

# UNMANNED SURFACE VESSELS (**USV**)

**NR681- JULY 2022**



**RULE NOTE**



# BUREAU VERITAS

## **RULES, RULE NOTES AND GUIDANCE NOTES**

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# NR681

## UNMANNED SURFACE VESSELS (USV)

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# Section 1                      General

## 1 Scope

### 1.1 General

**1.1.1** The notation **USV** is assigned to unmanned surface units (civilian units or naval units).

The scope of the service notation **USV** is limited to units with the following characteristics:

- unmanned surface vessel
- less than 500 GT
- built in steel, aluminium, or composite materials
- with the following degrees of automation, direct control and remote control as defined in the Guidelines for Autonomous Shipping NI641, Sec 1:
  - A1 - DC0 - RC3 (human directed, no direct control, full remote control)
  - or
  - A2 - DC0 - RC2 (human delegated, no direct control, discontinuous remote control)
  - or
  - A3 - DC0 - RC1 (human supervised, no direct control, available remote control)

**1.1.2** Underwater vehicles and non-manoeuving units, such as drifting buoys used for scientific research are out of scope of this Rule Note.

## 2 References

### 2.1 Society Rules and Guidelines

**2.1.1** In the present Rule Note, the references to other Rules, Rule Notes and Guidance Note of the Society are defined as follows:

- NI641 : Guidelines for Autonomous Shipping  
 NR467 : Rules for the Classification of Steel Ships  
 NR483 : Rules for the Classification of Naval Ships  
 NR600 : Hull structure and arrangement for the Classification of cargo ships less than 65 m and non cargo ships less than 90 m  
 NR566 : Hull arrangement, stability and systems for ships less than 500 GT  
 NR216 : Rules on materials and welding for the Classification of marine units  
 NR561 : Hull in aluminium alloys, design principles, construction and survey  
 NR546 : Hull in composite materials and plywood, material approval, design principles, construction and survey  
 NR659 : Rules on cyber security for the Classification of marine units.

## 3 Specific definitions

### 3.1 General

**3.1.1** For the purpose of this Rule Note, the definitions in NI641, Sec 1 are considered.

In addition, the specific definitions listed below are also considered.

#### 3.1.2 Bulkhead deck

The freeboard deck may be taken as the bulkhead deck.

For units not subject to the 1966 International Convention on Load Lines, the definition of the freeboard deck is given in the Rule Note NR566, Ch 1, Sec 1, [1.3].

#### 3.1.3 Lightweight

The lightweight is the displacement, in t, without cargo, fuel, lubricating oil, ballast water, fresh and feed water and any other consumable stores if any, but including liquids in piping.

#### 3.1.4 Normal operational condition

The normal operational condition is a condition under which the unit and the remote control centre as a whole, the machinery, services, means and aids ensuring propulsion, ability to steer, safe navigation, fire and flooding safety, internal and external communications and signals are in working order and functioning normally.

## 3.1.5 Unmanned

An unmanned vessel is a vessel with no humans aboard.

## 4 Applicable requirements

### 4.1 General requirements

#### 4.1.1 Civilian units

Unmanned surface civilian units assigned the service notation **USV** are to comply with:

- a) the Rules for the Classification of Steel Ships NR467, Part A (Classification and Surveys),
- b) the present Rule Note Sec 1 to Sec 7,
- c) the Guidance Note NI641 for all matters related to classification.

#### 4.1.2 Naval units

Unmanned surface naval units assigned the service notation **USV** are to comply with:

- a) the Rules for the Classification of Naval Ships NR483, Part A (Classification and Surveys),
- b) the present Rule Note Sec 1 to Sec 8,
- c) the Guidance Note NI641 for all matters related to classification.

**4.1.3** The unmanned configuration should be considered as the normal operational condition of unmanned surface units assigned the service notation **USV**.

As a rule, the management of degraded modes cannot rely on the possibility of having a person aboard.

The manned configuration may only be considered in some limited and temporary cases such as testing, maintenance or periodic surveys.

For these limited cases, specific provisions for the safety of personnel aboard are to be defined in the operational limitations and agreed by the Society and the Flag or Naval Authorities.

**4.1.4** The Society reserves the right, whenever deemed necessary or justified, to alter some requirements of the present Rule Note or to call new ones to take into consideration particular characteristics of a piece of equipment or of a definite installation. In particular, it may carry out a special examination of equipment or installation, when these are based on new principles or arrangements not explicitly governed by the present Rule Note.

**4.1.5** Attention is to be drawn to the possible additional requirements of the Flag or Naval Authorities.

### 4.2 Additional requirements

**4.2.1** Unmanned surface units assigned the service notation **USV** are to comply with the applicable requirements related to the assignment of the following additional class notations, as applicable:

- a) for integrated bridge system (notation **SYS-IBS**)  
see NR467, Pt F, Ch 4, Sec 2
- b) for dynamic positioning with redundancy (notation **DYNAPOS AM/AT R**)  
see NR467, Pt F, Ch 11, Sec 5
- c) for integrated machinery spaces (notation **AUT-IMS**)  
see NR467, Pt F, Ch 3, Sec 4
- d) for automated operation in port (notation **AUT-PORT**)
  - see NR467, Pt F, Ch 3, Sec 3 for civilian units
  - see NR483, Pt E, Ch 4, Sec 2 for naval units
- e) for availability of machinery
  - see NR467, Pt F, Ch 2, Sec 3 for civilian units (notation **AVM-IPS**)
  - see NR483, Pt E, Ch 3, Sec 3 for naval units (notation **AVM-IPS1-(V)**)
- f) for liquid cargo in bulk (notation **CARGOCONTROL**)  
see NR467, Pt F, Ch 12, Sec 4
- g) for liquid cold cargo (notation **COLD CARGO**)  
see NR467, Pt F, Ch 8, Sec 4
- h) for refrigerated cargo (notation **REF-CARGO**)  
see NR467, Pt F, Ch 7, Sec 2
- i) for cyber security (notation **CYBER SECURE**)  
see NR659.

**4.2.2** The applicable requirements related to the assignment of these additional class notations may be adjusted according to the results of the risk and technology assessment (refer to NI641, Sec 2), the navigation notation, the operational limitations, the possibility of external rescue, etc., in particular for small units, to the satisfaction of the Society and the Flag or Naval Authorities.

### 4.3 Surveys, tests and trials

**4.3.1** Unmanned surface units assigned the service notation **USV** are to comply with the general requirements for surveys as detailed in:

- NR467, Part A, Chapter 3 for civilian units
- NR483, Part A, Chapter 3 for naval units

**4.3.2** In addition, the following requirements are applicable:

- a) NR600, Ch 7 (Construction and Testing)
- b) NR566, Ch 2, Sec 1, [4] (Machinery - Works tests)
- c) NR566, Ch 2, Sec 3, [7] (Machinery - Steering gear)
- d) NR566, Ch 2, Sec 4, [6] (Machinery - Piping systems)
- e) NR566, Ch 2, Sec 8 (Machinery - Tests, Inspection and Seatrials)
- f) NR566, Ch 3, Sec 7 (Electricity & Automation - Testing)
- g) NR566, Ch 4, Sec 3, [2] (Fire Safety - Initial and periodical tests)
- h) NI641, Sec 4, [8] (Automation Systems - Testing)

**4.3.3** All tests and trials are to be performed in the normal operational condition, i.e. in unmanned configuration. In particular, all indicators, alarms and commands are to be tested from the remote control station.



## Section 2 Hull Scantlings and Structure Arrangement

### 1 Applicable requirements

#### 1.1 Rules references

**1.1.1** Hull scantlings (fore, central and aft parts) and structure arrangement of units assigned the service notation **USV** are to be in accordance with the requirements of the Rule Note NR600, taking into account the specific requirements in the present Section.

**1.1.2** As a rule, these units are to be part of the group “non cargo ships” as defined in NR600. Units from the group “cargo ships” may be considered by the Society on a case-by-case basis.

**1.1.3** Specific additional requirements applicable to units built in steel materials are defined in the Rule Note NR216.

**1.1.4** Specific additional requirements applicable to units built in aluminium materials are defined in the Rule Note NR561.

**1.1.5** Specific additional requirements applicable to units built in composite and/or plywood materials are defined in the Rule Note NR546.

#### 1.2 Local internal pressures on decks outside the machinery spaces

**1.2.1** The local internal pressure on decks and platforms not exposed to the action of sea and/or bad weather and located outside the machinery spaces is obtained, in kN/m<sup>2</sup>, from the following formula, taking into account the requirement of NR600, Ch 3, Sec 4, [4.1.2]:

$$p = p_s \left( 1 + \frac{a_z \eta}{g} \right)$$

where

$a_z$  : Reference value of the vertical acceleration defined in NR600, Ch 3, Sec 4, [2.2]

$\eta$  : As defined in NR600, Ch 3, Sec 4, [3.3.1]

$p_s$  : Pressure defined by the Designer, to be taken at least equal to 2,5 kN/m<sup>2</sup>

#### 1.3 Bulwarks and guard rails

**1.3.1** Relaxations or alternative arrangements to the requirements in the aforementioned Rule Note may be accepted, subject to the agreement of the Flag or Naval Authorities, if they provide an equivalent level of safety in all normal circumstances.

#### 1.4 Anchoring and towing

**1.4.1** The anchoring and towing arrangements are, at all times, to be capable of rapid and easy deployment, even in the absence of main power on the unit.

Such rapid and easy deployment is to be demonstrated, to the satisfaction of the Surveyor.

**1.4.2** Relaxations or alternative arrangements may be accepted, subject to the agreement of the Flag or Naval Authorities, if they provide an equivalent level of safety in all normal circumstances.

# Section 3 General Arrangement Design, Intact Stability and Hull Integrity

## 1 Applicable requirements

### 1.1 Rules references

**1.1.1** General arrangement design, intact stability and hull integrity of units assigned the service notation **USV** are to be in accordance with the requirements of the Rule Note NR566, Chapter 1, taking into account the specific requirements in the present Section.

**1.1.2** Only unmanned surface units for which the additional class notation **SDS** has been requested are to comply with the requirements of the Rule Note NR566, Ch 1, Sec 3, [3] regarding damage stability.

Note 1: The additional class notation **SDS** is related to ship subdivision and damage stability as defined in NR467, Pt A, Ch 1, Sec 2, [6.17.1].

### 1.2 Openings

**1.2.1** The number of openings in the shell plating, watertight bulkheads, decks, superstructures and deckhouses are to be kept to a minimum compatible with the design and proper working of the unit.

**1.2.2** As a rule, all openings are to be of type “permanently kept closed at sea” as defined in NR566, Ch 1, Sec 2, [1.4.2] All closing devices ensuring the watertight or weathertight integrity are to be closed before the voyage commences and are to be provided with means of indication on the remote control station showing whether these devices are open or closed.

**1.2.3** Openings of type “normally closed at sea” and “used while at sea” may be considered by the Society on a case-by-case basis. When required, all indicators and alarms for the position and remote operation of the closing devices are to be available at the remote control station.

**1.2.4** Sidescuttles, windows and skylights located in positions which are exposed to the action of sea and/or bad weather and which ensure the watertight or weathertight integrity of the unit are to be avoided.

Where this is not possible, these devices are to be subject to special consideration by the Society, including in particular deadlights and storm covers arrangements.

### 1.3 Discharges

**1.3.1** Ash-chutes, rubbish-chutes and garbage chutes are to be avoided.

Where this is not possible, these devices are to be subject to special consideration by the Society, including in particular inboard end covers and valves arrangements.

**1.3.2** When required, means of closing on pipe discharges are to be controllable from the remote control station and position indicators are to be available.

### 1.4 Ventilation openings

**1.4.1** When required, closing appliances on ventilation openings are to be controllable from the remote control station and position indicators are to be available.

### 1.5 Air pipes

**1.5.1** Automatic closing appliances are to be fitted on all air pipe ends.

# Section 4 Machinery

## 1 Applicable requirements

### 1.1 Rules references

1.1.1 Machinery of units assigned the service notation **USV** is to be in accordance with the requirements of the Rule Note NR566, Chapter 2, taking into account the specific requirements in the present Section.

### 1.2 Gauges

1.2.1 When required, information provided by gauges is to be available at the remote control station.

### 1.3 Hot surfaces protection

1.3.1 All surfaces having temperature exceeding 60°C are to be suitably protected or insulated.

### 1.4 Emergency starting systems

1.4.1 Emergency starting means are to be rapidly and easily implemented and fully controllable from the remote control station. Such rapid and easy implementation is to be demonstrated, to the satisfaction of the Surveyor.

### 1.5 Engine monitoring

1.5.1 When required, all indicators and alarms are to be available at the remote control station, which is to be considered as the normally attended position.

### 1.6 Steering gear

1.6.1 Considering the different types of steering gear as listed in NR566, Ch 2, Sec 3, [1.3.3], main and auxiliary steering gears of units assigned the service notation **USV** cannot be manual hydraulic or manual mechanic.

1.6.2 All displays and alarms required in NR566, Ch 2, Sec 3, Tab 3 are to be available at the remote control station.

1.6.3 Controls of the main and auxiliary steering gears are to be provided on the remote control station.

### 1.7 Piping systems

1.7.1 When required, all indications (levels, temperatures and pressures) are to be available at the remote control station.

1.7.2 Level indications are to be provided from a remote level gauging system of an approved type.

### 1.8 Bilge systems

1.8.1 Bilge pumps cannot be hand pumps (fixed or portable).

1.8.2 All distribution boxes and valves in connection with the bilge pumping arrangement are to be controllable from the remote control station and position indicators are to be available.

### 1.9 Overflow tanks

1.9.1 An alarm device is to be provided at the remote control station to give warning when the oil reaches a predetermined level in the tank.

### 1.10 Fuel oil systems

1.10.1 The power supply to oil fuel transfer pumps and to other pumps of the oil fuel system as well as to oil fuel separators is to be capable of being stopped from the remote control station.

1.10.2 If main propulsion is ensured by engines and if a transfer circuit of liquid fuel exists, this transfer is to be ensured by two pumps and both pumps are to be controllable from the remote control station. No pump can be manual.

1.10.3 When required, all cocks, valves and quick-closing valves are to be controllable from the remote control station and indicators are to be provided to show whether they are open or shut.

**1.10.4** When required, all alarms are to be available at the remote control station.

### **1.11 Ballast systems**

**1.11.1** When required, all ballast pumps are to be controllable from the remote control station. No pump can be manual.

### **1.12 Lubricating oil systems**

**1.12.1** The use of sight-flow glasses in lubricating systems is not permitted.

### **1.13 Hydraulic systems**

**1.13.1** All hydraulic power installations are to include at least two power units. Hand pumps cannot be accepted as alternative means of supply.

**1.13.2** When required, all indicators and alarms for hydraulic power installations are to be available at the remote control station.

### **1.14 Compressed air systems**

**1.14.1** When required, the initial charge of starting air is to be controllable from the remote control station. No manual means of starting can be accepted.

Such initial charge of starting is to be demonstrated, to the satisfaction of the Surveyor.

**1.14.2** When required, all control and monitoring air systems are to be controllable from the remote control station.

### **1.15 Exhaust gas systems**

**1.15.1** Where a shut-off valve is fitted at the overboard discharge, means are to be provided to prevent the engine from being started when the valve is not fully open.

Moreover this valve is to be readily operable from the remote control station.

**1.15.2** When water-cooled exhaust gas pipes are used, a high temperature alarm must be fitted after the water injection device. Alternatively, an alarm for low sea water flow rate may be fitted.

These alarms are to be available at the remote control station.

### **1.16 Ventilation**

**1.16.1** When required, mechanical ventilating fans are to be capable of being stopped from the remote control station.

### **1.17 Sea trials records**

**1.17.1** The stopping times, unit headings and distances recorded on trials, together with the results of trials to determine the ability of units having multiple propellers to navigate and manoeuvre with one or more propellers inoperative, are to be available at the remote control centre for the use of the operator.

# Section 5 Electricity

## 1 Applicable requirements

### 1.1 Rules references

**1.1.1** Electricity of units assigned the notation **USV** are to be in accordance with the requirements of the Rule Note NR566, Chapter 3, taking into account the specific requirements in the present Section.

**1.1.2** The normal operational and habitable condition as defined in NR566, Ch 3, Sec 1, [3.14] is not to be considered and is to be superseded by the normal operational condition as defined in the present Rule Note.

### 1.2 Emergency source of electrical power

**1.2.1** The indicator showing whether the battery constituting the emergency source of electrical power is being discharged is to be available in the remote control station.

### 1.3 Insulation level to earth

**1.3.1** When required, means to monitor the insulation level to earth, including audible and visual indication of abnormally low insulation values, are to be available at the remote control station.

### 1.4 D.C. distribution system supplied from batteries

**1.4.1** When required, isolation switches are to be controllable from the remote control station.

### 1.5 Emergency distribution of electrical power

**1.5.1** The emergency source of electrical power is to be capable of supplying all essential services simultaneously, including the means of communication between the unit and the remote control centre, for a period to be defined by the designer, shipyard, manufacturer and/or shipowner in accordance with the operational limitations of the unit, but not less than 6 hours.

### 1.6 Navigation and signalling lights

**1.6.1** Navigation and signalling lights are to be controlled from the remote control station.

**1.6.2** Navigation and signalling lights are to be provided with an automatic indicator giving audible and/or visual warning at the remote control station in the event of failure.

### 1.7 General alarm

**1.7.1** The general alarm is to be heard in all parts of the remote control centre.

### 1.8 Internal communications

**1.8.1** Relaxations or alternative arrangements to the requirements in the aforementioned Rule Note may be accepted, subject to the agreement of the Flag or Naval Authorities, if they provide an equivalent level of safety in all normal circumstances.

### 1.9 Bilge level alarms

**1.9.1** An alarm is to be triggered at the remote control station in case of high water level in all spaces located below the load line.

### 1.10 Electrical protection

**1.10.1** When required, all circuit-breakers are to be controllable from the remote control station and position indicators are to be available.

**1.10.2** As a rule, use of fuses is not permitted.

**1.10.3** For emergency generators, the overload protection may, instead of disconnecting the generator automatically, give a visual and audible alarm at the remote control station.

**1.10.4** When required, the visual and audible alarm to be activated in case of load shedding is to be available at the remote control station.

**1.11 Instruments**

**1.11.1** When required, information provided by instruments (voltmeters, ammeters, frequency meters, insulation level monitoring, etc.) is to be available at the remote control station.

# Section 6                      Automation

## 1 Applicable requirements

### 1.1 Rules references

**1.1.1** Automation of units assigned the service notation **USV** are to be in accordance with the requirements of the Rule Note NR566, Ch 3, Sec 5 and NR566, Ch 3, Sec 6 taking into account the specific requirements in the present Section.

### 1.2 Design general requirements

**1.2.1** In addition to manual override, automated systems are to be controllable also from the remote control station. Failure of any part of such systems shall not prevent the use of override from the remote control station.

**1.2.2** Manual override must have priority over the override from the remote control station.

**1.2.3** Control and alarm systems are to have self-check facilities. In the event of failure, an alarm is to be activated also at the remote control station.

### 1.3 Control of machinery - general requirements

**1.3.1** The system of alarm displays and controls which readily allows identification of faults in the machinery is also to be provided at the remote control station.

**1.3.2** When required, alarms and indications for propulsion engines are to be also individual at the remote control station.

**1.3.3** A general fault alarm is to be provided at the remote control station for the diesel generator(s).

### 1.4 Control of propulsion machinery

**1.4.1** Under all sailing conditions, including manoeuvring, the speed, direction of thrust and, if applicable, the propeller pitch are to be fully controllable from the remote control station.

**1.4.2** The main propulsion machinery is to be provided with an emergency stopping device at the remote control station which is to be independent of the navigation control system.

In the event that there is no reaction to an order to stop, provision is to be made for an alternative emergency stop. This emergency stopping device may consist of a simple and clearly marked control device, for example a push-button. This fitting is to be capable of suppressing the propeller thrust, whatever the cause of failure may be.

**1.4.3** Remote control of the propulsion machinery is to be possible only from one location at a time.

At each location, there is to be an indicator showing which location is in control of the propulsion machinery.

The transfer of control from the remote control station and the machinery space is to be possible only in the propulsion machinery space or in the machinery control room where provided. This system is to include means to prevent the propelling thrust from altering significantly when transferring control from one location to another.

**1.4.4** The design of the remote control system is to be such that in case of its failure an alarm will be given.

Unless impracticable, the preset speed and direction of thrust of the propeller shall be maintained until a fail-safe sequence is in operation.

**1.4.5** Indicators are to be fitted at the remote control station for:

- a) propeller speed and direction of rotation in the case of fixed pitch propellers,
- b) propeller speed and pitch position in the case of controllable pitch propellers.

**1.4.6** Supply failure in propulsion plant remote control is to activate an alarm at the remote control station. This applies in particular in the case of loss of electric, pneumatic or hydraulic supply to the system.

**1.4.7** As a general rule, the remote control station is not to be overloaded by alarms and indications which are not required.

### 1.5 Power supply of automation systems

**1.5.1** Automation systems are to be arranged with an automatic change-over to a continuously available standby power supply in case of loss of the normal power source.

The change-over to the stand-by power supply is to be achieved without interrupting the alarm system which could be adversely affected by an interruption in power supply.

In case of normal supply by a charger or a d.c. generator, the associated battery may be considered as the standby power supply.

**1.5.2** The capacity of the standby power supply is to be sufficient to allow the normal operation of the alarm system for a minimum period of time to be defined in accordance with the operational limitations of the unit and for a minimum of at least half an hour.

**1.5.3** Failure of any power supply to an automation system is to generate an audible and visual alarm at the remote control station.

**1.5.4** Similar power supply arrangements are to be provided for the remote control centre.



# Section 7 Fire Safety

## 1 Applicable requirements

### 1.1 Rules references

**1.1.1** Fire safety of units assigned the service notation **USV** are to be in accordance with the requirements of the Rule Note NR566, Chapter 4, taking into account the specific requirements in the present Section.

### 1.2 Suppression of fire: detection and alarm

**1.2.1** A fixed fire detection and alarm system complying with the requirements of NR566, Ch 4, Sec 3, [5] is to be installed in all spaces of units assigned the service notation **USV**.

**1.2.2** The detection system is to initiate audible and visual alarms distinct in both respects from the alarms of any other system not indicating fire, to ensure that the alarms are heard and observed on the remote control station and by a responsible operator. The alarm is to sound in a place where a responsible operator is on duty.

**1.2.3** The fixed fire detection and fire alarm system is to include means of identifying each detector individually from the remote control station.

**1.2.4** The activation of any detector is to initiate a visual and audible fire signal at the control panel and indicating units. The control panel and indicating units are to be located on the remote control station.

If the signals have not received attention within two minutes, an audible alarm is to be automatically sounded throughout the remote control centre.

This alarm sounder system need not be an integral part of the detection system.

**1.2.5** Indication units are to be capable of indicating which detector has been activated.

**1.2.6** A visual monitoring of all spaces by at least one CCTV system is to be available on the remote control station.

### 1.3 Suppression of fire: containment of fire

**1.3.1** Subject to compliance with the present Section, no specific fire insulation is required for units assigned the service notation **USV**.

**1.3.2** The main inlets and outlets of all ventilation systems are to be capable of being closed from the remote control station. The means of closing are to be easily accessible as well as prominently and permanently marked and are to indicate whether the shut-off is open or closed.

**1.3.3** Power ventilation of any spaces is to be capable of being stopped from the remote control station.

**1.3.4** The controls required in NR566, Ch 4, Sec 4, [5.1.2], item c) are to be located at the remote control station.

Such controls and the controls for any required fire-extinguishing system are to be situated at one control position or grouped in as few positions as possible.

### 1.4 Suppression of fire: fire fighting

**1.4.1** All spaces of units assigned the service notation **USV** are to be provided with an approved fixed fire-extinguishing system. This fixed fire-extinguishing system is to be in accordance with the requirements of NR467, Pt C, Ch 4, Sec 15.

**1.4.2** Where a fixed gas fire-extinguishing system is used, openings which may admit air to (or allow gas to escape from) a protected space are to be capable of being closed from the remote control station.

**1.4.3** The fixed fire-extinguishing system is generally to be activated manually by the remote operator. However, automatic activation may be acceptable. In this case, ventilation fans stops, closure of openings and fuel oil pump stops are also to be activated automatically upon fixed fire-extinguishing system activation and means for manual activation of the system are to be additionally available for the operator at the remote control station.

**1.4.4** Subject to compliance with the present Section, no specific water supply systems are required for units assigned the service notation **USV**.

**1.4.5** As a rule, no paint locker, galley or deep-fat cooking equipment are considered on units assigned the service notation **USV**. Otherwise, they are to be subject to special consideration by the Society.

### **1.5 Escape**

**1.5.1** Relaxations or alternative arrangements to the requirements in Rule Note NR566 may be accepted, subject to the agreement of the Flag or Naval Authorities, if they provide an equivalent level of safety in all normal circumstances.

**1.5.2** In particular, the Society may dispense with one means of escape when the unit is intended to be unmanned in all normal circumstances.

### **1.6 Fire control plans**

**1.6.1** One copy of the fire control plans is at all times to be available in the remote control centre in an accessible position.

### **1.7 Protection of vehicle spaces**

**1.7.1** When required, the power ventilation system is to be separate from other ventilation systems and is to be capable of being controlled from the remote control station.

**1.7.2** Means is to be provided on the remote control station to indicate any loss of the required ventilating capacity.

**1.7.3** Arrangements are to be provided to permit a rapid shut-down and effective closure of the ventilation system from the remote control station in case of fire.

**1.7.4** If a fixed water spray system is installed, it is to be remotely controlled from the remote control station, including the isolating valve located outside the vehicle space.

# Section 8 Additional Requirements applicable to Naval Units

## 1 General

### 1.1 Scope

1.1.1 The requirements of this Section are applicable to naval surface units assigned the service notation **USV**

1.1.2 The requirements of this Section apply in addition to those specified in Sec 1 to Sec 7.

### 1.2 Identification

1.2.1 Relaxations or alternative arrangements may be accepted in lieu of the requirements for identification as given in the Guidance Note NI641, Sec 1, [2.4], subject to the agreement of the Naval or Flag Authorities, if they provide an equivalent level of safety in all normal circumstances.

### 1.3 Rules and regulations

1.3.1 Relaxations or alternative arrangements may be accepted in lieu of the requirements for applicable international conventions, as given in NI641, Sec 1, [3], subject to the agreement of the Naval or Flag Authorities, if they provide an equivalent level of safety in all normal circumstances.

### 1.4 Hazard identification

1.4.1 The hazard identification is to cover all possible sources of hazards potentially contributing to undesirable events or accidents.

1.4.2 The list of typical hazards as given in NI641, Sec 2, [2.3] is to be considered as a guidance and is to be extended with typical military risks such as:

- a) ammunition explosion,
- b) blast and recoil effects of weapons,
- c) temporary or permanent communication blackout due to discretion imperatives,
- d) etc.

1.4.3 The list of hazards is to be limited to normal operation in peace time.

### 1.5 Full redundancy

1.5.1 With the objective of ensuring that unmanned naval units accomplish their mission, full redundancy is to be the preferred solution in order to improve the availability of critical systems such as navigation, detection, communication, unit integrity, machinery and remote control.

### 1.6 Minimum communication link

1.6.1 Considering the possibility of temporary or permanent communication blackouts due to stealth imperatives, relaxations or alternative arrangements may be accepted in lieu of the requirements for minimum communication link as given in NI641, Sec 3, [8.2], subject to the agreement of the Naval or Flag Authorities, if they provide an equivalent level of safety in all normal circumstances.

### 1.7 Degraded modes

1.7.1 Depending on mission requirements, the ability of unmanned naval units to accomplish their mission is to be considered in the list of minimum functions to be performed in degraded modes as given in NI641, Sec 3, [8.3].

### 1.8 Structure in way of weapons systems

1.8.1 The structure in way of weapons systems is to be in accordance with the requirements of NR483, Pt D, Ch 6, Sec 2, [3.1].

### 1.9 Ammunition storage

**1.9.1** Arrangements for ammunition storage are to be in accordance with the requirements of NR483.

In particular:

- a) the cofferdam arrangement is to be in accordance with the requirements of NR483, Pt B, Ch 2, Sec 2, [2.2],
- b) the case of fire extinguishing by flooding as per NR483, Pt C, Ch 4, Sec 6 is to be taken into consideration,
- c) each ammunition space is to have a drainage system that is independent of the drainage systems for others spaces,
- d) except where not practicable, scuppers pipes are not to pass through ammunitions spaces,
- e) air pipes are to be in accordance with the requirements of NR483, Pt C, Ch 1, Sec 10, [9.1],
- f) the fire detection and alarm of ammunitions spaces is to be in accordance with the requirements of NR483, Pt C, Ch 4, Sec 3, [5.1].

Information concerning the surveillance and monitoring thresholds for temperature and temperature gradient is to be clearly indicated on the outside of main access points to these spaces and is to be available on the remote control station.



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