ANNEX 21

DRAFT RESOLUTION MSC.333(90)
(adopted on 22 May 2012)

ADOPTION OF REVISED PERFORMANCE STANDARDS FOR SHIPBORNE VOYAGE DATA RECORDERS (VDRs)

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO resolution A.886(21), by which the Assembly resolved that the function of adopting performance standards and technical specifications, as well as amendments thereto shall be performed by the Maritime Safety Committee and/or the Marine Environment Protection Committee, as appropriate, on behalf of the Organization,

RECALLING FURTHER that, by resolution A.861(20), the Assembly, at its twentieth session, adopted *Performance standards for shipborne voyage data recorders (VDRs)*, which were amended by resolution MSC.214(81), adopted by the Committee, at its eighty-first session,

RECOGNIZING the need to revise the performance standards for VDRs to assist in investigations into casualties,

HAVING CONSIDERED the recommendation by the Sub-Committee on Safety of Navigation, at its fifty-seventh session,

1. ADOPTS the Revised Recommendation on performance standards for voyage data recorders (VDRs), set out in the annex to the present resolution;

2. RECOMMENDS Governments to ensure that VDRs:

.1 if installed on or after 1 July 2014, conform to performance standards not inferior to those specified in the annex to the present resolution; and

.2 if installed before 1 July 2014, conform to performance standards not inferior to those specified in the annex to resolution A.861(20), as amended by resolution MSC.214(81).

ANNEX

RECOMMENDATION ON PERFORMANCE STANDARDS FOR SHIPBORNE VOYAGE DATA RECORDERS (VDRs)

1 PURPOSE

The purpose of a voyage data recorder (VDR) is to maintain a store, in a secure and retrievable form, of information concerning the position, movement, physical status, command and control of a ship over the period leading up to and following an incident having an impact thereon. Information contained in a VDR should be made available to both the Administration and the shipowner. This information is for use during any subsequent safety investigation to identify the cause(s) of the incident.

2 APPLICATION

A VDR with capabilities not inferior to those defined in these performance standards is required to be fitted to ships of classes defined in SOLAS chapter V, as amended.

3 REFERENCES

3.1 IMO resolutions:

- A.694(17) General requirements for shipborne radio equipment forming part of the GMDSS and for electronic navigational aids;
- A.810(19) Performance standards for float-free satellite emergency position-indicating radio beacons (EPIRBs) operating on 406 MHz; and
- A.1021(26) Code on Alerts and Indicators, 2009.

3.2 IMO circular:

- MSC/Circ.982 Guidelines on ergonomic criteria for bridge equipment and layout.

4 DEFINITIONS

4.1 *Voyage data recorder (VDR)* means a complete system, including any items required to interface with the sources of input signals, their processing and encoding, the final recording medium, the playback equipment, the power supply and dedicated reserve power source.

4.2 *Signal source* means any sensor or device external to the VDR, to which the VDR is connected and from which it obtains signals and data to be recorded.

4.3 *Final recording medium* means the items of hardware on which the data is recorded such that access to any one of them would enable the data to be recovered and played back by use of suitable equipment. The combination of a fixed recording medium and float-free recording medium and long-term recording medium, together, is recognized as the final recording medium.

4.4 *Fixed recording medium* means a part of the final recording medium which is protected against fire, shock, penetration and a prolonged period on the ocean floor. It is expected to be recovered from the deck of the ship that has sunk. It has a means of indicating location.

4.5 *Float-free recording medium* means a part of the final recording medium which should float-free after a sinking. It has a means of indicating location.

4.6 *Long-term recording medium* means a permanently installed part of the Final Recording Medium. It provides the longest record duration and has a readily accessible interface for downloading the stored data.

4.7 *Playback equipment* means any data medium with the playback software, the operational instructions and any special parts required for connecting a commercial off-the-shelf laptop computer to the VDR.

4.8 *Playback software* means a copy of the software program to provide the capability to download the stored data and play back the information. The software should be compatible with an operating system available with commercial off-the-shelf laptop computers and where non-standard or proprietary formats are used for storing the data in the VDR, the software should convert the stored data into open industry standard formats.

4.9 *Dedicated reserve power source* means a battery, with suitable automatic charging arrangements, dedicated solely to the VDR, of sufficient capacity to operate it as required by 5.4.2.

4.10 *Configuration data* describes the vessel's equipment, its installation on the vessel and its relation to the VDR. The storage and playback software uses this data to store the data record and to convert the data record into information that assists casualty investigation during playback.

5 OPERATIONAL REQUIREMENTS

5.1 General

5.1.1 The VDR should continuously maintain sequential records of preselected data items relating to the status and output of the ship's equipment, and command and control of the ship, referred to in 5.5.

5.1.2 To permit subsequent analysis of factors surrounding an incident, the method of recording should ensure that the various data items can be co-related in date and time during playback on suitable equipment.

5.1.3 The system should include functions to perform a performance test at any time, e.g. annually or following repair or maintenance work to the VDR or any signal source providing data to the VDR. This test may be conducted using the playback equipment and should ensure that all the required data items are being correctly recorded.

5.1.4 The design and construction, which should be in accordance with the requirements of resolution A.694(17) and international standards acceptable to the Organization[1], should take special account of the requirements for data security and continuity of operation as detailed in 5.3 and 5.4.

[1] Refer to publication IEC 60945 – Maritime navigation and radiocommunication equipment and systems – General requirements, methods of testing and required test results.

5.2 Final recording medium

The final recording medium should consist of the following items:

.1 fixed recording medium;

.2 float-free recording medium; and

.3 long-term recording medium.

5.2.1 Fixed recording medium

The fixed recording medium should be installed in a fixed protective capsule which should meet all of the following requirements:

.1 be capable of being accessed following an incident but secure against a physical or electronically manipulated change or deletion of recorded data;

.2 maintain the recorded data for a period of at least two years following termination of recording;

.3 maximize the probability of survival against fire, shock, penetration and deep-sea-pressure and recovery of the final recorded data after any incident;

.4 be of a highly visible colour and marked with retro-reflective materials; and

.5 be fitted with an appropriate device to aid location under water.

5.2.2 Float-free recording medium

The float-free recording medium should be installed in a float-free capsule which should meet all of the following requirements:

.1 be fitted with means to facilitate grappling and recovery;

.2 maintain the recorded data for a period of at least six months following termination of recording;

.3 be so constructed as to comply with the requirements specified in resolution A.810(19) and to minimize risk of damage during recovery operations;

.4 be capable of transmitting an initial locating signal and further locating homing signal for at least 48 hours over a period of not less than seven days/168 hours; and

.5 be capable of being accessed following an incident but secure against a physical or electronically manipulated change or deletion of recorded data.

5.2.3 Long-term recording medium

The long-term recording medium should:

.1 be capable of being accessed from an internal, easily accessible area of the ship; and

.2 provide access to the data held on it but be secured against a physical or electronically manipulated change or deletion of recorded data.

5.3 Data selection and security

5.3.1 The minimum amount of data items to be recorded by the VDR is specified in 5.5. Optionally, additional items may be recorded provided that the requirements for the recording and storage of the specified selections are not compromised.

5.3.2 The equipment should be so designed that, as far as is practical, it is not possible to manipulate the amount of data being recorded by the VDR, the data itself nor the data which has already been recorded. Any attempt to interfere with the integrity of the data or the recording should be recorded.

5.3.3 The recording method should be such that each item of the recorded data is checked for integrity and an alarm given if a non-correctable error is detected.

5.4 Continuity of operation

5.4.1 The VDR should be capable of operating from the ship's main and emergency source of electrical power.

5.4.2 If the ship's source of electrical power supply fails, the VDR should continue to record Bridge Audio (see 5.5.5) from the dedicated reserve power source for a period of 2 hours. At the end of this 2 hour period all recording should cease automatically.

5.4.3 Recording should be continuous unless terminated in accordance with 5.4.2. The time for which all stored data items are retained should be at least 30 days/720 hours on the long-term recording medium and at least 48 hours on the fixed and float-free recording media. Data items which are older than this may be overwritten with new data.

5.5 Data items to be recorded

5.5.1 Date and time

Date and time, referenced to UTC, should be obtained from a source external to the ship and an internal clock should be synchronized with valid date and time data. During times of a loss of the external source, the internal clock should be used. The recording should indicate which source is in use. The recording method should be such that the timing of all other recorded data items can be derived on playback with a resolution and continuity sufficient to reconstruct the history of the incident in detail.

5.5.2 Ship's position

Latitude and longitude, and the datum used, should be derived from an electronic position-fixing system (EPFS). The recording should ensure that the identity and status of the EPFS can always be determined on playback.

5.5.3 Speed

Speed through the water and speed over the ground, including an indication of which it is, derived from the ship's speed and distance measuring equipment, as required by SOLAS regulations.

5.5.4 Heading

Heading as indicated by the ship's heading source.

5.5.5 Bridge audio

Microphones should be positioned on the bridge covering all work stations as described in MSC/Circ.982 so that conversation is recorded. The recording should be such that, on playback, a normal speaking voice should provide adequate intelligibility while the ship is performing its normal operations. This performance should be maintained at all work stations while there is a single audio alarm anywhere on the bridge or any noise, including noise from faulty equipment or mounting, or wind. This should be achieved through the use of at least two channels of audio recording. Microphones positioned outside on bridge wings, should be recorded on at least one additional separate channel.

5.5.6 Communications audio

VHF communications relating to ship operations should be recorded on an additional separate channel to those referred to in 5.5.5.

5.5.7 Radar

The electronic signals of the main displays of both ship's radar installations as required by SOLAS regulations. The recording method should be such that, on playback, it is possible to present a faithful replica of the entire radar display that was on view at the time of recording, albeit within the limitations of any bandwidth compression techniques that are essential to the working of the VDR.

5.5.8 ECDIS

Where a vessel is fitted with an ECDIS installation, the VDR should record the electronic signals of the ECDIS display in use at the time as the primary means of navigation. The recording method should be such that, on playback, it is possible to present a faithful replica of the entire ECDIS display that was on view at the time of recording, albeit within the limitations of any bandwidth compression techniques that are essential to the working of the VDR and in addition the source of the chart data and the version used.

5.5.9 Echo sounder

The depth information. This should include, where available, depth under keel, the depth scale currently being displayed and other status information.

5.5.10 Main alarms

This should include the status of all mandatory alarms on the bridge[2] or as received from the Bridge Alert Management System, if installed, recorded as individually identified alarms.

[2] Resolution A.1021(26), *Code on Alerts and Indicators, 2009*, table 10.1.1.

5.5.11 Rudder order and response

This should include status and settings of heading or track controller, if fitted and indicate the control station, mode, and power unit(s) in use.

5.5.12 Engine and thruster order and response

This should include the positions of any engine telegraphs or direct engine/propeller controls and feedback indications on the bridge, if fitted, including ahead/astern indicators and indicate the control station in use. This should also include any thrusters if fitted and indicate the control station in use.

5.5.13 Hull openings status

This should include all mandatory status information required to be displayed on the bridge.

5.5.14 Watertight and fire door status

This should include all mandatory status information required to be displayed on the bridge.

5.5.15 Accelerations and hull stresses

Where a ship is fitted with hull stress and response monitoring equipment, all the data items that have been pre-selected within that equipment should be recorded.

5.5.16 Wind speed and direction

Where a ship is fitted with a suitable sensor, wind speed and direction should be recorded, including its true or relative status.

5.5.17 AIS

All AIS data should be recorded.

5.5.18 Rolling motion

The VDR should be connected to an electronic inclinometer if installed. The recording method should be such that the rolling motion can be reconstructed during playback.

5.5.19 Configuration data

In addition to the data items specified in 5.5.1 to 5.5.18, a data block defining the configuration of the VDR and the sensors to which it is connected should be written into the final recording medium during commissioning of the VDR. The data block should be maintained up to date with respect to the vessel installation. It should include details on the manufacturer, type and version number of a sensor, the identification and location of the sensor and the interpretation of the sensor data. This configuration data should be permanently retained in the final recording media and protected from modification other than by a duly authorized person following any change to the configuration.

5.5.20 Electronic logbook

Where a ship is fitted with an electronic logbook in accordance with the standards of the Organization the information from this should be recorded.

6 OPERATION

The unit should be entirely automatic in normal operation.

7 DOCUMENTATION

Information describing the location of the long-term recording medium interface and instructions describing the means of interfacing with it as referred to in 9 should be provided in at least the English language. The equipment documentation should include guidance for the placement of the information and instructions at a prominent position as close to the long-term recording medium interface as practicable.

8 INTERFACING

Interfacing to the various signal sources required should be in accordance with the relevant international interface standard, where possible[3]. Any connection to any item of the ship's equipment should be such that the operation of that equipment suffers no deterioration, even if the VDR system develops faults.

9 DOWNLOAD AND PLAYBACK EQUIPMENT FOR INVESTIGATION AUTHORITIES

9.1 Data output interface

The VDR should provide an interface for downloading the stored data and play back the information to an external computer. The interface should be compatible with an internationally recognized format, such as Ethernet, USB, FireWire, or equivalent. It should be possible to perform a download of the recorded data for a user-defined period of time.

9.2 Software for data downloading and play back

9.2.1 A copy of the software program providing the capability to download the stored data and play back the information onto a connected external laptop computer and for the playback of the data should be provided for each VDR installation.

9.2.2 The software should be compatible with an operating system available with commercial-off-the-shelf laptop computers and provided on a portable storage device such as a CD-ROM, DVD, USB-memory stick, etc.

9.2.3 Instructions for executing the software and for connecting the external laptop computer to the VDR should be provided.

9.2.4 The portable storage device containing the software, the instructions and any special (not commercial off-the-shelf) parts necessary for the physical connection of the external laptop computer, should be stored within the main unit of the VDR.

9.2.5 Where non-standard or proprietary formats are used for storing the data in the VDR, the software for converting the stored data into open industry standard formats should be provided on the portable storage device or resident in the VDR.

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[3] Refer to publication IEC 61162 – Maritime navigation and radiocommunication equipment and systems – Digital interfaces.