



Maritime and Coastguard Agency

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## ADVICE ON THE DANGERS OF FLOODING OF FORWARD COMPARTMENTS

Notice to Masters, Owners and Managers of ships.

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### *Summary*

This MGN draws attention to precautionary measures against dangers through flooding of forward compartments.

#### Key Points

- The principal advice is aimed at masters, but owners and managers should be aware of the same information and should examine their Safety Management Systems. Where necessary, such systems should be updated to incorporate appropriate procedures.
- The advice derives directly from the findings of the Re-opened Formal Investigation into the loss of m.v. **Derbyshire**, but other losses have been identified as being probably due to similar flooding. This includes small as well as large ships.
- Although the advice is aimed generally at all ships, bulk carriers are recognised as more vulnerable to the consequences of flooding than other ship types.

1. The Maritime Safety Committee of IMO, at its seventy-fourth session (30 May to 8 June 2001) considered the recommendations of the Re-opened Formal Investigation (RFI) into the loss of the motor vessel **Derbyshire**, carried out by the United Kingdom<sup>1</sup>. In particular the judge presiding over the RFI recommended that masters should be made fully aware of the possible dangerous consequences of water entry into forward spaces and any resultant reduction of freeboard.
2. The committee approved the publication of a circular proposed by UK in the form of MSC/Circ.995, which is attached at the ANNEX to this note.
3. As well as precautionary measures to be taken on board, the circular seeks to involve ship managers with a view to improving their knowledge concerning the whereabouts of their ships. The search for **Derbyshire** was hindered by lack of information regarding her position. Since that time communications have improved and daily reporting need not be the difficult process that it often was in the days when only terrestrial radio was available. The advice in the note concerning reporting when weather deteriorates could be incorporated into any reporting system. It was the opinion of the judge in the case of the **Derbyshire** investigation that such reports should be made daily. Managers are strongly recommended to incorporate daily reporting into their procedures.

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1. REPORT OF THE RE-OPENED FORMAL INVESTIGATION INTO THE LOSS OF THE MV DERBYSHIRE. THE HONOURABLE MR JUSTICE COLMAN. HER MAJESTY'S STATIONERY OFFICE. ISBN 0 11 702530 5

4. Evidence of bulk carrier casualties indicates that rapid sinking is a feature in ships carrying heavy cargoes. For this reason improved early warning has been identified as a useful contribution in saving the ship and ultimately the lives of the seafarers manning her. On many ships, bilge alarm systems are already fitted. It is strongly recommended that, in the absence as yet of any regulatory requirement, owners should fit bilge alarms in forward

compartments or in any other compartment deemed to influence to a significant extent, the ship's condition in the event of water ingress. Any such alarm should sound in a space that is permanently manned when the ship is at sea. Although aimed primarily at bulk carriers, this recommendation is considered to be sound advice for any ship type where compartments are in remote locations that are difficult or impossible to reach during adverse weather.

Maritime and Coastguard Agency  
Load Line and Cargo Ship Safety Branch  
Spring Place  
Commercial Road  
Southampton SO15 1EG

Tel: 023 8032 9530  
Fax: 023 8032 9161

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## ANNEX

### ADVICE ON THE DANGERS OF FLOODING OF FORWARD COMPARTMENTS

The capesize Oil Bulk Ore Carrier MV DERBYSHIRE sank off Okinawa in Typhoon ORCHID in September 1980 with the loss of 44 lives. The cause of her sinking remained a mystery until 1994 when, using modern deep-sea underwater techniques an expedition located the wreck. This preliminary expedition led to a detailed survey of the wreck in 1997 which revealed aspects of the sinking that showed – after subsequent research using testing tank models – that the initial cause of sinking was progressive flooding of forward spaces.

The DERBYSHIRE initially suffered damage to the air pipes serving the fore peak tank and the forward bosun's store. The damage was attributed to the impact of heavy seas on air pipes and, possibly, the displacement of the starboard windlass, which then caused further damage.

The research that was commissioned subsequent to the findings at the wreck site showed that large volumes of water can be taken in through damaged air pipes of the size and type typically fitted to bulk carriers and tankers to serve forward tanks. Flooding rates in excess of 400 cubic metres per hour through a single 300 mm air pipe were found to be possible in relatively heavy but by no means extreme seas.

Flooding of the fore peak and the forward ballast tank through air pipes caused the ship to trim by the head and reduce the effective bow height. Statistical analysis of tank test results indicated that, although there was a low probability of the ship meeting a hatch-breaking wave in her intact condition, a reduction in bow height of as little as 1.1m could lead to a 70% probability of encountering a hatch-breaking wave (depending on speed, etc). The hatch covers of No. 1 and 2 cargo holds subsequently failed allowing rapid flooding of those spaces. The ship was then in a condition beyond its survival capability.

The evidence considered by the investigation indicated that these events took place rapidly. There was no evidence that any attempt to abandon ship had been possible. The events took place almost certainly at night and it was concluded that in such circumstances the ship's crew would have been unlikely to have detected the impending disastrous circumstances until the ship was already doomed.

Masters – particularly those who sail on large ships where the bridge is remote from the forward spaces – need to be especially vigilant that the weathertight integrity of their ship is fully maintained. After initial battening down, regular checks should be made to detect any reduction in the integrity of the closing arrangements. In particular:

- Spaces that are entered on routine basis should be subject to a careful check after their use to ensure that watertight integrity is fully restored.
- Rope and other hatches should have their fixing arrangements checked to compensate for any slackening of toggles or other fixing devices.
- Bilges and tanks should be regularly sounded and any ingress of water investigated.
- Where bilge alarms are fitted, they should be regularly tested.
- Pumping arrangements for forward spaces should be regularly checked for operational effectiveness.

Owners of ships without bilge alarms in remote forward spaces should consider fitting such devices with audible and visual indication on the bridge.

Masters should consider early evasive action in the event that severe weather systems approach the region in which the ship is navigating. Due regard should be had for the handling characteristics of the ship and any limitations of control that may lead to the ship being dangerously exposed to the forces of such extreme weather.

Masters should keep owners or managers advised when weather conditions deteriorate necessitating evasive action. Such advice should include position, course and speed and should be given more frequently in proportion to the severity of the weather and the limitations imposed on the ship's progress.

