

New VDR rules trigger maintenance reboot

Like the black boxes carried on aircraft, the Voyage Data Recorders (VDRs) carried on ships are crucial for accident investigators, providing them the means to review procedures and instructions in the moments leading up to and immediately after an incident. They are pretty much indispensable for determining what caused an accident and hopefully preventing its recurrence.

VDRs are built to store information on the position, movement, physical status, command and control of a ship in a secure and retrievable form. Following an incident, the information it contains must be made available to both the authorities and the shipowner.

IMO regulations require that they are fitted to passenger ships and other vessels 3000gt or larger constructed on or after 1 July 2002. Meanwhile cargo ships constructed before this date must be equipped with a simplified VDR (S-VDR).

Revised requirements

In May 2012 IMO's Maritime Safety Committee adopted a revised recommendation - MSC.333(90) - on performance standards for VDRs, which is due to enter force on 1 July 2014. New requirements defined in the document are outlined below:

- ▶ Data shall be recorded in a fixed capsule, a float-free capsule and internally in the VDR (opposed to just a fixed capsule);
- ▶ Data shall be recorded for minimum 48 hours in both capsules (opposed to 12 hours in the fixed capsule)

In advance of IMO's revised performance standard entering into force, Danelec has overhauled the design of its voyage data recorder to make servicing easier

and 30 days internally in the VDR;

- ▶ Bridge audio shall be recorded using at least two tracks for indoor microphones. Outdoor microphones (where applicable) shall be recorded on an additional separate track. The current standard is not very specific regarding this. The new standard also specifies that audible alarms and noise on the vessel shall not prevent the VDR from recording audio properly;
- ▶ Images, chart(s) used and settings from the ECDIS shall be recorded;
- ▶ Images from both radars - X-band and S-band - on the vessel shall be recorded (as opposed to just one);
- ▶ Data from the AIS shall be recorded; and

- ▶ Data from an inclinometer shall be recorded if installed.

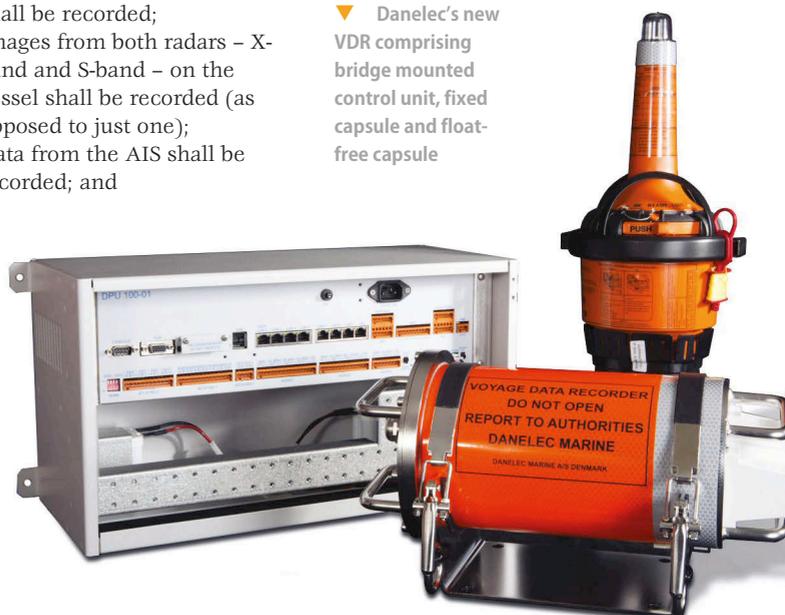
An additional requirement in IEC 61996-1 Ed.2 stipulates that the VDR should not generate audible alarms. Instead, the crew or a service technician shall be able, on demand, to initiate a self-test of the VDR and be able to read the result without having to use any additional equipment.

Costly debate

Some flag states argued that the cost of retrieving a fixed capsule from deep water can sometimes be prohibitive and that consequently investigators will end up having precious little data available to pursue an accident investigation.

It was concluded that the addition of a float-free capsule would bring an extra degree of redundancy and reduce the likelihood of this scenario. Addition-

▼ Danelec's new VDR comprising bridge mounted control unit, fixed capsule and float-free capsule





ally, the float-free capsule can replace or act as an EPIRB. However, it should be noted that the float-free capsule does not have to be built to the same survivability standards as a fixed capsule. It would not, for instance, withstand a prolonged fire.

Autosave activated

The current concept of having someone to initiate a save of data in the capsule following an incident was found to be counterintuitive. Moreover most vessels - even those that have sustained severe damage in an incident - have typically been able to supply power to the VDR for more than 10 hours after the event. Consequently the data from the critical minutes at the time of the incident gets overwritten. Increasing the recording time to 48 hours in the capsules and to 30 days internally in the VDR is believed to cover all likely scenarios following an incident.

Over time a number of problems relating to the quality of audio recordings from VDRs were discovered. It was found that too many microphones are mixed together on too few recording tracks and that low frequency 'out-of-band' noise often interfered with the recordings. Additionally the codec (Ed: algorithm) used for the audio compression was not suited for compressing voice with a high level background noise. Requirements in

the updated standard are intended to address all these issues.

Another area of contention was whether or not an inclinometer for measuring a vessel's rolling motion and roll period ought to become a carriage requirement. A compromise was reached whereby the information - invaluable for post-incident investigations - is recorded only if the vessel is fitted with such a device. It is not compulsory.

Failure mode

The original standard specifies that if a VDR malfunctions, it should generate an audible alarm which crew must acknowledge. Further, an indicator shall become red as long as the problem exists and until the crew fix the problem or call for assistance.

In practice, this didn't work out as it should have. The VDR would generate numerous false alarms, for instance, if equipment responsible for feeding it data was switched off. If a GPS fails, crew do not benefit by having to contend with two alarms at the same time. The audible alarms have been crossed out of the revised standard, which now requires only a red indicator to show something is wrong. Further the user interface to the VDR shall facilitate that the crew or a service technician can start a self-test of the VDR and read the result without having to use any special equipment.

▲ The hot swappable memory card simplifies maintenance

These changes won't necessarily prevent vessels from sailing with a defective VDR, but on vessels where appropriate procedures are implemented there is a much greater chance of having a functional VDR.

Timely upgrade

Danelec was one of the first companies to bring to market IMO-compliant VDRs and Simplified VDRs (S-VDRs) in 2002. Today more than 5500 vessels are equipped with the company's data recorders. Ahead of the IMO rule change, it has introduced its third-generation model, the DM100.

'It meets all the new requirements listed in MSC.333(90) including a float-free capsule, 48-hour data storage in both the protective fixed capsule and float-free capsule, separate audio track for outdoor microphones, as well as data recording from the ship's ECDIS, both radars, AIS and inclinometer,' says Hans Ottosen, chief-exec of the Danish firm.

But of course it does. It has to. However Danelec hopes that shipowners will be swayed by its new approach to product servicing: SoftWare Advanced Protection (SWAP) technology. The servicing and repair of shipboard electronics has long held a reputation for being a time consuming and expensive business.

Put simply, the SWAP concept is based on saving vessel-specific configuration files on a memory card which can be swapped in and out of a 'generic' hardware shell (actually a full-fledged computer designed specifically for use in VDRs).

The new approach offers a number of benefits, explains Ottosen. 'Most important are the time savings. Repairs can be carried out in a matter of hours, not days. This keeps the ship on schedule, eliminating in-port delays and financial penalties. Furthermore, the use of hot-swappable memory cards reduces the risk of data being lost during the repair.'

According to Ottosen, the traditional service scenario goes something like this: 1) the ship experiences problems with a vital piece of electronics and schedules a service call at the next port; 2) service technicians meet the ship to troubleshoot the problem and determine what spares are needed to make the repair; 3) they leave the ship to obtain the parts. If they are not available locally, the parts must be ordered and it could take several days for them to arrive; 4) the service technicians return to the ship to make the repairs.

Even after the repair has been completed, it could take several further hours of repro-

gramming, reloading software and reconfiguring files before the unit can be reactivated. In the meantime, Port State Control authorities may delay the ship's departure, resulting in expensive demurrage and port costs. If the ship is allowed to sail, the spares must be delivered to its next port, requiring a second service call to complete the repairs. Either way, the process is slow and expensive.

Danelec's SWAP products are designed so that all system configuration and programming data are saved automatically onto a memory card, which slides into a slot in the front of the data processing unit. The memory card can be moved to a replacement

unit, transferring all the programming and configuration files and thus eliminating the need for reloading files manually.

With a SWAP-enabled unit, following a request for a service call, the service technician brings a new unit when boarding the ship. He disconnects and removes the old unit, inserts the new one in its place and slides the memory card from the old VDR into the slot on the front of the replacement.

The old unit is then taken ashore for repair without holding up the ship's departure. The entire procedure is accomplished in just a few hours with a single service call, and the ship sails on time. 

Maximising the safety dividend

 Cruise ship operator Holland America Line has retrofitted voyage data recorders (VDRs) from Interschalt across its fleet of 15 ships. The vessels have been equipped with the German firm's G4 model ahead of the incoming changes to VDR rules.

A distinguishing feature of the G4 is its ability to transmit back to shore the ship's position, data from the conning display and from alarm systems. It also records the status of the vessel's watertight doors, which for large cruise ships like those operated by Holland America could be vital in an emergency situation.

This information is automatically funnelled by satellite to Holland America Line's command and emergency response centre (ERC) in Seattle. The op-

erator's nautical superintendent Steve Nevey says the process contributes to improved safety: 'Our ERC now receives more standardised data for processing and receives it much more quickly!' The same information can of course be accessed by the Captain and other officers aboard ship via a standard PC or, if away from the bridge, via smartphone.

A replay facility is an integral requirement of IMO's original VDR performance standards. 'Following a non-catastrophic incident, this allows port authorities to board the ship and quickly download a record of events leading up to the incident. That much is mandatory,' Interschalt chief technical officer Rainer Twisterling told *MITE*. 'But if we are already collecting this data, then why not give shore-based managers access to it too? For them, even data from normal operations can provide valuable insights,' he explains.

As might be expected, the system is constrained by the availability of bandwidth over satellite. For instance, at the moment, feeds from the bridge system displays are not routinely transmitted.

Holland America Line isn't the only passenger ship operator to deploy the system. Twisterling reveals that AIDA Cruises has also implemented the system, with data from ships flowing back to its fleet operations centre in Rostock, Germany.

Another feature of the G4's online monitor is its corridor tracking tool. Twisterling explains: 'After an officer plans a voyage from A to B on his ECDIS, it is pinged back to fleet operation centre, where a safety corridor is defined around the intended passage. If the vessel for some reasons strays beyond the perimeters of this corridor, relevant personnel are alerted to the situation.'

Twisterling believes that shipowners don't always consider the full potential of mandatory safety equipment. 'The tendency is to treat it solely as a cost. But that is short-sighted. VDRs by definition are continually recording data from mission-critical systems aboard a vessel. Therefore it makes sense to harness this information in ways that will bring positive benefits to ship operation!' 

▼ Holland America's 2000-plus passenger *Eurodam* will be equipped with a data recorder from Interschalt

