph which provides visual indication of the orders and responses both in the machinery spaces and on the Bridge. Appropriate means of communication shall be provided from the conning position to any other position from which the speed or direction of the thrust of the propellers can be controlled. Communications shall also comply with Part 1 Chapter 04 *Engineering Systems* Rule 5 *Manoeuvring* and Rule 13 *Electrical Distribution and Equipment*.

3.7 At least two independent methods of communication shall be provided between the conning position and the manoeuvring equipment compartment. Appropriate means of communication shall be provided from the conning position to any other position from which the manoeuvring equipment may be controlled. Communications shall also comply with Part 1 Chapter 04 *Engineering Systems* Rule 5 *Manoeuvring* and Rule 13 *Electrical Distribution and Equipment*.

3.8 Where means of communicating can be exercised between the Bridge, alternate / emergency conning positions and control stations for manoeuvring equipment and machinery, it shall be considered as part of the whole ship internal communications matrix.

3.9 Power supplies for workstations, including reversionary power supplies, shall be in accordance with the requirement of Rule 8 *Resilience and Continuous Availability*.

3.10 Electrical and electronic equipment, including portable electrical and electronic equipment, provided for use on, or near, the Bridge shall comply with MIL-STD-461G *Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment* for the following:

3.10.1 Have been tested for electromagnetic compatibility;

3.10.2 Be so installed or operated that electromagnetic interference does not affect the proper function of navigational systems and equipment; and

3.10.3 In the case of passive electronic equipment, be provided with an exemption statement in place of evidence of electromagnetic compatibility (e.g. cables, purely resistive loads and batteries).

3.11 Where a chair is installed at a workstation, operations shall be capable of being conducted in both the standing and seated positions.

3.12 Bridge seating shall meet the operating and/or environmental conditions criteria required of seats provided in the Operations, and other Control Rooms.

3.13 Utilisation of the same type of seating, and the method of securing it, as used in the Operations Room and other Control Rooms.

3.14 The design shall include space for the temporary stowage of portable equipment and instruments.

3.15 The Bridge design shall provide unobstructed accessibility and movement in accordance with IMO Resolution MSC/Circ.982 – *Guidelines on ergonomic criteria for bridge equipment and layout*.

3.16 A clear passage width shall be provided for the following routes which should be as direct as possible and shall comply with the requirements of Chapter 07 *Escape, Evacuation and Rescue* Rule 16 *Escape Routes and Escape Exists*:

3.16.1 From Bridge wing to Bridge wing;

3.16.2 Between the internal entrance to the Bridge and to the Bridge wing to Bridge wing route; and

3.16.3 From the pelorus to each wing.

3.17 Ships that engage in replenishment at sea (RAS) shall be provided with flood lights, flags and shapes (see Rule 11 *Collision Avoidance*) detailed in ATP16 as appropriate to the receive/supply role defined in the Operating and Support Intent (OSI).

3.18 The Bridge structure and its equipment shall be constructed in compliance with the Ingress Protection Code (IEC 60529 – *Degrees of Protection Provided by Enclosures*) appropriate to their location.

3.19 The Bridge shall be protected against the ingress of solids, liquids and gases. Where required by the OSI, the Bridge shall also be protected against Chemical, Biological, Radiological and Nuclear (CBRN) hazards. Ingress protection shall also comply with Chapter 01 *Integrated Platform Survivability* Rule 13 *Chemical, Biological, Radiological and Nuclear (CBRN) Defence*, Chapter 02 *Structure*, Chapter 03 *Buoyancy and Stability* Rule 2 *Watertight Integrity* and Rule 7 *Preservation of Life*, and Chapter 04 *Engineering Systems* Rule 19 *Heating, Ventilation and Air Conditioning (HVAC)*.

3.20 The design and installation of Bridge windows shall be in accordance with IMO Resolution MSC/Circ.982 – *Guidelines on ergonomic criteria for bridge equipment and layout*. The Bridge windows shall also comply with Part 2 Chapter 03 *Buoyancy and Stability* Rule 2 *Watertight Integrity*.

3.21 Where required by the OSI, Bridge windows shall provide ballistic protection to Class G – Simulated attack by Handgun, and Class R – Simulated attack by Rifle, in accordance with AS/NZS 2343 *Bullet Resistant Panels and Elements*. Ballistic protection shall also comply with Part 2 Chapter 01 *Integrated Platform Survivability* Rule 16 *Vulnerability Reduction*.

3.22 Where required by the OSI, heavy-duty wipers with a fresh water wash shall be provided. It is preferable that an interval function be also fitted.

3.23 Where required by the OSI, efficient cleaning, de-icing and de-misting systems shall be fitted.

3.24 Suitable safe external access arrangements fitted under the Bridge windows shall be provided to enable cleaning in the event of failure of the de-icing and/or de-misting systems (if fitted).

3.25 Ships of unconventional design which, in the opinion of the ANC Authority, cannot comply fully with this Rule shall be provided with a level of visibility that is as near as practicable to that prescribed in this Rule.

3.26 There shall be direct line of view of Small Craft launch positions from the Bridge and Bridge wings by day and night.

3.27 Where a rescue station from which the Swimmer of the Watch will operate is provided in accordance with Part 2 Chapter 07 *Escape, Evacuation and Rescue* Rule 27 *Rescue Arrangements*, there shall be direct line of view of the Swimmer of the Watch station from the Bridge and Bridge wing.

3.28 There shall be direct line of view of the flight deck from the Bridge and Bridge wings.

3.29 Where required by the OSI there shall be a method of observing the RAS position by day and night.

3.30 Where required by the OSI, the ANC Authority may also require a method of viewing other locations such as anchoring/mooring positions etc.

3.31 At least one of the screens for presentation of WECDIS or radar shall be mounted near the conning position in 'portrait' orientation in order to optimise the functionality of the WECDIS Anti-Grounding Cone (AGC) and promote 'head up' working.

3.32 The workstations and display systems used on the Bridge and Bridge wings shall comply with the recommended equipment for workstations detailed in Appendix 2 of IMO Resolution MSC/Circ.982 – *Guidelines on ergonomic criteria for bridge equipment and layout*. In addition, the workstation for navigating and manoeuvring shall provide facilities to display the NDS, Closed Circuit Television (CCTV) and Electro-Optical Surveillance System (EOSS).

3.33 The NDS shall comprise of the following:

3.33.1 A primary workstation, a backup workstation, a planning workstation, and associated equipment, including displays, keyboard, trackball, alarm, processors, sensor interfaces and Uninterruptible Power Supplies (UPS).

3.33.2 The primary workstation, backup workstation, and planning workstation shall be capable of displaying the video from the primary and backup PCs. Additional slave displays capable of acting as a slave display of the primary, backup, or planning PC shall be provided.

3.33.3 The primary interface (keyboard and trackball) shall be capable of controlling and displaying both the primary and the backup PCs. The primary interface can only control one PC at a time. Control of the backup PC is mutually exclusive. That is, when the primary interface is controlling the backup PC, the backup interface does not control anything. The backup interface is not capable of controlling the primary PC. The planning workstation is not capable of controlling either of the primary or backup PCs.

3.33.4 The primary and backup workstations shall be capable of performing all the same functions and shall be independent of each other and receive all sensor inputs independently. Failure of either the primary or backup workstation shall not affect sensor input to the remaining operational unit. The systems shall also comply with Chapter 01 *Integrated Platform Survivability* Rule 4 *Zoning, Separation and Redundancy*.

3.33.5 The sensor cables for the INBS backup system shall not be run in the same cable tray as the primary system and where practicable shall be separated by at least 3m. Cables for navigation systems shall also meet the requirements of Chapter 04 *Engineering Systems* Rule 13 *Electrical Distribution and Equipment*.

3.34 In addition to any displays presented as part of an integrated navigation or control system the following indicators shall be provided directly from the relevant machinery or equipment installation:

3.34.1 For controllable pitch propellers, the propeller pitch applied;

3.34.2 Speed and direction of shaft rotation;

3.34.3 Where lateral or directionally controllable thrusters are installed, the proportion of full thrust being generated;

3.34.4 Where, lateral or directionally controllable thrusters are installed, the direction of thrust;

3.34.5 For each rudder, the rudder angle demanded and achieved;

3.34.6 Rate of turn indication;

3.34.7 Heading; and

3.34.8 The status of electrical motors of electric and electrohydraulic manoeuvring equipment.

3.35 The ship shall be provided analogue with roll and pitch indicators readily visible at the conning position.

3.36 Where required by the OSI to participate in Replenishment at Sea, the docking workstation shall be provided with the following indicators fed directly from the relevant machinery or equipment installation:

3.36.1 The speed of the ship;

3.36.2 Where, lateral or directionally controllable thrusters are installed, the direction of thrust;

3.36.3 For each rudder, the rudder angle demanded and achieved; and

3.36.4 Heading.

3.37 Where the design includes an Integrated Navigational Bridge System (INBS) it shall comply with Rule 9 *Integrated Bridge*.

3.38 Alarms and indicators provided for workstations and equipment on the Bridge and Bridge wings shall comply with IMO Resolution MSC/Circ.982 – *Guidelines on ergonomic criteria for bridge equipment and layout* and IMO Resolution A.1021(26) – *Code on Alerts and Indicators*.

3.39 Alarms associated with navigation equipment are to be both audible and visual and are to be centralised for efficient identification and management. Repeater displays shall be fitted on the docking workstations and at other appropriate positions where necessary. At least the following alarms are to be provided:

3.39.1 Closest Point of Approach;

3.39.2 Shallow Depth;

3.39.3 Waypoint approaching (where automatic track follow is provided);

3.39.4 Off-course;

3.39.5 Off-track (where automatic track following is provided);

3.39.6 Manoeuvring alarms;

3.39.7 Navigation light failure;

3.39.8 Gyro failure;

3.39.9 Watch safety system failure (where provided);

3.39.10 Power supply failure.

3.40 Audible signals shall be designed not to startle operators. Suitable types of audible signals are shown in Table 1.

Table 1: Suitable Audible Signal Types

Type	Typical characteristics	Considerations
Buzzer	Low intensity and frequencies	Good alerting in quiet environment without startling
Bell	Moderate intensity and frequencies	Penetrates low frequency noise well, abrupt onset, has a high alert value
Chime	Moderate intensity and frequencies	Good in quiet environment, non-startling
Tone	Moderate intensity and limited frequency range	Convenient for intercom transmission, high alert value if intermittent.

3.41 A centralised alarm management panel shall be fitted adjacent to the conning position.

Rule 4. Alternate Conning Positions

Solutions

4.1 The NVO shall present and justify a solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

4.2 Conning shall be able to be seamlessly transferred from the Bridge to the alternate conning position, and back, without loss of safe navigation.

4.3 Continuity of navigation data, when changing from the conning position to the alternate conning position and back again, shall be maintained without loss of accuracy.

4.4 Where possible, the alternate conning position shall be located in a different fire zone than the Bridge, from where route planning, route monitoring, monitoring, conning and communication functions can be exercised.

4.5 Where the alternate conning position co-exists within another compartment, workstations are to be arranged to facilitate the conduct of safe navigation whilst not interfering with that compartment's other functions.

4.6 The alternate conning position, to a standing operator with a maximum of one change of position within that enclosed area, shall be provided by day and night:

4.6.1 A 360-degree view of the horizon;

4.6.2 The ship's side at the waterline;

4.6.3 The launch positions (davits) of Small Craft;

4.6.4 The Swimmer of the Watch rescue station (where fitted);

4.6.5 Flight deck (where fitted);

4.6.6 RAS positions (where required by the OSI);

4.6.7 Anchoring/mooring positions (where required by the OSI); and

4.6.8 Other locations as identified by the NVO (where required by the OSI).

4.7 The alternate conning position shall be provided with lighting arrangements that comply with IMO Resolution MSC/Circ.982 – Guidelines on Ergonomic Criteria for Bridge Equipment and Layout. Lighting systems shall be designed such that they do not impair safe navigation. Alternatively, where a lighting system is required which could have such an impact, facilities are to be provided to ensure that their use does not impair safe navigation.

4.8 The navigation systems installed at the alternate conning position shall be of a common design with those navigation systems installed on the Bridge such that alternate conning position and Bridge have visibility of the same information.

4.9 The location, function, interrelation, equipment fit and ergonomics of workstations within the alternate conning position shall be designed to comply with IMO Resolution MSC/Circ.982 – Guidelines on ergonomic criteria for bridge equipment and layout.

4.10 Where a chair is installed at a workstation, operations shall be capable of being conducted in both the standing and seated positions by operators of any size.

4.11 Seating shall meet the operating and/or environmental conditions criteria required of seats provided in the Operations and other Control Rooms.

4.12 The alternate conning position shall be arranged such that access to the workstations, movement around the position and escape from the position is unobstructed and hazard free. Access shall also comply with Part 1 Chapter 07 *Escape, Evacuations and Rescue* Rule 16 *Escape Routes and Escape Exits*.

4.13 The alternate conning position shall be provided with non-slip deck surfaces free of trip hazards, handrails, hand grabs or other means to ensure operators retain their balance.

4.14 The alternate conning position shall be arranged such that an operator has immediate access to the ship's internal and external communications networks. Access shall also comply with Part 1 Chapter 08 *Safety Communications* Rule 2 *GMDSS Equipment* and Rule 6 *Internal Communications*.

4.15 At least two independent methods shall be provided for communicating orders from the conning position to the position in the machinery space or control room from which the speed and direction of thrust of the propellers are normally controlled; one of these shall be an engine-room telegraph which provides visual indication of the orders and responses both in the machinery spaces and on the alternate conning position. Appropriate means of communication shall be provided from the conning position to any other position from which the speed or direction of the thrust of the propellers can be controlled. Communications shall also comply with Part 1 Chapter 04 *Engineering Systems* Rule 5 *Manoeuvring* and Rule 13 *Electrical Distribution and Equipment*.

4.16 At least two independent methods of communication shall be provided between the conning position and the manoeuvring equipment compartment. Appropriate means of communication shall be provided from the conning position to any other position from which the manoeuvring equipment may be controlled. Communications shall also comply with Part 1 Chapter 04 *Engineering Systems* Rule 5 *Manoeuvring* and Rule 13 *Electrical Distribution and Equipment*.

4.17 At least two independent methods shall be provided for communicating between the alternate conning position to central and / or damage control stations.

4.18 Where required by the OSI, it shall be possible to control the manoeuvring equipment and propulsion from the alternate conning position in accordance with the requirements of Rule 7 *Operation and Control Stations*.

4.19 Power supplies for workstations, including reversionary power supplies, are to be in accordance with the requirements of Rule 8 *Resilience and Continuous Availability*.

4.20 Electrical and electronic equipment, including portable electrical and electronic equipment, provided for use on, or near, the alternate conning position shall comply with MIL-STD-461G *Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment* for the following:

4.20.1 Have been tested for electromagnetic compatibility;

4.20.2 Be so installed or operated that electromagnetic interference does not affect the proper function of navigational systems and equipment; and

4.20.3 In the case of passive electronic equipment, be provided with an exemption statement in place of evidence of electromagnetic compatibility (e.g. cables, purely resistive loads and batteries).

4.21 The alternate conning position and fitted navigation systems shall be protected against the ingress of solids, liquids and gases. Where required by the OSI, the alternate conning position shall also be protected against CBRN hazards. Ingress protection shall also comply with Chapter 01 *Integrated Platform Survivability* Rule 13 *Chemical, Biological, Radiological and Nuclear (CBRN) Defence*, Chapter 02 *Structure*, Chapter 03 *Buoyancy and Stability* Rule 2 *Watertight Integrity* and Rule 7 *Preservation of Life*, and Chapter 04 *Engineering Systems* Rule 19 *Heating, Ventilation and Air Conditioning (HVAC)*.

4.22 In addition to any displays presented as part of an integrated navigation or control system, the following indicators shall be provided directly from the relevant machinery or equipment installation:

4.22.1 For controllable pitch propellers, the propeller pitch applied.

4.22.2 Speed and direction of shaft rotation;

4.22.3 Where lateral or directionally controllable thrusters are installed, the proportion of full thrust being generated;

4.22.4 Where, lateral or directionally controllable thrusters are installed, the direction of thrust;

4.22.5 For each rudder, the rudder angle demanded and achieved;

4.22.6 Rate of turn indication;

4.22.7 Heading; and

4.22.8 Roll and pitch indicators.

4.23 Alarms associated with navigation equipment shall comply with IMO Resolution MSC/Circ.982 – *Guidelines on ergonomic criteria for bridge equipment and layout* and IMO Resolution A.1021(26) – *Code on Alerts and Indicators*. They are to be both audible and visual and are to be centralised for efficient identification and management. At least the following alarms are to be provided:

4.23.1 Closest Point of Approach;

4.23.2 Shallow Depth;

4.23.3 Waypoint approaching (where automatic track follow is provided);

4.23.4 Off-course;

4.23.5 Off-track (where automatic track following is provided);

4.23.6 Manoeuvring alarms;

4.23.7 Navigation light failure;

4.23.8 Gyro failure;

4.23.9 Watch safety system failure (where provided); and

4.23.10 Power supply failure.

4.24 In accordance with IMO Resolution MSC/Circ.982 – Guidelines on Ergonomic Criteria for Bridge Equipment and Layout, utilisation of dark coloured, non-reflective or matt surfaces shall be made for bulkheads, deckheads, consoles, chart tables and other major fittings in order to reduce indirect glare so that the information presented on visual display units and instruments shall not be obscured in any lighting conditions.

4.25 The design and fitting out of the alternate conning position shall be such that noise levels comply with the requirements of IMO Resolution MSC/Circ.982 – Guidelines on Ergonomic Criteria for Bridge Equipment and Layout and IMO Resolution MSC.337(91) – Code on Noise Levels on Board Ships.

4.26 The alternate conning position shall include appropriate stowages for personnel safety equipment required by Chapter 07 *Escape, Evacuation and Rescue* Rule 9 *Escape, Evacuation and Rescue Equipment Stowage*, Rule 20 *Emergency Escape Breathing Devices*, Rule 25 *Life-Jackets* and any other personnel safety equipment required by the ANC Authority.

4.27 Sufficient provision for the temporary, secure stowage and immediate access to equipment such as personal protective equipment shall be made.

4.28 The alternate conning position shall be provided as required with HVAC that complies with IMO Resolution MSC/Circ.982 – *Guidelines on Ergonomic Criteria for Bridge Equipment and Layout*. HVAC shall also comply with Part 1 Chapter 04 *Engineering Systems* Rule 19 *Heating, Ventilation and Air Conditioning (HVAC)*.

Rule 5. Emergency Conning Positions

Solutions

5.1 The NVO shall present and justify a solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

5.2 The emergency conning position shall be located on the upper deck but not on the Bridge, from where route planning, route monitoring, conning and internal communication functions can be exercised using only limited resources.

5.3 The Bridge and emergency conning position shall be located in different fire zones.

5.4 Power supplies for workstations, including reversionary power supplies, shall be in accordance with the requirements of Rule 8 *Resilience and Continuous Availability* and Chapter 04 *Engineering Systems* Rule 13 *Electrical Distribution and Equipment*.

5.5 Electrical and electronic equipment, including portable electrical and electronic equipment, provided for use on, or near, the emergency conning position shall comply with MIL-STD-461G *Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment* for the following:

5.5.1 Have been tested for electromagnetic compatibility;

5.5.2 Be so installed or operated that electromagnetic interference does not affect the proper function of navigational systems and equipment; and

5.5.3 In the case of passive electronic equipment, be provided with an exemption statement in place of evidence of electromagnetic compatibility (e.g. cables, purely resistive loads and batteries).

5.6 Navigation systems shall be protected against the ingress of solids, liquids and gases appropriate to their location. Ingress protection shall also comply with Chapter 01 *Integrated Platform Survivability* Rule 13 *Chemical, Biological, Radiological and Nuclear (CBRN) Defence*, Chapter 02 *Structure*, Chapter 03 *Buoyancy and Stability* Rule 2 *Watertight Integrity* and Rule 7 *Preservation of Life*, and Chapter 04 *Engineering Systems* Rule 19 *Heating, Ventilation and Air Conditioning (HVAC)*.

5.7 Navigation systems for emergency conning purposes, shall be able to be started from cold in 4 minutes and when placed in standby condition, shall be ready for use and have continuity of data within five seconds of activation.

5.8 Navigation systems, where fitted at the emergency conning position, shall be common with those used on the Bridge and alternate conning positions so as to avoid confusion and mal-operation.

5.9 The emergency conning position shall provide a 360-degree view of the horizon to a standing operator with a maximum of one change of position within that enclosed area.

5.10 A means of viewing the ship's side at the waterline shall be provided at the emergency conning position.

5.11 There shall be a method of observing the launch positions (davits) of Small Craft from the emergency conning position by day and night.

5.12 Where a rescue station from which the Swimmer of the Watch will operate is provided in accordance with Part 2 Chapter 07 *Escape, Evacuation and Rescue* Rule 27 *Rescue Arrangements*, this position shall be visible from the emergency conning position.

5.13 Emergency conning position workstations and navigation systems are to be arranged to facilitate the navigation and manoeuvring, planning and documentation, and communication (under emergency conditions):

5.13.1 Navigations systems can be portable or handheld.

5.13.2 Means of communicating to other ships or shore can be provided by portable or handheld devices.

5.13.3 Sufficient provision for the temporary, secure stowage and immediate access to portable and handheld navigation systems shall be made.

5.13.4 Communication between the emergency conning position and control stations (for controlling the manoeuvring and propulsion of the ship) shall be provided by fixed systems.

5.13.5 At least two independent methods shall be provided for communicating orders from the emergency conning position to control stations (for controlling the manoeuvring and propulsion of the ship).

5.13.6 At least two independent methods shall be provided for communicating between the emergency conning position to central and / or damage control stations, and to the operations room (if fitted).

5.13.7 Repeater displays shall not be used.

5.13.8 Navigation systems shall be appropriate for use in those areas of operation detailed in the OSI.

5.14 The following indicators are to be provided directly from the relevant machinery or equipment installation:

5.14.1 The speed of the ship;

5.14.2 Where, lateral or directionally controllable thrusters are installed, the direction of thrust;

5.14.3 For each rudder, the rudder angle demanded and achieved; and

5.14.4 Heading.

5.15 The emergency conning position shall be provided with lighting arrangements that comply with ISO 8468 Ships and marine technology – Ships bridge layout and associated equipment – Requirements and guidelines – lighting.

5.16 Navigation systems at the emergency conning position shall comply with ISO 8468 Ships and marine technology – Ships bridge layout and associated equipment – Requirements and guidelines – illumination and individual lighting of equipment.

5.17 Where a lighting system is required which could have an impact on safe navigation, facilities are to be provided to ensure their safe use.

5.18 Dark coloured, non-reflective or matt surfaces shall be utilised for bulkheads, deckheads, consoles, chart tables and other major fittings in order to reduce indirect glare.

5.19 The emergency conning position noise levels shall comply with IMO Resolution MSC.337(91) – Code on Noise Levels on Board Ships.

5.20 The emergency conning position shall be provided with non-slip deck surfaces free of trip hazards, handrails, hand grabs or other means to ensure operators retain their balance.

5.21 The emergency conning position shall be arranged such that access to the workstations, movement around the position and escape from the position is unobstructed and hazard free.

5.22 The emergency conning position shall include appropriate stowages for personnel safety equipment required by Chapter 07 *Escape, Evacuation and Rescue* Rule 9 *Escape, Evacuation and Rescue Equipment Stowage*, Rule 25 *Life-Jackets* and any other personnel safety equipment required by the ANC Authority.

5.23 Sufficient provision for the temporary, secure stowage and immediate access to equipment such as personal protective equipment shall be made.

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

Solutions

6.1 The NVO shall present and justify a solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

6.2 All equipment provided for sensing, measuring, processing and recording shall:

6.2.1 Be compliant with IMO SOLAS Convention V/19 – *Carriage Requirements for Shipborne Navigational Systems and Equipment*;

6.2.2 Be compliant with IMO Resolution A 694(17) – General Requirements for Shipborne Radio Equipment forming part of the GMDSS and for Electronic Navigation Aids;

6.2.3 Be able to interoperate with other navigation equipment using standard and open industry formatted data messages.

6.3 The ship shall have at least one precise time generator, or other means, suitable for maintaining and displaying platform time continuously throughout the intended voyage, which automatically synchronises Ship's Time System with UTC and may be interfaced with the GNSS or terrestrial navigation receivers installed.

6.4 The ship shall be provided with at least one precise time and frequency generating equipment to a specification agreed with the ANC Authority.

6.5 The Ship's Time System shall:

6.5.1 Provide a synchronised time indication to all operational areas.

6.5.2 Be configured to provide Zulu time (UTC) and local time.

6.5.3 Provide a master/slave arrangement to a distribution system.

6.5.4 Be provided with a non-volatile back up power supply.

6.5.5 Not exceed a central clock error of 0.1 ms/day.

6.5.6 Display the time in a 24-hour format and shall be large enough so as to be clearly visible from the opposite end of the compartment in which the time is displayed.

6.5.7 Allow the local time displays to be adjusted from a single point such as the master clock.

6.5.8 Allow time displays to be visible and readable during all lighting conditions and can be individually dimmable in areas requiring dark adaptation lighting.

6.6 The ship shall be fitted with at least two independent gyrocompasses or Ships Inertial Navigation System (SINS) to determine ship's true heading, pitch heave and roll. The performance of the system fitted shall meet the requirements of IMO Resolution A.424(XI) – *Performance Standards for Gyro-Compasses*.

6.7 Where accurate position estimates are critical, or ships are expected to operate in a GPS denied environment, an Assured PNT source such as SINS shall be used instead of gyrocompasses.

Note: SINS shall provide an approximated position and time independent of the GNSS.

6.8 The ship shall have the means to continuously transmit relevant information from the gyrocompass and/or SINS for input to, at least, a display at the manual manoeuvring workstation, the navigational radar, an electronic plotting aid, or equivalent, the WECDIS, WAIS equipment, a recording facility, the Combat Management System (CMS) and other equipment as required. The heading shall be correctable to True at all times.

6.9 The ship shall be able to determine, at all times, its heading and display the reading to the main, secondary and emergency manoeuvring positions as well as the conning position, alternate conning position and emergency conning position. The equipment shall be capable of correcting headings to True at all times.

6.10 Gyrocompasses and/or SINS shall automatically perform integrity checking against other gyrocompasses and/or SINS unit, and other similar sensor inputs such as GPS time and position. Gyrocompass and/or SINS failed integrity checking shall alarm, with one alarm location to be on the Bridge.

6.11 Only one gyrocompass (or equivalent) shall be used at any time for main display and control purposes.

6.12 The heading display output shall be switchable between gyrocompasses (or equivalent) at any time.

6.13 It shall be possible to compare readings from each gyrocompass (or equivalent) via the navigation workstation displays.

6.14 Gyrocompasses and/or SINS shall be separated by a minimum of two watertight bulkheads in accordance with Chapter 01 *Integrated Platform Survivability* Rule 4 *Zoning, Separation and Redundancy*.

6.15 Ship's position shall be able to be determined by navigation systems or techniques to at least 95% probability accuracy in accordance with BR 45 Admiralty Manual of Navigation Vol 9 – *Operational Navigational Techniques*.

6.16 The ship shall have a method of measuring, displaying and recording its rate of turn and transmit rate of turn information for input to, at least, the navigational radar, automatic radar plotting aid, or equivalent, and the WAIS and VDR equipment. The performance of the system fitted shall meet the requirements of IMO Resolution A.526(13) – *Performance Standards for Rate-of-Turn Indicators*.

6.17 The ship shall have at least one gyrocompass bearing repeater, or other means, to take bearings over an arc of the horizon of 360 degrees from within the Bridge, using the gyrocompass or other means. The repeater shall be directly connected to the WECDIS. The equipment shall be capable of correcting bearings to True at all times.

6.18 The ship shall be provided with roll and pitch indicators and recorders. The roll and pitch indicators shall be readily visible at the conning position.

6.19 The ship shall be provided with at least one speed and distance measuring equipment (SDME), or other means, to be able to determine, display and record its speed and distance travelled through the water in both the fore and aft and athwartships axes and transmit speed information for input to, at least, the navigational radar, an electronic plotting aid, or equivalent, and the WECDIS, WAIS, recording equipment, the Combat System and other equipment as required. The performance of the fitted SDME shall meet the requirements of IMO Resolution MSC.334(90) – *Adoption of Amendments to Performance Standards for Devices to Measure and Indicate Speed and Distance (MSC.96(72))*.

6.20 The ship shall have at least one echo sounder, or other device, for measuring, displaying and recording the available depth of water. Ships operating in Polar waters shall have two. The

equipment shall be capable of transmitting depth information to the ship's WECDIS, CMS, VDR and other equipment as required. The performance of the fitted echo sounder shall meet the requirements of IMO Resolution MSC.74(69) Annex 4 – *Recommendation on Performance Standards for Echo-Sounding Equipment*.

6.21 The ship shall be fitted with an ECDIS to facilitate the planning, execution and recording of an intended voyage so as to take account of relevant ship's routing systems, ensure sufficient searoom for safe passage, anticipate all known navigational hazards and adverse weather conditions, take into account the marine environmental protection measures that apply, and avoid, as far as possible, actions and activities which could cause damage to the environment.

6.22 The performance of the fitted ECDIS shall meet the following standards:

6.22.1 IMO Resolution A.817(19) – *Performance Standards for Electronic Chart Display and Information Systems (ECDIS)*;

6.22.2 IMO Resolution MSC.232(82) – *Adoption of the Revised Performance Standards for Electronic Chart Display and Information Systems (ECDIS)*; and

6.22.3 IEC 61174 Maritime Navigation and Radiocommunication Equipment and Systems – *Electronic Chart Display and Information Systems (ECDIS) – Operational and Performance Requirements, Methods of Testing and Required Test Results*.

6.23 The ECDIS shall enable an operator to manually fix (plot) the ship's position based on any combination up to six (6) of the below to indicate a 'best position'. However, the operator may either confirm this position or choose an alternate position based on the 'cocked hat' information:

6.23.1 At least four (4) straight position lines in support of each manual position fix;

6.23.2 At least four (4) position arcs in support of each manual position fix;

6.23.3 At least eight (8) astronomical position lines in support of each manual position fix;

6.23.4 At least six (6) bathymetric position lines in support of each manual position fix;

6.23.5 At least four (4) transit position lines in support of each manual position fix;

6.23.6 At least four (4) range position lines in support of each manual position fix;

6.23.7 At least two (2) horizontal sextant angle position lines in support of each manual position fix; and

6.23.8 At least two (2) transit position lines in support of each manual position fix.

6.24 Where required by the OSI, a WECDIS shall be fitted as an alternative, or additional to, an ECDIS. The WECDIS has the same capability as a standard ECDIS with the additional functionality for a classified maritime environment. In addition to the ECDIS performance standards, the performance of the fitted WECDIS shall be meet the following standards:

6.24.1 NATO – *STANAG 4564: Warship Electronic Chart Display and Information System (WECDIS)*; and

6.24.2 NATO – STANAG 7170: *Additional Military Layers (AML) – Digital Geospatial Data Products*.

Note: The NVO shall define the extent of the 'warship' functionalities as captured in STANAG 4564.

6.25 Where required by the OSI, the WECDIS shall be able to operate using Digital Nautical Chart (DNC).

6.26 The WECDIS user interface and features shall remain the same (where available) regardless of whether ENC, RNC or DNC charts are selected.

6.27 In any area where both ENC and RNC charts are available, WECDIS shall indicate and provide options for the operator to choose between the two.

6.28 WECDIS shall have the capability of being operated by the INBS in both ENC and RCDS modes of operation.

6.29 The WECDIS shall be able to import, display, and retain upon export of Additional Military Layers (AML) in an IHO approved standard and DIGEST VPF. Where there are Marine Information Overlays (MIO), any attachments or correction sets shall be retained within their respective format.

6.30 The WECDIS shall be able to securely display and import AML Confidential Data as its Classification and format; and have it properly displayed to the User.

6.31 The WECDIS shall be able to render itself UNCLASSIFIED once CLASSIFIED data is no longer required (an example of this may be the removal of classified storage and the clearing of the cache).

6.32 The ship shall have at least one receiver for at least one global navigation satellite system (GNSS), suitable for use at all times throughout the intended voyage, including the capability to utilise 'differential' data and 'limited access signals' (such as PPS GPS), which automatically establishes and updates the ship's position and transmits positional information for input to, at least, the navigational radar, an electronic plotting aid, or equivalent, and the (W)ECDIS, (W)AIS, appropriate GMDSS transmitters and VDR equipment. The equipment may be combined with the receiver(s) for civil terrestrial radionavigation installed. The receiver(s) shall also comply with Part 1 Chapter 08 *Safety Communications* Rule 5 *Position Updates to GMDSS Equipment*.

Note: The NVO shall determine whether the connection is left to stand, is capable of being interrupted as dictated by naval operations, or is permanently disabled upon the justification that, in case of distress, ship's position will be passed by military means.

6.33 Where required by the OSI, military GPS receivers shall be used for safety and mission critical systems and shall meet the following requirements:

6.33.1 At least two independent automatic position fixing systems, primary and secondary, giving a continuous display of latitude and longitude.

6.33.2 The primary system shall comprise of two military Precise Positioning Service (PPS) and/or Dual Frequency GPS receivers capable of receiving encrypted GPS signals, and shall:

6.33.2.1 Be M-Code capable or provide an upgrade capability to M-Code;

6.33.2.2 Be P-Code capable or provide an upgrade capability to P-Code;

6.33.2.3 Be Y-Code (encrypted P-Code) or provide an upgrade capability to Y-Code;

6.33.2.4 Be compatible with the GPS Receiver Applications Module (GRAM) standard;

6.33.2.5 Incorporate the Selective Availability Anti-Spoofing Module (SA-ASM);

6.33.2.6 Be Satellite-Based Augmentation System (SBAS) capable;

6.33.2.7 Provide a 1 pulse per second output to synchronise the Ships Time System; and

6.33.2.8 Able to warn/indicate when it has not been loaded with a valid and current crypto key.

6.33.3 The secondary system shall:

6.33.3.1 Use differential and integrity signals from geostationary earth orbit satellites (WAAS, MSAS, EGNOS, etc.) and MF maritime beacons (RTCM SC-104) on operator selection;

6.33.3.2 Be capable of using signals from both GPS and Galileo satellites, or provide an upgrade path for Galileo; and

6.33.3.3 Have dual band (e.g. L1/L2 or E2-L1-E1/E5A) reception capability.

6.34 The ship shall have at least one receiver for at least one terrestrial navigation system, suitable for use during the intended voyage, including the capability to utilise 'differential' data, which automatically establishes and updates the ship's position and transmits positional information for input to, at least, the navigational radar, an electronic plotting aid, or equivalent, and the WECDIS, WAIS, appropriate GMDSS transmitters and VDR equipment. The equipment may be combined with the receiver(s) for civil GNSS installed. The receiver(s) shall also comply with Part 1 Chapter 08 *Safety Communications* Rule 5 *Position Updates to GMDSS Equipment*.

6.35 The ship shall have sufficient meteorological instruments/sensors so as to comply with IMO SOLAS Convention V/5 – *Meteorological Services and Warnings*.

6.36 Where required by the OSI, Hydrographic and Oceanographic Systems shall be provided with the following:

6.36.1 Water depth shall be measured in accordance with IHO S-44 *Hydrographic Surveys* from ships keel, all speeds, to meet the accuracy requirements that is intended to be from restricted water areas (harbours, berthing areas and critical areas of fairways and channels) to more than 200m.

6.36.2 The display and depth record shall be able to be corrected for ship's draught in order to display depth below the waterline.

6.36.3 The depth measurement system shall automatically select frequencies and/or power output appropriate to the water depth detected but permit a manual override.

6.36.4 The display shall permit a permanent record to be retained and have the capability to be annotated.

6.36.5 A system for navigation, collision and mine avoidance shall also be provided that detects and records obstructions ahead of the vessel and is able to warn of such obstructions in time to stop the ship.

6.36.6 To enable accurate sonar range predictions to be made, the following parameters shall be supplied to the Commonwealth for any underwater acoustic systems supplied: Frequencies, Source Level, Pulse Length, Gain Values (Band Width Correction Factor, Spectral Resolution, Receiver Noise and Directivity Index), Tilt Angle, Signal type (Continuous Wave/Frequency Modulated), Transmission Mode (Omni/directional), sensor depth, Maximum Instrumented Range, Pulse Repetition Frequency, Probability of False Alarm.

6.36.7 A system shall be provided that can operate on a non-interference basis with the operations of the ship, recording the current at depth below the ship measuring speed and direction (to within 0.1m/s and 5°) continuously and automatically.

6.36.8 Current profile information shall be provided to the INBS and be available for display on the bridge and in other locations as required by the OSI.

6.36.9 A system shall be provided to measure and record temperature, salinity and sound speed profiles of the ocean (temperature ±0.15°C, salinity ±0.15ppt and sound speed ±0.15m/s) with depth, preferably continuously. Profiles shall extend from the hull to the seafloor or 460m (whichever is the less) at 14kts and at least 1500m when stopped. The system shall operate in all conditions, by both day and night.

6.36.10 The system shall be capable of accepting additional sensors (e.g. a fluorometer) to measure other parameters.

6.36.11 The system shall collect data in accordance with WMO Pub 8 – *Guide to Instruments and Methods of Observation* and disseminate it in accordance with WMO Pub 306 – *Manual on Codes* and Bureau of Meteorology (BoM) practices.

6.36.12 Temperature, salinity and sound speed profile information shall be provided to the INBS.

6.36.13 Two independent wind speed and direction anemometers shall be provided.

6.36.14 The anemometers shall be capable of measuring wind speed and direction in accordance with ISO 10596 – *Ships and Marine Technology — Marine Wind Vane and Anemometers*.

6.36.15 The anemometers shall be positioned such that at least one will always be in clear air irrespective of wind direction. That upwind anemometer data shall feed to the INBS.

6.36.16 An Automatic Weather Station (AWS) shall be provided on all ships.

6.36.17 The AWS shall create and disseminate discrete, coded weather observations (in accordance with WMO Pub 306 and BoM practices) at standard times and when "Special" observation criteria are met. It shall also create "Special" observations on demand.

6.36.18 In addition to inputs of wind speed and wind direction, it shall include input from external sensors providing (in accordance with WMO Pub 8) air pressure, air temperature, and humidity/dew point temperature (as required). Sea and swell shall be calculated from pitch, heave and roll information.

6.36.19 The AWS shall allow input of visual parameters (i.e. precipitation, cloud and swell parameters, visibility, etc.).

6.36.20 Apart from prompting when visual parameter input is required, the AWS shall operate on a non-interference basis with the operations of the ship.

6.36.21 The AWS shall store and display instantaneous and averaged data on the bridge and shall be repeated in both the Navigation Officer and Commanding Officer sea cabins.

6.36.22 The AWS shall be connected to the ship's INBS, which shall provide time of observation, position, sea surface temperature, and ship course and speed.

6.36.23 An atmospheric sounding system shall be provided.

6.36.24 The system shall be able to collect a temperature, humidity and wind profile of the atmosphere continuously up to 1667m and to the tropopause as required. The profiling system shall operate automatically on a non-interference basis with the operations of the ship in all conditions, by both day and night.

6.36.25 The system shall be capable of measuring, recording and disseminating the data in accordance with WMO Pub 306 and latest BoM practices.

6.36.26 Sounding equipment may be remote from the bridge at a location suitable for convenient, unobtrusive operation.

6.36.27 Sounding data shall be available on, and stored in, the INBS.

6.37 The ship shall be provided with a meteorological data facsimile receiver or equivalent compliant with the Recommendations of the CCITT committee of the ITU and/or a meteorological data suite as agreed with the ANC Authority.

6.38 The ship shall be provided with a receiver capable of receiving international NAVTEX service broadcasts automatically if the naval ship is engaged on voyages in any area in which an international NAVTEX service is provided. The NAVTEX receiver shall be capable of exchanging data directly with the WECDIS such that message content will be automatically displayed at a chart presentation. The receiver may be part of the ship's GMDSS installation. The receiver(s) shall also comply with Part 2 Chapter 08 *Safety Communications* Rule 2 *GMDSS Equipment*.

6.39 The ship shall have an Operator Guidance System, or other means, to measure, display, record and analyse, in real time, the vessel's behaviour in the prevailing conditions of wind and sea so as to better determine its stability and identify combinations of course and speed which will preserve stability and enable the safe conduct of evolutions constrained by motion limitations.

6.40 The ship shall have a device for measuring, displaying and recording the angle of heel, pitch, roll, and trim. The equipment may be part of the Operator Guidance System, if fitted.

6.41 The ship shall have a ship's log-book, or other means, to retain onboard a record of daily navigational activities and incidents which are of importance to safety of navigation and which must contain sufficient detail to restore a complete record of the voyage. When such information is not contained in the ship's log-book it shall be maintained in another form approved by the ANC Authority.

6.42 The ship shall be provided with a system capable of exchanging secure situational awareness in real time with Organic Watercraft and/or between multiple Organic Watercraft when deployed together.

6.43 The system shall allow the ship to track and control the following operations of the Organic Watercraft:

6.43.1 Amphibious operations;

6.43.2 High speed littoral operations;

6.43.3 Maritime Interdiction Operations; and

6.43.4 Port security operations.

6.44 The system shall host ECPINS and WAIS capability, and be IMO Type Approved.

6.45 The system shall provide a Beyond Line-of-Sight capability.

6.46 The system shall be operated in all weather conditions, by day and by night.

6.47 The ship shall be fitted with an on-board geospatial data base that can serve geospatial data to consuming subsystems in their native formats. These subsystems include:

6.47.1 INBS;

6.47.2 ECDIS/WECDIS;

6.47.3 ARPA;

6.47.4 CMS;

6.47.5 Primary Surveillance Radar (PSR) for land clutter suppression and regions where atmospheric effects such as radar ducting occurs;

6.47.6 Secondary Surveillance Radar (SSR);

6.47.7 Role-specific Radars such as Short Range Helicopter Control Radars;

6.47.8 Deployable systems in support of establishing Recognised Environmental Picture (REP);

6.47.9 Deployed systems including uninhabited vehicles, autonomous systems and environmental operations teams in support of Rapid Environmental Assessment (REA).

6.47.10 Autopilot (Heading Control System or Track Control System); and

6.47.11 AIS/WAIS.

Rule 7. Operation & Control Systems

Solutions

7.1 The NVO shall present and justify a solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

7.2 The ship shall be provided with a means of:

7.2.1 Controlling and operating the manoeuvring equipment from the Bridge;

7.2.2 Controlling the manoeuvring equipment from the alternate conning position (if such position is required by the OSI); and

7.2.3 Controlling the manoeuvring equipment from the emergency conning position.

7.3 Manoeuvring equipment shall be capable of being brought into operation from the manual manoeuvring workstation. The system shall be so arranged as to permit, at least, the testing routines laid down in SOLAS Chapter V/26 – *Steering Gear Testing and Drills*. Manoeuvring equipment shall also comply with Chapter 04 *Engineering Systems*.

7.4 Where required by the OSI, the manoeuvring equipment shall also be capable of being operated from:

7.4.1 The manual manoeuvring workstation, and/or

7.4.2 Docking workstations.

7.5 The ship shall be provided with a control system, or other means, to enable safe manoeuvring of the ship from any position on the Bridge, alternate conning position (where provided) and emergency conning position.

7.6 For emergency situations, analogue helm controls shall be provided and shall override all other helm controls.

7.7 The ship shall be provided with a heading or track control system, or other means, to automatically control and keep to a heading and/or track. The heading or track control system shall comply with the following as appropriate to the ship type:

7.7.1 IMO SOLAS Convention V/24 – *Use of Heading and/or Track Control Systems*;

7.7.2 IMO Resolution A.694(17) – *General requirements for shipborne radio equipment performing part of the GMDSS and for electronic navigational aids*;

7.7.3 IMO Resolution A.830(19) – *Code on alarms and indicators*;

7.7.4 MSC.74(69) Annex 2 – *Recommendations on performance standards for Track Control Systems*;

7.7.5 IMO Resolution A.822(19) – *Performance standards for automatic steering aids (automatic pilots) for high-speed craft*; and

7.7.6 IMO Resolution A.342(IX) – *Recommendation on performance standards for autopilots*.

7.8 Where required by the OSI, the ship is to be provided with an appropriate, discrete propulsion and manoeuvring control system (Dynamic Positioning system) or equivalent, integrated with the navigation system. The system shall be compliant with IMO Resolution MSC/Circ.645 – *Guidelines for Vessels with Dynamic Positioning Systems* for ships constructed on or after 1 July 1994 but before 9 June 2017, or IMO Resolution MSC.1/Circ.1580 – *Guidelines for Vessels and Units with Dynamic Positioning (DP) Systems* for ships constructed on or after 9 June 2017. The installation of such a system shall not prevent the conventional operation of propulsion and manoeuvring systems when required.

7.9 Where required by the OSI, the DP system shall also be operable from the alternate conning position.

7.10 A list of the operational limitations applicable to the ship, its propulsion and manoeuvring arrangements, anchors and cable and any other data which will assist prevent collision or environmental damage shall be prepared and be readily available to the Officer of the Watch (OOW).

7.11 A system for controlling and monitoring the ship's sound signalling arrangements shall be provided as per Chapter 8 *Safety Communications* Rule 18 *Signalling Devices in Restricted Visibility*. The system shall include means for the automatic sounding of prescribed sound signals and enable the manual operation of the combined whistle arrangement or individual whistles. One of the control positions is to be located adjacent to the manual manoeuvring workstation and the conning position.

7.12 The control system for sound signalling arrangements shall comply with the rules of a Classification Society as agreed with the ANC Authority.

7.13 A sound signalling control system shall be provided in the Bridge, alternate conning position (where provided) and emergency conning position.

7.14 A 'Pilot Information Card' shall be prepared for the ship and displayed on the Bridge, adjacent to the conning and pilot's positions. It shall be compliant with the requirements of IMO Resolution A.601(15) – *Provision and Display of Manoeuvring Information on Board Ships*.

7.15 Navigation Light Controllers (NLC) shall meet the requirements of MSC.253(83) – *Adoption of Performance Standards for Navigation Lights, Navigation Light Controllers and Associated Equipment*. The monitoring and control of the navigation light arrangements shall:

7.15.1 Comply with the rules of a Classification Society; and

7.15.2 Be operable from the alternate and emergency conning positions.

7.16 The ship shall be provided with at least one adequate searchlight controllable from the Bridge as per Chapter 8 *Safety Communications* Rule 19 *Visual Signalling*.

7.17 Provision shall be made for the OOW to have overriding control of all lighting on the upper deck (working lights, screen lighting, red lighting.

7.18 The ship shall be provided with a control panel for the monitoring and control of those Upper Deck lights (working lights, screen lighting, red lighting) which may interfere with the maintenance of lookout or the conduct of safe navigation. The panel shall be readily available to the OOW independent of any other control system and shall comply with the rules of a Classification Society.

7.19 An Upper Deck lights control panel shall be provided in the Bridge, alternate conning position (where provided) and emergency conning position.

7.20 The ship shall be provided with at least one portable daylight signalling lamp, to communicate by light during night and day, maintained ready for use on the Bridge.

7.21 The searchlight and daylight signalling lamp, or a lamp or lamps which combine both functions, shall comply with ISO 17884: Ships and marine technology – Searchlights for High Speed Craft.

7.22 A searchlight and daylight signalling lamp, or a lamp or lamps which combine both functions, shall be provided at the emergency conning position.

7.23 The ship shall be provided with means for controlling International Maritime Mobile (IMM) VHF radiotelephone channels at the conning position, from the Bridge wings and the alternate conning position (where provided), in accordance with Part 1 Chapter 8 *Safety Communications* Rule 2 *GMDSS Equipment*.

7.24 The ship shall be provided in accordance with Chapter 08 *Safety Communications* Rule 2 *GMDSS Equipment*, a GMDSS suite that either:

7.24.1 Is located in the Bridge, which, when operated, initiates a distress alert using all radio-communications installations fitted in the ship;

7.24.2 Is located in a separate communications room that is continuously manned; or

7.24.3 Is located in a separate communications room that is not continuously manned and a 'distress panel' is fitted on the Bridge.

7.25 Where required by the OSI, means to issue a distress alert using all radio-communications installations fitted in the ship shall also be able to be initiated from the alternate conning position (where provided). The system shall also comply with Part 1 Chapter 08 *Safety Communications* Rule 2 *GMDSS Equipment*.

7.26 Facilities to operate the Emergency Alarm System in accordance with Chapter 07 *Escape, Evacuation and Rescue* Rule 10 *General Emergency Alarm System* from the Bridge, alternate conning position (where provided) and emergency conning position shall be provided.

7.27 Facilities to operate the Public Address System in accordance with Chapter 07 *Escape, Evacuation and Rescue* Rule 10 *General Emergency Alarm System* and Rule 11 *Main Broadcast System*, and Chapter 08 *Safety Communications* Rule 7 *Main Broadcast System* from the Bridge (including the Bridge wings) and alternate conning position (where provided) shall be provided.

7.28 Where required by the OSI, the ship shall be fitted with a means of exchanging 'Stop/Go' visual signals between the Bridge and alternate conning position (where provided) to the following positions:

7.28.1 Flight Deck and helicopter controller's position for conducting aviation operations;

7.28.2 Seaboat/rescue craft and other craft davit positions for conducting small craft operations; and

7.28.3 Manoeuvring deck for controlling anchoring.

7.29 For ship operations and control locations, communications between these locations shall be in accordance with Chapter 07 *Escape, Evacuations and Rescue* Rule 12 *On Board Two-Way Communication* and Chapter 08 *Safety Communications* Rule 6 *Internal Communications* and Rule 8 *Portable Communications*.

Rule 8. Resilience and Continuous Availability

Solutions

8.1 The NVO shall present and justify a solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

8.2 The angular position of the rudder shall be indicated in the Bridge, alternate (where provided) and emergency conning positions when reversionary modes of control are in use. The system shall comply with Part 1 Chapter 04 *Engineering Systems* Rule 13 *Electrical Distribution and Equipment*.

8.3 The direction of rotation of shafts and/or thrust of the propulsion system shall be indicated in the Bridge, alternate (where provided) and emergency conning positions when reversionary modes of control are in use. The system shall comply with Part 1 Chapter 04 *Engineering Systems* Rule 13 *Electrical Distribution and Equipment*.

8.4 The ship shall be able to utilise available terrestrial radionavigation services during emergency operation. The system shall comply with Part 1 Chapter 04 *Engineering Systems* Rule 9 *Other Essential Safety Functions*.

8.5 The provision of duplicate systems, power supplies, internal communications bearers and instrumentation, reversionary modes of control, alternative control locations and means of automatic reinstatement after loss and restoration of power supplies shall be comply with the electrical distribution system defined in Part 1 Chapter 04 *Engineering Systems* Rule 9 *Other Essential Safety Functions* and Rule 10 *Electrical Generation and Power Supplies*.

8.6 Power supplies shall comply with Part 1 Chapter 08 *Safety Communications* Rule 4 *GMDSS Sources of Energy,* and Chapter 04 *Engineering Systems* Rule 9 *Other Essential Safety Functions* and Rule 10 *Electrical Generation and Power Supplies*.

8.7 Portable signalling lamps provided in accordance with Rule 7 are to be capable of using an energy source of electrical power not solely dependent upon the ship's power supply.

Rule 9. Integrated Bridge

Solutions

9.1 The NVO shall present and justify a solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

9.2 Where required by the OSI, the Bridge shall be IBS, INS or INBS compliant. The system shall combine the ship's navigation systems, system components and sensors into a single integrated system to determine and output the most accurate calculated position for the ship and allow transfer of navigational and environmental data.

9.3 Where required by the OSI, the alternate conning position shall be IBS, INS or INBS compliant.

9.4 The INBS shall be designed, constructed and installed in accordance with:

9.4.1 IMO SOLAS Convention V/15 – *Principles Relating to Bridge Design, Design and Arrangement of Navigational Systems and Equipment and Bridge Procedures*;

9.4.2 IMO SOLAS Convention V/19 – *Carriage Requirements for Shipborne Navigational Systems and Equipment*;

9.4.3 IMO Resolution SN.1/Circ.288 – *Guidelines of Bridge Equipment and Systems, their Arrangement and Integration (BES)*;

9.4.4 IMO Resolution MSC.252(83) – *Revised Performance Standards for Integrated Navigation Systems (INS)*, as amended by MSC.452(99); and

9.4.5 The standards for operational performance of the individual components.

Note: The INBS should enable the operator to revert to traditional navigational techniques when in an EMCON environment where access to all radio position fixing aids have been denied.

9.5 Where required by the OSI and in addition to the IMO standards for INBS, the INBS shall be capable of:

9.5.1 A visual display of approved electronic charts, navigational information and the ship's position in real time (Refer to Rule 6 for ECDIS/WECDIS requirements).

9.5.2 Automatic distribution of navigational and environmental parameters to all necessary systems including the navigation workstations, CMS and Ship's Time System.

9.5.3 Compatibility with Mission System documents derived from the OSI.

9.5.4 A continuous record of all available navigation, charting and environmental parameters which shall be readily available for selective or bulk download, transfer or management as required by the NVO.

9.5.5 A Voyage Data Recorder (VDR) capability in accordance with Rule 10 *Data Communication*.

9.5.6 Sufficient redundancy for the required navigation inputs to the CMS and helicopter flight deck and control room, where fitted.

9.5.7 Displaying and manipulating Additional Military Layers (Refer to Rule 6).

9.5.8 Displaying and aid in providing situational awareness to Organic and/or Embarked Watercraft, and Towed Bodies characteristics.

9.5.9 Providing a repeater of navigation information and a connection for a live display of the Electronic Charting System in the Commanding Officers (CO) working or sleeping accommodation.

9.5.10 Accepting position data from no less than four position fixing devices, of which two may be selected by the operator as primary and secondary position sources.

9.6 INBS elements shall be permanently mounted in consoles or other appropriate places, taking into account operation, maintenance and environmental conditions.

9.7 Where failure occurs in one part or function of the INBS, including network failures, it shall be possible to operate each other individual part or function separately.

9.8 The INBS shall include a monitoring and alarm system which employs warning annunciations consistent with the monitoring systems of other ship's equipment.

9.9 The operators and/or pilot shall be provided with immediate and easily recognisable annunciation of fault conditions, including human error, in time to take appropriate action and to permit 'alarm management'.

9.10 The operators shall be presented with consistent warning annunciation across all the ship's system. The system shall also comply with Rule 5 *Emergency Conning Position*.

9.11 INBS elements shall be plainly visible and easily read in all lighting conditions with the minimum risk of confusion under all operating conditions in compliance with the following:

9.11.1 IMO Resolution A.694(17) *General Requirements for Shipborne Radio Equipment Forming Part of the Global Maritime Distress and Safety System and for Electronic Navigational Aids*;

9.11.2 IMO Resolution MSC.191(79) *Performance Standards for the Presentation of Navigation-Related Information on Shipborne Navigational Displays*, as amended by MSC.466(101);

9.11.3 IMO Resolution SN/Circ.243 *Guidelines for the Presentation of Navigation Related Symbols, Terms and Abbreviations*, as amended;

9.11.4 IMO Resolution MSC.192(79) *Adoption of the Revised Performance Standards for Radar*;

9.11.5 IMO Resolution MSC.232(82) *Adoption of the Revised Performance Standards for ECDIS*; and

9.11.6 IMO Resolution MSC/Circ. 982 *Guidelines for Ergonomic Criteria for Bridge Equipment and Layout*.

9.12 INBS elements shall be logically grouped according to their functions and shall not be rationalised by sharing functions or by inter-switching.

9.13 The utilisation of programmable electronic systems shall be compliant with ISO 17894: Ships and marine technology – Computer applications – General principles for the development and use of programmable electronic systems in marine applications.

9.14 The INBS shall be so installed that it remains functional, visible to the operator and operable in heavy seas or after subjection to operating and/or environmental conditions and will not present a loose object hazard to the operators.

9.15 The INBS shall maintain uninterrupted essential safety functions regardless of any sensor or processing demands from the ship's combat systems.

Note: Failure of the INBS shall not interfere with the operation of the combat functions.

9.16 It shall be possible, by a 'single operator action' function, to remove all tactical data that may have been transmitted to the INBS by the combat system.

Rule 10. Data Communication

Solutions

10.1 The NVO shall present and justify a solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

10.2 The ship shall be provided with a Voyage Data Recorder (VDR), for automatically recording navigation related information, compliant with IMO Resolution MSC.333(90) – *Adoption of Revised Performance Standards for Shipborne Voyage Data Recorders (VDRs)* as amended by MSC.494(10). Where required by the OSI, the following exceptions shall be applied:

10.2.1 The VDR shall not be float free.

10.2.2 The VDR shall not be fitted with a device to aid location.

10.2.3 The VDR shall have a discreet identifier (i.e. no high visibility coating).

10.2.4 The INBS shall record the details of each voyage at intervals of not greater than 1 minute.

10.2.5 It shall not be possible for users to alter or amend the voyage records.

10.3 The ECDIS/WECDIS shall provide a data recording and playback facility which has removable storage that is able to be securely destroyed. Electronic Navigation Logs shall be securely stored and shall be write-only.

10.4 Sufficient hard disk and memory capacity for all required electronic charts, and pre-planned sorties, shall be provided. Storage shall be provided to accommodate all navigational charts and publications (both digital and printed media), handbooks, and instruments necessary for navigation in the ship's designated area of operations.

10.5 Digital storage shall be sufficient to also retain a continuous record of all available navigation and environmental parameters as previously discussed that would reasonably be collected in an eight month deployment.

10.6 Where required by the OSI, the WECDIS shall have a Data Management utility.

10.7 Where required by the OSI, the following security requirements shall be applied in addition to Division 2 Chapter 01 *General Requirements* Rule 18 *Emanation Security*, Division 2 Chapter 02 *Cyberworthiness* and Division 2 Chapter 03 *Software Systems*:

10.7.1 The Bridge shall hold the same classification as the Highest Classification of information presumable on the Bridge.

10.7.2 The WECDIS shall operate on a secure INBS sub-net.

10.7.3 The WECDIS shall be capable of interfacing with a RED Network.

10.7.4 The WECDIS shall maintain RED-BLACK Separation.

10.7.5 The WECDIS shall be protected against a data spill.

10.7.6 Charts must be updated from a storage medium and not directly over the internet.

10.7.7 The WECDIS shall be able to isolate itself and maintain critical capability from a compromised INBS.

10.7.8 The WECIDS software shall include the latest patch notes with the application.

10.7.9 User profiles, message logs, and their interactions with the W-ECDIS shall be logged.

10.8 Where required by the OSI, the ship shall be fitted with a LRIT that is compliant with IMO Resolution MSC.263(84) *Performance Standards and Functional Requirements for the Long-Range Identification and Tracking of Ships* (as amended).

10.9 Bridge and communications operators shall have instant access to the appropriate message formats and codes for messages relating to distress and lifesaving.

10.10 The ship shall be provided with an Automatic Identification System (AIS) compliant with the following standards:

10.10.1 IMO SOLAS Convention V/19 *Carriage Requirements for Shipborne Navigational Systems and Equipment*;

10.10.2 IMO Resolution A.1106(29) *Revised Guidelines for the Onboard Operational use of Shipborne Automatic Identification System (AIS)*;

10.10.3 IMO Resolution 74(69) Annex 3 *Recommendation on Performance Standards for a Universal Shipborne Automatic Identification System (AIS)*;

10.10.4 IMO Resolution SN/Circ.227 *Guidelines for the Installation of a Shipborne Automatic Identification System (AIS)*, as amended; and

10.10.5 ITU-R M.1371 *(Performance Standard) Technical Characteristics for a Universal Shipborne Automatic Identification System using Time Division Multiple Access in the VHF Maritime Mobile Band*.

10.11 Where required by the OSI, the ship shall be provided with a Warship Automatic Identification System (WAIS). In addition to the AIS standards, the WAIS shall be compliant with the following standards:

10.11.1 STANAG 4668 *Warship – Automatic Identification System (WAIS)*; and

10.11.2 STANAG 4669 *Automatic Identification System (AIS) on Warships*.

Note: AIS is not required for Embarked Special Forces or Organic Watercraft.

10.12 The AIS or WAIS (as applicable) shall be capable of being configured such that transmission is disabled on power-up without operator intervention.

Note: For the purposes of maintaining operational security, the WAIS prevents automatic transmission of the ship's identity, type, position, course, speed, navigational status and other safety-related information to appropriately equipped shore stations, other ships and aircraft unless explicitly directed by the CO.

10.13 When transmission is inhibited the AIS or WAIS (as applicable) shall operate in a “receive only” mode.

10.14 AIS or WAIS (as applicable) shall be configured such that when operating in 'transmit/receive' mode, information transmitted is limited to ship type, course and speed, turning rate and size of the vessel. Passage information such as port of origin, ETA or destination shall not be transmitted.

10.15 AIS or WAIS (as applicable) shall be configurable with security mechanisms to detect disabling and prevent unauthorised alteration are not enabled.

10.16 AIS or WAIS (as applicable) shall be programmed with a Maritime Mobile Subscriber Identity (MMSI) as allocated by the Australian Maritime Safety Authority (AMSA) and issued by the Joint Operations Command (JOC) (ADF Beacons).

10.17 AIS or WAIS (as applicable) shall be programmed with a 'standard Radio Call Sign and Name' as issued by JOC (ADF Beacons).

10.18 AIS or WAIS (as applicable) shall be programmed with a 'ship type' as 'Australian Defence Vessel'.

10.19 AIS or WAIS (as applicable) shall be configured such that it does not automatically transmit a DSC response to an interrogation request for information specified in Recommendation ITU-R M.825 Annex1.

10.20 Data from the AIS or WAIS (as applicable) shall be distributed to the following systems:

10.20.1 An AIS/WAIS Minimum Keyboard and Display (MKD) fitted on the Bridge at the OOW position;

10.20.2 The INBS workstation fitted at the OOW/Navigator position on the Bridge; and

10.20.3 The INBS workstation fitted in the Control/Operations Room for the Action Information Organisation (AIO), where fitted.

10.21 AIS or WAIS (as applicable) shall be installed and configured to utilise data from the ship's GPS as the primary source of ship position information.

10.22 AIS or WAIS (as applicable) shall include a direct GPS reception capability as a secondary source of ship position data.

10.23 AIS or WAIS (as applicable) shall output and distribute the primary source of GPS, and AIS data, to a separate junction box in order to facilitate the connection of a minimum of four additional separate situational awareness systems.

10.24 AIS or WAIS (as applicable) shall have Safe to Transmit switch in the Transmit path.

10.25 AIS or WAIS (as applicable) shall be connected to the platform's commercial RADAR with Automatic Radar Plotting Aid (ARPA) capability (only if not fitted to INBS).

Note: AIS or WAIS (as applicable) integration with ARPA may be satisfied through INBS integration with ARPA, where radar plots are made available on INBS.

Rule 11. Collision Avoidance

Solutions

11.1 The NVO shall present and justify a solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

11.2 For this Rule, two alternative Solutions are provided to address the International Regulations for Preventing Collisions at Sea, 1972 (COLREGS). Solution 1 aligns with COLREGS whilst Solution 2 is a Military specific solution. The NVO and the ANC Authority shall agree if Solution 1 or Solution 2 is applied, the two solutions should not be combined.

Note: Solution 1 is considered to be appropriate for vessels with an OSI similar to commercial vessels, whilst Solution 2 is suitable where the OSI requires a military context. Additional requirements, applicable to all vessels, follow at the end of this rule.

Solution 1

11.3 The ship shall comply with the requirements of COLREGS.

Solution 2

11.4 The ship shall be provided with shapes compliant with COLREGs Rules 21-30 and Annex I. In addition, a spare of each shape shall be carried.

Note: It is recommended that not less than 5 ball shapes, 3 diamond shapes and (if over 30m in length) 2 cylinder shapes are fitted.

11.5 The ship shall be provided with appropriate stowages for the shapes adjacent to the means of exhibiting them. The style of the stowages to be agreed with the NVO.

11.6 The ship shall be provided with sufficient white, red, green and yellow navigation lights compliant as closely as possible with COLREGs Rule 1(e) and Annex I for a ship of its dimensions and purpose and EN 14744 *Inland Navigation Vessels and Seagoing Vessels – Navigation Lights*, except that the lanterns shall not be installed in a position where they contribute to light pollution of the Bridge. Permanently fitted, battery powered, emergency navigation lights shall also be provided.

Note: Further guidance for Navigation Light systems as well as other external lighting, are given in Part 3 Chapter 04 *Engineering Systems* Rule 14 *Lighting*.

11.7 Where required by the OSI, the lights installed for all navigation and signalling purposes shall be night vision device compatible.

11.8 The ship shall be provided with a comprehensive control system for the management of navigation and signalling light arrangements. If the control system is programmable it shall be compliant with ISO 17894 Ships and marine technology – Computer applications – General principles for the development and use of programmable electronic systems in marine applications and Classification society rules as agreed by the ANC Authority. Refer to Rule 7 *Operation and Control Systems* for Navigation Light Controllers.

11.9 Ships that engage in Replenishment at Sea shall be provided with flood lights, flags and shapes detailed in ATP16 *Replenishment at Sea*, as appropriate to the receive/supply role defined in the OSI.

11.10 Where required by the OSI, the ship's navigation lights shall be capable of being continuously adjusted in intensity from the maximum required for the ship of its size to zero. Navigation light luminance shall be indicated and controlled from the Bridge. The NVO may require the lights to be adjusted simultaneously.

11.11 Ships greater than 30 metres in length and aviation capable, shall be provided with red 'masthead obstruction' lights, visible all-round from a range of at least one nautical mile, placed at or near the highest point of each mast, or other similar structure.

11.12 Where required by the OSI, the ship shall be provided with additional, sufficient white or coloured lamps for the purpose of specific military signalling:

11.12.1 Ships which are the Guide or Supplying ship for Replenishment at Sea evolutions shall be provide with 'contour' lights in accordance with ATP-16.

11.12.2 It shall be possible to:

11.12.2.1 Exhibit contour lights when all other lights are extinguished;

11.12.2.2 Adjust the intensity of individual contour lights.

11.12.3 In ships that are capable of operating aircraft from their deck or whose design includes masts or other projections more than 15 metres above the main superstructure shall have at least one red 'obstruction' light that:

11.12.3.1 Are fitted at or near the extremities of those projections;

11.12.3.2 May be seen from all round;

11.12.3.3 Are of such an intensity that they may be seen at a range of not less than one nautical mile; and

11.12.3.4 Shall be capable of being exhibited as a steady light or flashing or occulting.

11.13 It shall be possible to exhibit any, or all, of the light signals above without the necessity for personnel to access the Upper Deck.

11.14 The ship shall be provided with such other signalling lights as are required by the ANC Authority. Any such lights installed shall not obscure those lights required by the COLREGs or be capable of being interpreted as a COLREG signal.

11.15 For ships with operational lights, it shall be possible to revert to ordinary navigation lights by a single operator action.

11.16 The ship shall be provided with the capability of sounding, in all weather, so that they may best be heard, those sound signals prescribed by the COLREGs for ships of its size, nature, movement and limitations.

11.16.1 If fitted, a bell shall be capable of automatically generating the signals required in COLREGs and of manual operation.

11.16.2 If fitted, a gong shall be capable of automatically generating the signals required in COLREGs and of manual operation.

11.17 The ship shall be provided with one or more whistles, or combined whistle system.

Additional Requirements

11.18 The ship shall be fitted with at least one Navigation Radar System (NRS) operating in the X-band (9.2 GHz – 9.5 GHz) compliant with IMO Resolution MSC.192(79) *Adoption of Revised Performance Standards for Radar Equipment* and IHO S52 *Specifications for Chart Content and Display Aspects of ECDIS*, Appendix 2. If more than one radar is fitted, each shall be functionally independent of the others.

11.19 The ship shall be fitted with at least one NRS operating in the S-band (2.8 GHz – 3.1 GHz) compliant with IMO Resolution MSC.192(79) *Adoption of Revised Performance Standards for Radar Equipment* and IHO S52 *Specifications for Chart Content and Display Aspects of ECDIS*, Appendix 2. If more than one radar is fitted, each shall be functionally independent of the others. The ANC Authority may exempt smaller ships from this requirement.

11.20 The NRS shall interface and support the INBS through the following requirements:

11.20.1 The radar display shall be of the raster scan daylight viewing type and the loss of any input signal, such as video or azimuth, shall be detected and clearly indicated.

11.20.2 Automatic and manual means to adjust the length of the transmitted pulse (i.e. short, medium and long) shall be provided.

11.20.3 The nominal antenna height, in the Over-Sea Radar performance tests (IEC 62388 *Maritime navigation and radiocommunication equipment and systems – Shipborne radar – Performance requirements, methods of testing and required test results*), shall be taken as the designed antenna height of the ship for which the radar is intended, instead of 15m.

11.20.4 The NRS and associated display system alarms shall be both audible and visual, compliant with IMO Resolution MSC.191(79).

11.20.5 In addition to the mandatory display requirements detailed in MSC.192(79), the NRS shall provide:

11.20.5.1 Range scales out to 50 NM or greater.

11.20.5.2 Bearing scales outside of the operational display area, be numbered at least every 10 degrees and have division marks every 1 and 5 degrees. The 1, 5 and 10 degree division marks shall be clearly distinguishable from each other.

11.20.5.3 All Naval Vessels shall conform to the chart display performance requirements of “All ships/craft ≥ 10,000 gt” in Table 1 of MSC.192(79).

11.20.6 The operator control devices, such as manually operated switches, shall be located so that an operator can easily access them.

11.20.7 The switches controlling electronic equipment shall be placed so that the involuntary activation of equipment is prevented.

11.20.8 The NRS shall be capable of automatically receiving and sending the requisite and appropriate information to the following systems (where fitted):

11.20.8.1 CMS;

11.20.8.2 AIS;

11.20.8.3 ARPA;

11.20.8.4 ECDIS;

11.20.8.5 VDR;

11.20.8.6 Navigational Aids;

11.20.8.7 Electronic Support Measures (ESM);

11.20.8.8 On Board Training System (OBTS); and

11.20.8.9 Support Services.

11.20.9 The NRS shall be able to be operated independently of the CMS, with the following data provided to the CMS:

11.20.9.1 Track reports which include azimuth, range, speed, status of track and identification information;

11.20.9.2 Ownship navigational data that includes ownship position, heading, pitch, roll, course and speed;

11.20.9.3 Clutter Video;

11.20.9.4 System Status information; and

11.20.9.5 Environmental Data.

11.20.10 Each fitted navigation radar shall provide a minimum of two independent navigation data feeds.

11.20.11 The NRS shall provide dual redundancy for gyro-compass input data.

11.20.12 Each fitted navigation radar shall be capable of receiving a minimum of two independent gyro-compass feeds.

11.20.13 The NRS shall provide transmission blanking trigger pulse signals for the Electronic Support Measures (ESM) interface (where fitted).

11.20.14 The NRS shall have Built in Test (BIT) capability. Manual BIT initiation shall be password protected to ensure only authorised and competent operator/maintainer can initiate and operate BIT functionality.

11.20.15 The NRS Transceivers shall be located below decks and not mast mounted.

11.20.16 The NRS shall provide sufficient service space for access to parts or components requiring maintenance, where access is required internally to the equipment.

11.20.17 The NRS shall have two separate and independently keyed isolation points: one for RF Transmission (Safe-To-Transmit) and one for Antenna movement (Safe-To-Rotate). The key systems shall be captive once keyed.

11.20.18 The navigation radar shall be designed in such a way the instantaneous loss of power or other support services will not adversely affect or cause corruption of data to the system.

11.20.19 The NRS shall operate without degradation during and following degaussing procedures.

11.20.20 The NRS shall be included in a Combat System Alignment. The navigation radar shall have the means to mechanically and/or electrically align the system to the vessels reference planes (refer to Master Reference Plane in Chapter 02 *Structure* Rule 09 *Military Features*).

11.20.21 The NRS electrical equipment and machinery shall have suitable barriers or screens to protect personnel from contacting energised and/or moving parts. This is to include barriers to prevent inadvertent contact with live electrical components and/or moving parts during maintenance procedures.

11.20.22 The NRS shall have total system isolation switches co-located with all major equipment in addition to system breakers and individual on/off switches. This is to allow for emergency shut down in the event of an emergency i.e. electrocution, fire etc. The isolation switch shall be able to independently isolate the NRS from all power sources (primary, secondary, emergency, and UPS where fitted).

11.20.23 The NRS power disconnection switch or switches shall have a suitable label plate identifying ON/OFF positions.

11.20.24 Operating parameters, designation and dimensions shall be supplied for the X-band, and if fitted S-band, navigation radars in accordance with Division 2 Chapter 01 *General Requirements* Rule 7 *Hazardous Areas*.

11.21 The ship shall be provided with one ARPA per X-band or S-band radar, or equivalent system, compliant with IMO Resolution MSC.192(79) - *Adoption of the Revised Performance Standards for Radar Equipment*.

11.22 The operator shall be able to select between GPS speed or speed through water for direct use by the ARPA as an aid to collision avoidance.

11.23 The OOW shall be able to hear other sound signals and determine their direction from within the Bridge.

11.24 The ship shall be fitted with a Sound Reception System compliant with IMO Resolution MSC.86(70) Annex 1, Recommendations on Performance Standards for Sound Reception Systems.

11.25 The ship shall be provided with a fixed or portable image intensifier to a standard agreed with the ANC Authority, or other means, installed on the Bridge to supplement an operator's vision to maintain a proper lookout.

11.26 The ship shall be provided with a propulsion installation and machinery control system appropriate to its size and intended operations, compliant with the requirements of SOLAS II-1, having sufficient power for going astern to secure proper control of the ship in all normal circumstances and the ability to reverse the direction of thrust of the propeller in sufficient time, and so to bring the ship to rest within a reasonable distance from maximum ahead speed.

11.27 It shall be possible to operate the manoeuvring equipment from the Bridge and, where required in the OSI, the alternate conning position.

11.28 The ship shall be provided with a primary and an alternate manoeuvring equipment and associated control systems compliant with the requirements of SOLAS II-1, such that the failure of one of them will not render the other one inoperative.

11.29 The engineering systems for manoeuvring the ship shall comply with Chapter 04 *Engineering Systems*.

Rule 12. Controllability

Solutions

12.1 The NVO shall present and justify a solution for demonstrating compliance to Part 1 of the ANC Rules. In the presentation and justification of a solution, the following shall be considered.

12.2 For this Rule, two alternative Solutions are provided to address controllability. Solution 1 aligns with IMO Resolution MSC.137(76) *Standards for Ship Manoeuvrability* whilst Solution 2 is a Military specific solution. The NVO and the ANC Authority shall agree if Solution 1 or Solution 2 is applied, the two solutions should not be combined.

Note: Solution 1 is considered to be appropriate for vessels with an OSI similar to commercial vessels, whilst Solution 2 is suitable where the OSI requires a military context.

Solution 1

12.3 The ship shall comply with the requirements of IMO Resolution MSC.137(76) *Standards for Ship Manoeuvrability*.

12.4 Manoeuvring characteristics of the ship shall be provided in accordance with IMO Resolution A.601(15) *Provision and Display of Manoeuvring Information*.

Solution 2

12.5 Manoeuvring performance requirements of the ship shall comply with ANEP 4721 *Naval Surface Ship Manoeuvring Performance and Requirements* and tailored according to the OSI.

12.6 A pilot card and wheelhouse poster shall be provided in accordance with ANEP 79 *Controllability and Safety in a Seaway*.

12.7 A manoeuvring booklet shall be provided in accordance with ANEP 70 Volume II *Guidance for the Preparation of Onboard Manoeuvring Information*.