Report on the investigation of

flooding of the forward machinery space of

***P&OSL Canterbury***

as she entered Dover Harbour

on 17 May 2001

Marine Accident Investigation Branch
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**Report No 16/2002**
**April 2002**

**The Merchant Shipping**

**(Accident Reporting and Investigation)**

**Regulations 1999**

The fundamental purpose of investigating an accident under these Regulations is to determine its circumstances and the cause with the aim of improving the safety of life at sea and the avoidance of accidents in the future. It is not the purpose to apportion liability, nor, except so far as is necessary to achieve the fundamental purpose, to apportion blame

## CONTENTS

## GLOSSARY

| | | |
|---|---|---|
| MARPOL | - | International Convention for the Prevention of Pollution from Ships |
| MCA | - | Maritime and Coastguard Agency |
| MCR | - | Machinery control room |
| P&OSL | - | P & O Stena Line |
| ro-ro | - | roll on - roll off |

## SYNOPSIS

During the morning of 18 May 2001, a Maritime and Coastguard Agency (MCA) surveyor reported to the MAIB that the ro-ro ferry *P&OSL Canterbury*, had suffered flooding of her forward machinery space while entering Dover Harbour the previous day. The MAIB began an investigation immediately.

At 0948 on 17 May 2001, *P&OSL Canterbury* sailed from Calais, France, for Dover with 151 passengers, 116 crew, 41 freight vehicles and 37 other vehicles on board. Her entry into Dover Harbour was delayed but, at 1242, preparations began for Dover arrival. At 1244 a 'high bilge' alarm activated, indicating a high level of water in a catering stores space bilge. The necessary bilge valves were opened and the port emergency bilge pump started from the machinery control room (MCR).

At 1245 another 'high bilge' alarm activated, this time for the forward machinery space. An engineer left the MCR to investigate, while the remaining watchkeeping engineer changed over bilge suctions remotely, to pump from the forward machinery space using the port emergency bilge pump. This emergency bilge pump is in the forward machinery space, a comparatively small watertight space below the main vehicle deck.

The engineer found the forward machinery space filling with water. Other staff were called to assist. The flooding continued until the starter for the port emergency bilge pump's motor became affected by the floodwater. Another bilge pump was started, and at that stage, the level of the floodwater appeared to stabilise. There was no immediate threat to the vessel's safety.

The vessel entered harbour, berthed safely and all passengers and cargo were disembarked. Divers were employed to blank off the single overboard discharge from the forward machinery space, and salvage pumps were used to pump out the space.

Investigation found that a test valve on the discharge line from the emergency bilge pumps had been left open. Also, the overboard discharge valve from this line had no non-return capability. This arrangement allowed water to backflood from the sea when the pump was prepared to pump the bilges.

Since this incident, the owners have fitted a non-return valve to the overboard discharge line from the emergency bilge pumps. They have also supplemented onboard instructions for using the pumps' test line.

The MAIB recommends that the owners reposition the starters for the emergency bilge pumps so that they cannot be affected by flooding. They are also recommended to consider connecting the emergency bilge pumps' test line to a holding tank, or similar, so that it need not discharge to the bilges.

The MCA is recommended to address, as a matter of urgency, the delay in approving the stability information of this and possibly other UK-flagged ro-ro vessels.

Photograph courtesy of FotoFlite


*P&OSL Canterbury*

# SECTION 1 - FACTUAL INFORMATION

## 1.1 PARTICULARS OF VESSEL AND INCIDENT

| | | |
|---|---|---|
| Vessel name | : | *P&OSL Canterbury*<br>Formerly *Stena Fantasia –99*<br>*Fantasia – 90*<br>*Fiesta – 90*<br>*Tzarevetz –88*<br>*Scandinavia - 82* |
| Port of choice | : | Dover |
| Type | : | Ro-ro passenger |
| Official number | : | 715381 |
| Gross tonnage | : | 25,122 |
| Displacement | : | 15,710 tonnes |
| Length | : | 163.51m |
| Built | : | 1980 |
| builders | : | Kockums Vary AB<br>Malmo<br>Sweden |
| Owner | : | P&O Stena Line<br>Channel House<br>Channel View Road<br>Dover<br>Kent<br>CT17 9TJ |
| Classification Society | : | Lloyd's Register |
| Position of incident | : | Approaches to Dover Harbour, UK |
| Date and time | : | 17 May 2001 at 1245 |
| Damage | : | Water ingress to electrical equipment |
| Injuries | : | Nil |

## 1.2 BACKGROUND

Built as a ro-ro cargo ferry in 1980, the vessel underwent major conversion to a ro-ro passenger ferry in 1989/90. During conversion, the bilge pumping system was modified with the installation of two submersible bilge pumps in the forward machinery space.

On 30 June 1998, the vessel, while named *Stena Fantasia*, transferred to the UK flag from the Bahamian registry with the port of choice being Dover. Her name was changed to *P&OSL Canterbury* on 8 January 1999, but she remained under the UK flag with Dover as the port of choice.

During October 2000, a test line and valve were fitted to the discharge line of the emergency bilge pumps, allowing the pumps' output to be directed into the bilge space of the forward machinery space. The objective was to allow the pumps to run and be tested under near operating conditions, without discharging potentially polluting liquid overboard.

During November and December 2000, she underwent survey for the renewal of her Passenger Ship Safety Certificate. This work was performed in Falmouth, UK.

At that survey, the attending MCA surveyor requested that a padlock and chain be fitted to the emergency bilge pumps' test valve.

## 1.3 NARRATIVE

At 0948 on 17 May 2001, *P&OSL Canterbury* sailed from Calais, France, with 151 passengers, 116 crew, 41 freight vehicles and 37 other vehicles on board.

When 5 miles from Dover, at 1110, four vessels were ahead of her, so she hove-to to await berthing instructions. The wind was SW, 45 to 55knots, and the port stabiliser fin was in use. The starboard fin was out of service.

The engine room staff were given 15 minutes notice of stand-by for Dover arrival at 1242.

Two minutes later a 'high bilge' alarm activated, indicating a high bilge level in a catering stores space. The bilge suction to this compartment was opened, as were the overboard discharge from the emergency bilge pumps and the intervening valves in the system. The port emergency bilge pump was started from the MCR.

At 1245, another 'high bilge' alarm activated, this time for the forward machinery space. The third engineer left the MCR to investigate, while the remaining watchkeeping engineer changed over bilge suctions remotely to pump from the forward machinery space using the running port emergency bilge pump.

The third engineer went to the forward machinery space via the main vehicle deck and climbed down the booby hatch ladder. On sighting the lower part of the space he saw a significant level of water. He was unable to see the source of the flooding, and requested assistance from the MCR.

The second engineer, chief petty officer, senior chief engineer and electro-technical officer responded. At 1300, the senior chief engineer informed the master that the forward machinery space was flooding.

The port emergency bilge pump failed at 1310, but pumping of the forward machinery space continued using the pumps in the main engine room and tunnel. The level of floodwater appeared to have stabilised at this stage. The senior chief engineer updated the master and requested that salvage pumps be made available on arrival at Dover.

Two fire detection heads in the forward machinery space activated at 1320. There was no fire, but the senior chief engineer requested a fire party to stand-by. The off-duty deck watch was called for that purpose.

Following an alarm on the stabiliser's panel at 1322, indicating that the port fin had not retracted, the MCR was requested to retract it by hand. This was done and the fin was locked manually.

With the vessel 1 mile from the harbour's eastern entrance, stand-by main engine was rung at 1324. A tug was standing by to assist.

As the vessel entered the eastern entrance of Dover Harbour at 1329, a further fire alarm was activated for the forward machinery space. Again it was confirmed that there was no fire in this space.

When the vessel berthed at 1355, the water level in the forward machinery space was steady and had immersed most of the equipment housed within. The depth of flooding was between 1.1m and 1.4m. It was estimated that the vessel's trim had changed by 10cm by the bow.

Divers were employed to blank off the single overboard discharge from the forward machinery space, and salvage pumps were used to pump out the space.

Once the space was empty of oil-contaminated residue, which was pumped to a road tanker, it was discovered that the locally-operated test valve, on the emergency bilge pumps' test line, was open. Further examination showed there was no non-return valve between the single overboard discharge from the pumps and this open test valve. It was concluded that once the overboard discharge had been opened from the control room, water backflooded into the forward machinery space through the overboard discharge and test valve.

## 1.4 THE FORWARD MACHINERY SPACE (Figures 1 & 2)

The forward machinery space contains two motor-driven, submersible, reciprocating emergency bilge pumps, the sprinkler system pump, the drencher system pump and the emergency fire pump. These are supplied from the emergency switchboard.

The space is below the vessel's normal waterline and main vehicle deck. Access is from the main vehicle deck through a booby hatch fitted with a hinged weathertight cover. There is no other access route to the space.

It extends over six frame spaces, giving a length of 4.928m and has a breadth of about 10m, although bow flare and fineness affect this figure.

## 1.5 BILGE SYSTEM (Figures 3 & 4)

In addition to the two emergency bilge pumps in the forward machinery space, there is a bilge pump in the main engine room and another in the tunnel.

The two emergency bilge pumps can discharge overboard, or through a test line and valve into the bilge space of the forward machinery space. There is no provision for these pumps to discharge to a holding tank or separator.

All remotely-operated valves in the bilge system can be controlled at a mimic panel in the MCR. The mimic panel does not show the test line or valve for the emergency bilge pumps. Adjacent to this panel are the starter controls for the emergency bilge pumps. However, the starters are in the forward machinery space. A second control station is in the drencher control room, above the main vehicle deck.

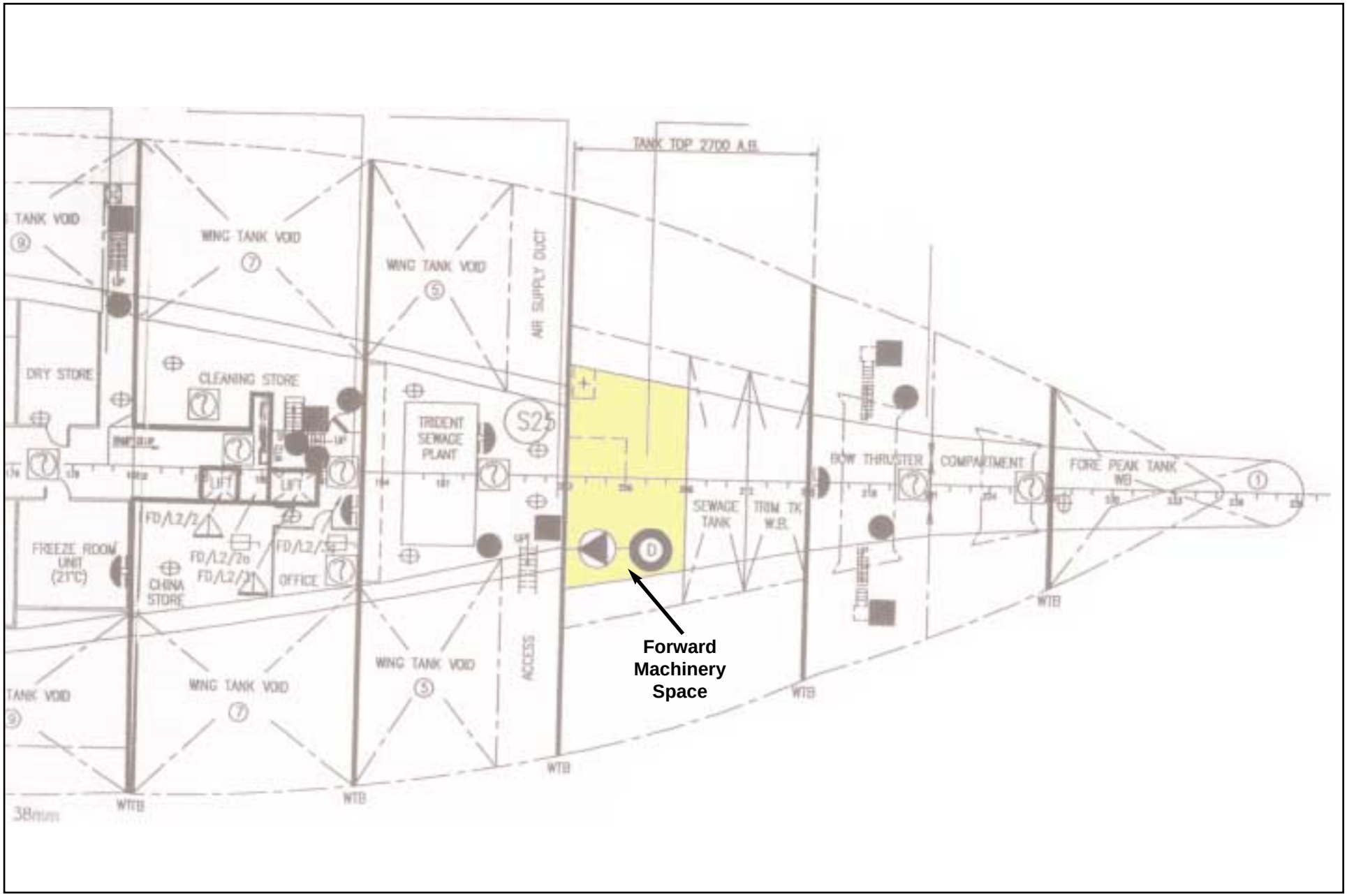
The overboard discharge valve from the emergency bilge pumps is a remotely-operated valve with no non-return capability. There was no separate non-return valve in series with this discharge valve.

## 1.6 BILGE PUMPING PROCEDURES

The owners have a set of regulations, applicable to its fleet, covering the obligations of the vessel's chief and watchkeeping engineers when inspecting and pumping bilges. The objectives of these regulations are to maintain the vessel's bilges clear while complying with the requirements of the International Convention for the Prevention of Pollution from Ships (MARPOL) and associated statutory requirements for the prevention of pollution.

The fleet regulations require the watchkeeping engineers to ensure that *machinery spaces are pumped out regularly*. An added note states that *this avoids unnecessary free-surface effects and prevents fire risk if the water is particularly oily.*

These regulations further state that *bilges are pumped into a tank, or ashore, or overboard after passing through an approved, functional separator.* And *water shall not be discharged through pumps/pipes contaminated by oil.*




Position of forward machinery space (plan)

Figure 1

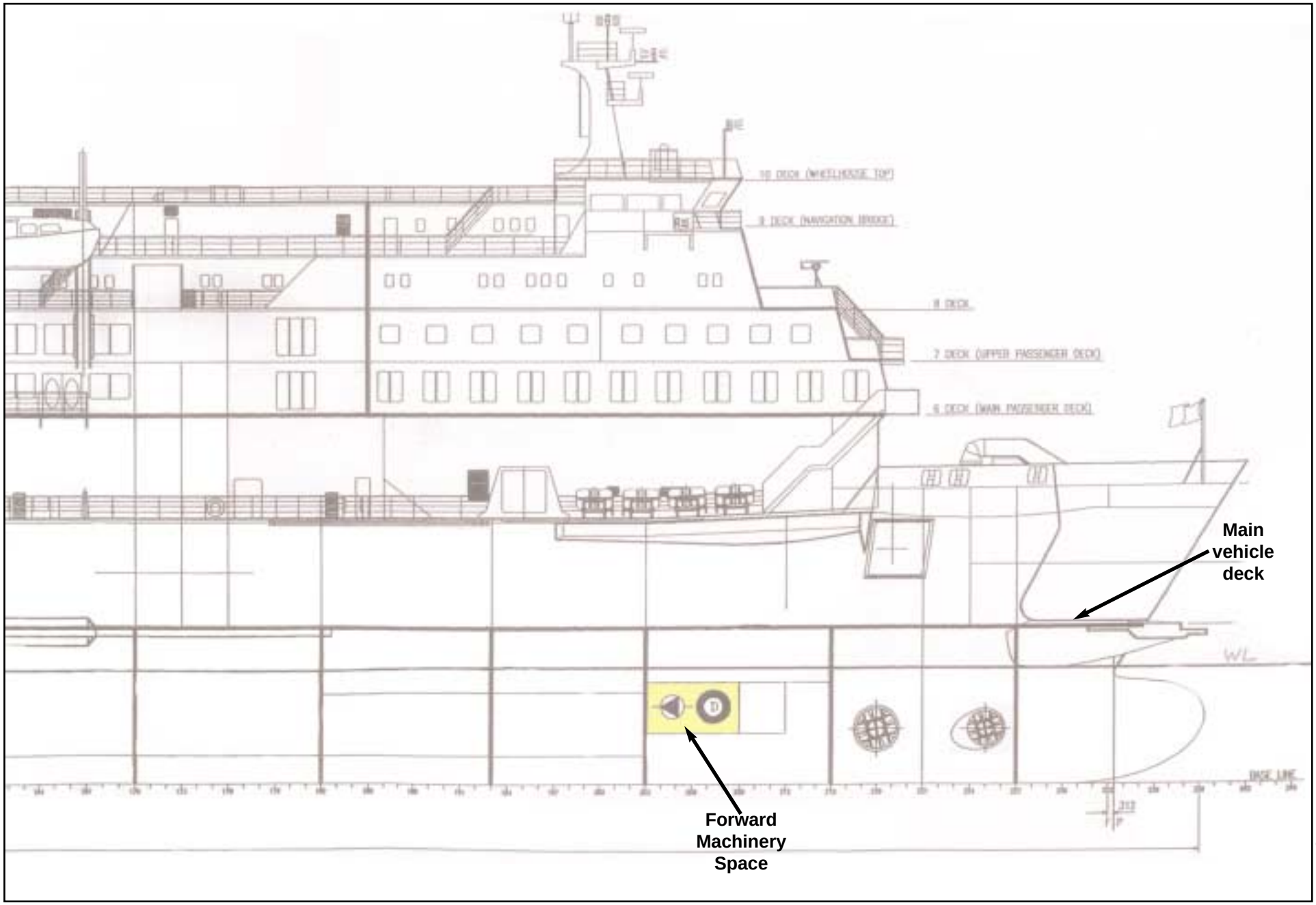



Figure 2

Position of forward machinery space (elevation)

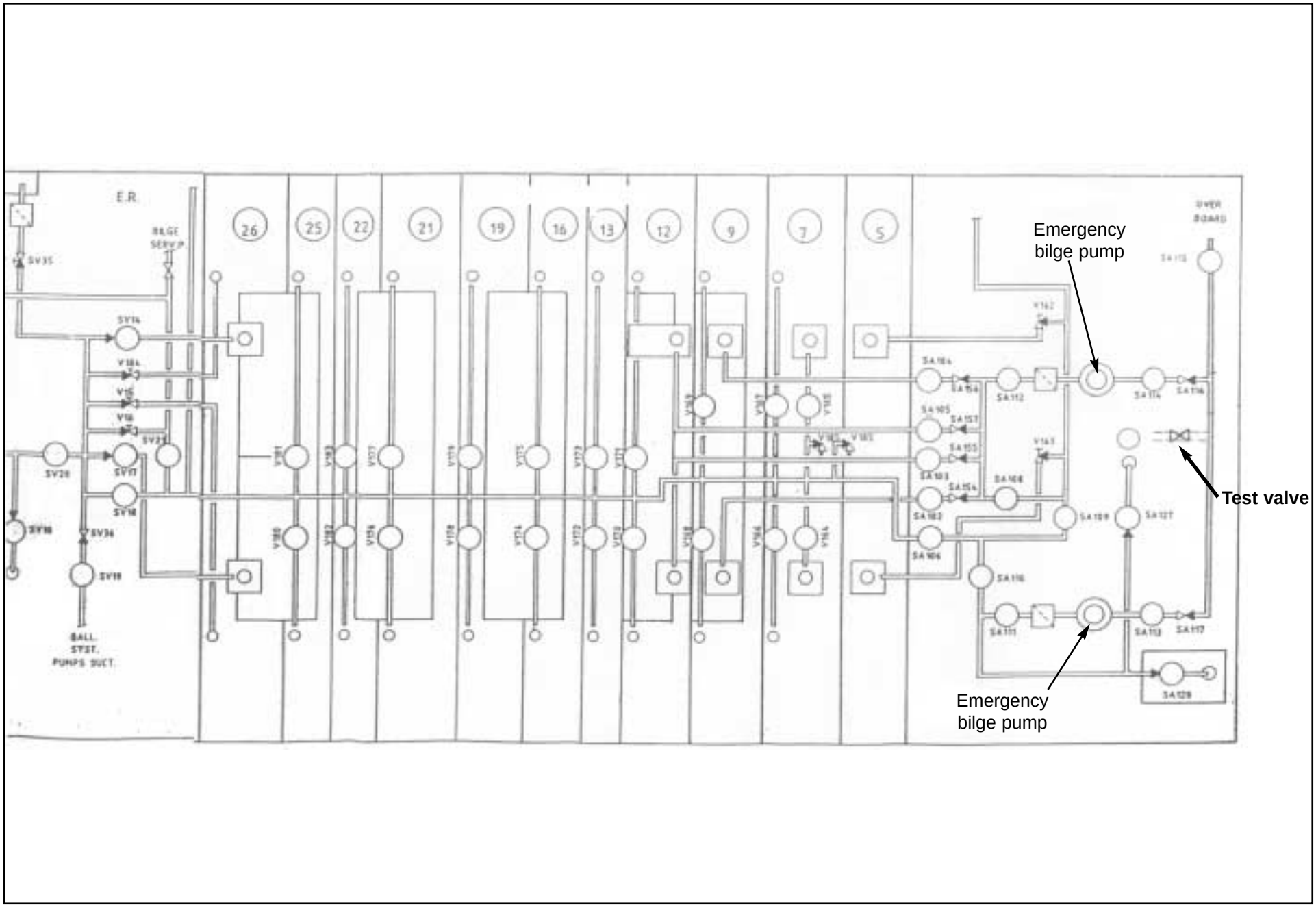
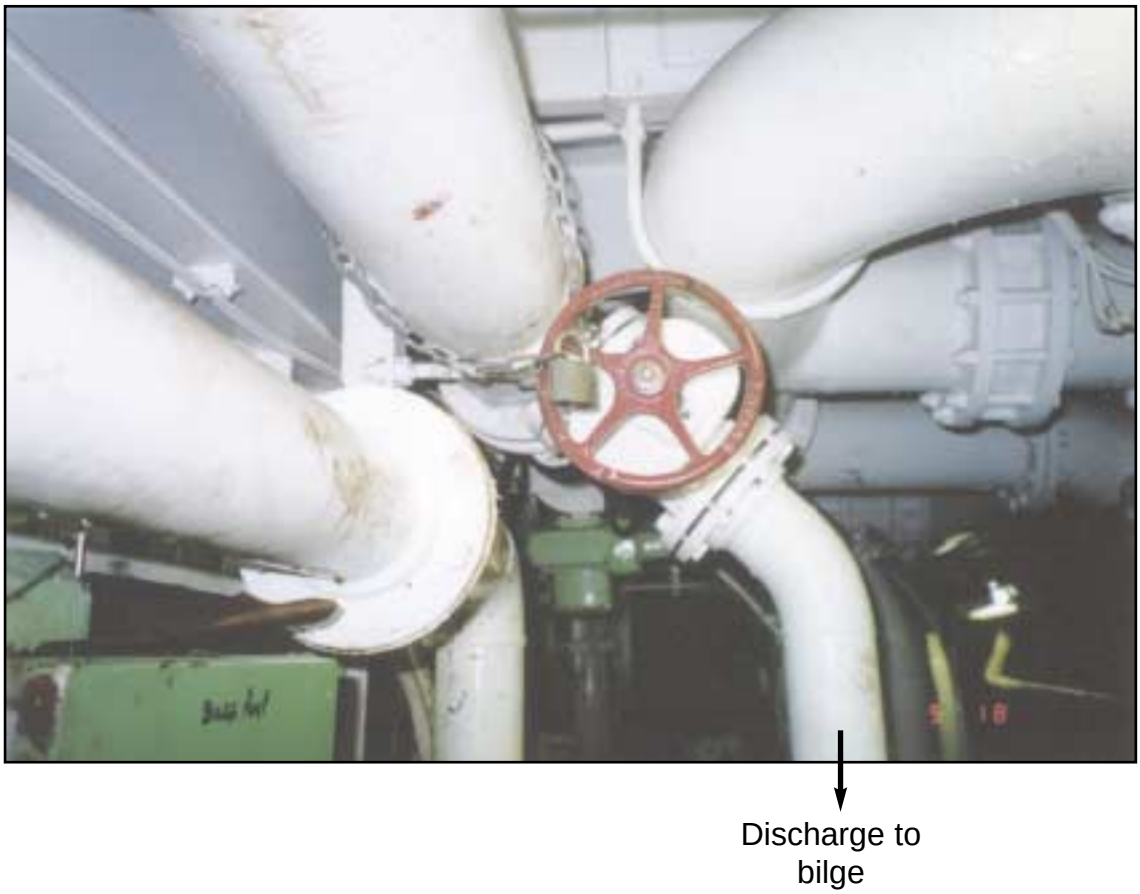



Figure 3

The bilge system (part only)

Figure 4




The locked test valve

## 1.7 BILGE PUMP TESTING

A set of vessel-specific instructions and checks cover the procedures for testing of bilge pumps.

In particular, testing of the port emergency bilge pump in the forward machinery space requires:

*Open* (the following) *suction valves;*

*V3 or V4, which are the bilge suction in the tunnel space – hand operated*
*V20, isolator from main engine room bilge main – remotely operated*
*V18, isolator – remotely operated*
*V106, isolator – remotely operated*
*V109, isolator – remotely operated*
*V108, isolator – remotely operated*
*V112, bilge pump suction – remotely operated*
*V114, bilge pump discharge – remotely operated*
*Test valve in forward machinery room – hand operated*

The written procedure calls for two people to perform the test, normally one engineer officer and one motorman. Both should use a radio for communications.

*The motorman should be in the forward machinery room, opening and monitoring the discharge from the test valve, whilst the engineer opens the necessary valves, starts the pump and monitors the suction from the tunnel bilge.* The instructions conclude with a note stating that *all valves should be shut on completion of the tests.*

## 1.8 EMERGENCY BILGE PUMPS OVERBOARD DISCHARGE VALVE

The Merchant Shipping (Load Line) Regulations 1998, as amended, are applicable to this vessel. The regulations state that *every discharge led through the shell of a ship from a space below the freeboard deck shall be fitted with the means for preventing water from passing inboard.*

The overboard discharge valve serving the emergency bilge pumps had no non-return capability, nor was a separate non-return valve fitted.

These regulations also cover the vessel's stability requirements.

## 1.9 STABILITY INFORMATION

The Merchant Shipping (Load Line) Regulations 1998 allow certain categories of vessel to have their stability information approved by assigning authorities or classification societies. These regulations require the stability information of other ships to be approved by the Secretary of State (MCA). *P&OSL Canterbury* falls into this category, as do all similar ro-ro passenger vessels.

The same regulations require most vessels, including ro-ro passenger vessels, to carry information on the vessel's stability for the guidance of her master. This information must be in the form of a book, which must be kept on the ship at all times in the master's custody. It must be amended whenever any alterations are made to the ship, or changes occur to it that materially affects this information.

At the time of this incident, *P&OSL Canterbury* was operating on an interim Load Line Certificate, valid 17 April 2001 to 16 September 2001, issued while awaiting approval of stability information by the MCA. She had operated on a series of interim Load Line certificates since transferring to the UK flag in June 1998. The MCA's approval of her stability information is a requirement for the issue of a full Load Line Certificate.

Interim stability information was on board *P&OSL Canterbury* at the time of the flooding. In December 1998 this was inspected by an MCA surveyor. It was then submitted to MCA's headquarters for formal checking and approval. However, at the time of this accident, it had not been given formal approval.

## SECTION 2 - ANALYSIS

### 2.1 AIM

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations, if any, with the aim of preventing similar accidents occurring again.

### 2.2 PATH OF THE FLOODING

Once the forward machinery space had been pumped out, ship's staff quickly established that the overboard discharge valve had no non-return capability, and the test valve serving the emergency bilge pump was open. They then concluded that water had backflooded through the overboard discharge and test valve into the forward machinery space. The MAIB agrees that the floodwater took this route.

### 2.3 THE OVERBOARD DISCHARGE

The overboard discharge valve is remotely-operated, but has no non-return capacity. Without a second valve in series, with a non-return capability, there is no barrier to prevent water entering the vessel through this discharge valve when the bilge pump test valve is open. This arrangement does not comply with the requirements of the Load Line Regulations.

This discharge valve had been in place since the installation of the emergency bilge pumps, at least since 1989/90. However, at that time, the discharge line from these pumps had no test line and valve fitted. Thus, provided the discharge line remained intact, there was little possibility of backflooding with the overboard discharge valve open. Notwithstanding the lack of a non-return capability on this overboard discharge, little danger of backflooding into the forward machinery space existed unless there was damage to pipelines or fittings.

The fitting of the test line and valve a few months before this incident changed that condition and provided a backflooding route, when both overboard discharge and the test valve were opened. Until this incident, the risks associated with the fitting of the test line, and the latent problem of having no non-return valve on the overboard discharge, were not fully recognised.

Apart from recognising the role played by the absence of a non-return capability in this incident, the MCA asked for a non-return valve to be fitted inboard of the discharge valve on the vessel's side, to comply with Load Line requirements. This modification was completed shortly after the incident, and thus no recommendation on the subject is necessary.

However, the vessel might have other overboard discharge valves which do not satisfy the requirements of the Load Line regulations. Hence, the owners are recommended to check the overboard discharges of the vessel are in compliance with the regulations, at the next opportunity.

It is judged that the above modification will prevent an exact repetition of this incident, but the use of the bilge pumps' test valve has implications for the vessel's safety.

## 2.4 FLOODING EFFECTS

The volume of floodwater which entered the forward machinery space was approximately 75 tonnes, reaching a depth of approximately 1.1m to 1.4m. Neither this quantity, the associated free surface, nor the change of trim, was sufficient to cause concern about *P&OSL Canterbury*'s stability or berthing.

Also, there was no danger to the vessel from progressive flooding. All boundaries to the forward machinery space are watertight and the only opening is the access hatch to the main vehicle deck. Thus flooding of the forward machinery space, due to ingress from the sea, can spread only if this hatch is already below sea level. As this hatch is in the freeboard deck, the vessel would already be in a perilous state were that stage reached.

Although not an issue during this incident, there may be other indirect threats to the vessel's safety if this space is flooded. The forward machinery space houses components of important safety systems, namely the sprinkler and drencher pumps. Neither of these pumps is designed to operate submerged, and both were disabled during this incident.

A fire requiring the use of one of these pumps, together with fire-fighting hoses, could produce a condition where it is necessary to pump water from bilges to minimise effects on the vessel's stability. Being an emergency, use of the emergency bilge pumps to pump bilge water directly overboard would be perfectly proper. Should the emergency bilge pumps' test valve be open, even with no backflooding through the overboard discharge, the forward machinery space would then fill with the water discharging from the pumps. Although the space's bilge alarm would be expected to activate, it might well, in the circumstances, be given a low priority for attention. Failure of the sprinkler and drencher pumps would follow. Cross-connections to the drencher and sprinkler systems may be possible from other pumps on board, but the interruption in supplies, while the necessary changes are made, could be important in handling the fire.

While this test line remains in place, the integrity of important safety systems relies totally on staff following procedures for closing the test valve without error. This incident demonstrates how easily that error can be made. Alternative policies may be possible and, if practicable, should be pursued. A possible

method is to connect this test line to a holding tank, or similar. This would avoid the possibility of pumping into the bilges. The owners are recommended to consider such a possibility.

## 2.5 THE TEST LINE

As installed, the discharge line from the emergency bilge pumps had no test line fitted. During October 2000, the test line was fitted to aid testing of the bilge pumps without pumping overboard and risking pollution. It allows the output of the emergency bilge pumps to be directed into the bilges of the forward machinery space. Thus the pump discharge can be seen.

The use of this line has become established, and instructions for its use are included in *P&OSL Canterbury*'s operating instructions. However, the mimic panel, from which all remotely-operated bilge valves can be operated, does not show this test line or valve. Because staff new to the vessel are likely to use the line diagram shown on this panel as a reference, it is important that this line is shown there. While the test line remains in its present format, this modification to the mimic panel diagram will also serve to remind all staff of the presence of the test line, and the importance of using it correctly. The owners are recommended to make this modification to the mimic panel.

The onboard instructions set out the need to close the test valve after testing is completed. The only change which had been made to the test line, since its installation, was the recent fitting of a padlock and chain to the valve's handwheel at the vessel's last survey, about five months earlier.

Fitting of this padlock and chain called for no major modification to the test procedures. The test valve is still required to be closed after testing is complete, but the chain and padlock are then to be fitted and locked. In this case the chain and padlock secured the valve, but in the open position.

## 2.6 FAILURE TO CLOSE TEST VALVE

The only occasion the test valve needs to be opened is when the emergency bilge pumps are tested. During these tests a person is required to be inside the forward machinery space, both to open and close this valve, and to observe the discharge from the test line. Having entered the space and opened the test valve, this person has no need to leave the space until the test is complete and the valve is closed.

This procedure is well established and has been used for several months without event. There is no reason why this valve might not have been left open following any earlier test of the emergency bilge pumps. It is conceivable that it was left open on some occasions, but was not identified because no attempt was made to use an emergency bilge pump to discharge overboard.

It is possible that since the chain and padlock were first used, the priorities changed in the mind of whoever last fitted them. Following the last test, he was obviously aware of the need to fit the chain and padlock, probably because it was the most recent requirement and thus uppermost in his mind. This was at the expense of overlooking the need to close the valve.

A label, or other visual reminder, that the test valve must be locked closed, might have assisted. Following this incident, the owners have issued fleet regulations covering the labelling of valves and other controls. In particular, these state that: *Where a valve is required to be locked in position, the label shall give relevant information. For example "Locked open", or "Locked in port".* Thus, no recommendation is made on the subject of labelling the test valve.

## 2.7 THE EMERGENCY BILGE PUMPS

Each of these two pumps is designed to operate while submerged. However, as the forward machinery space was flooding, the water level reached the starter box of the running port pump; about 1.1m above the bottom of the space. Water ingress to this starter stopped the bilge pump. Consequently, ship's staff changed over to other pumps sited in the main engine room. From this stage of the flooding, the water level in the space rose no further. This was probably because the overboard discharge valve was closed when another bilge pump was started. Thus, the flooding was halted at that stage, albeit unintentionally.

Since the port emergency bilge pump is submersible, it should not have failed in this way. The positioning of its starter, below even the level of its motor, ensured that the level of floodwater did not reach a depth greater than 1.1m before failure occurred owing to water ingress. At that level of flooding, the pump's motor is still above water. It makes little sense to require the motor to be submersible if its power supply is interrupted by a lower level of floodwater than that needed to immerse it.

In Paragraph 1(2) of Schedule 6 of Merchant Shipping Notice 1698(M), associated with The Merchant Shipping (Passenger Ship Construction: Ships of Classes I, II and II(A)) Regulations 1998, it requires that the emergency bilge pump to be *of a submersible type having its source of power and the necessary controls situated above the ship's bulkhead deck.* The starters of these pump motors are necessary controls, and are thus covered by this requirement.

The owners are recommended to raise the starters of both emergency bilge pumps, to ensure they are not affected by any of the flooding conditions the vessel is required to withstand by regulation.

## 2.8 THE PUMPING OPERATION

The flooding followed the start of a routine bilge pumping operation. As both emergency bilge pumps are able to discharge only to the sea, it was clearly a conscious decision of the watchkeeping engineer, to elect to use one of these pumps, to pump directly overboard. Notwithstanding the likely high level of cleanliness of the bilge being pumped, being in a catering store, his choice had the potential to cause pollution even if by nothing more than traces contained in the pump and piping system. This might have resulted in contravention of MARPOL and company requirements.

Since this incident, the owners have reviewed some of their instructions and procedures for pumping bilges.

## 2.9 EMERGENCY RESPONSE

This incident unfolded as *P&OSL Canterbury* was approaching and entering Dover harbour. In addition to the tasks associated with this normally routine manoeuvre, ship's staff were faced with several problems. Apart from the confirmed flooding of the forward machinery space, they were also presented with two fire alarms, failure of one bilge pump, and an alarm indicating the failure of one stabiliser fin to retract.

Once the bilge pump had failed, it was recognised that the vessel might need external assistance in the form of salvage equipment. This was requested when she was still 1½ miles outside the harbour.

The stabiliser problem was easily overcome, but was still a distraction to those attempting to tackle the flooding and understand its cause. The fire detection system indicated a fire in the forward machinery space. As staff in that space could see no signs of fire, it would have been simple to dismiss immediately these alarms as associated with the flooding due to water ingress to the alarm system. However, a fire party was called and told to stand by. In the event this party was not used, but to have them prepared was a prudent precaution.

No public address announcement was made to the passengers. Since the space which was flooding was watertight, had a very limited volume, and that each fire alarm had been proved to be false, the risks to passengers were negligible. To have attempted to keep passengers informed of the incident would have served no purpose other than to cause them unnecessary concern.

## 2.10 THE LOAD LINE CERTIFICATE

In section 1.8 it was noted that all UK vessels similar to *P&OSL Canterbury* are required to have their stability information approved by the MCA. Copies of the information belonging to *P&OSL Canterbury* were submitted to the MCA in December 1998, after she transferred to the UK flag on 30 June 1998. Subsequently, a series of interim Load Line Certificates were issued because of the lack of full stability approval from the MCA. This was the situation at the time of this flooding incident. An MCA surveyor had inspected the vessel's stability booklet at the time she transferred to the UK flag. This inspection, however, was not a detailed examination and the booklet was forwarded to MCA's headquarters for the thorough examination required for approval purposes. This final examination had not been performed at the time of this accident, over two years after the booklet was submitted to MCA.

This investigation found that the vessel's stability was not an issue in this flooding incident. However, during the course of the enquiries which led to this conclusion, the MAIB found considerable delay in the MCA approving the vessel's stability information. This is a safety issue which the MCA needs to resolve.

Regulations place an obligation on the MCA to perform these approvals. Unless the MCA performs this work, it cannot satisfy itself that vessels comply with critical safety-related requirements.

In view of the high profile incidents involving ro-ro passenger vessels during the past fifteen years, and the international agreement on certain enhanced stability requirements for ro-ro passenger vessels (the Stockholm agreement) which is being implemented between April 1997 and October 2002, the delay in the MCA's formal approval of stability information, is of concern.

The MCA is recommended to address, as a matter of urgency, its failure to approve promptly the stability information of this, and possibly other, UK-flagged ro-ro vessels.

## SECTION 3 - CONCLUSIONS

### 3.1 FINDINGS

1. The forward machinery space backflooded through an open overboard discharge valve and a bilge pump test valve. [2.2]

2. The overboard discharge valve had no non-return capability. [2.3]

3. The overboard discharge valve did not comply with the requirements of the Load Line Regulations. [2.3]

4. Approximately 75 tonnes of seawater entered the forward machinery space. [2.4]

5. The vessel's stability was not seriously affected by the flooding. [2.4]

6. The floodwater disabled the pumps serving the drencher and sprinkler systems. [2.4]

7. Loss of the drencher and sprinkler systems could affect the vessel's ability to control a fire. [2.4]

8. The emergency bilge pumps' test valve arrangement has the potential to affect the vessel's safety. [2.4]

9. The test valve is fitted to a line which discharges into the forward machinery space. [2.5]

10. The test line was installed during October 2000. [2.5]

11. The bilge system's mimic and control panel in the machinery control room did not show the test valve. [2.5]

12. At the request of the MCA, the test valve was fitted with a chain and padlock during November/December 2000. [2.5]

13. Operating instructions called for the test valve to be closed after testing of the emergency bilge pumps. [2.5]

14. The test valve was inadvertently left locked open following the previous testing of the emergency bilge pumps. [2.6]

15. Although designed to operate submerged, the port emergency bilge pump was disabled by ingress of floodwater into the starter of its electric motor. [2.7]

16. The starters for the emergency bilge pumps were positioned below the level of the pumps' motors. [2.7]

17. Use of the vessel's emergency bilge pumps to pump bilges has the potential to cause pollution. [2.8]

18. The actions of the vessel's staff in handling the incident were prudent and sensible. [2.9]

19. The MCA had not approved the vessel's stability information, as is required by regulation. [2.10]

20. The vessel's stability booklet had been inspected by an MCA surveyor and then submitted in December 1998 to MCA's headquarters for formal approval. [2.10]

## 3.2 CAUSES

Fitting of the emergency bilge pumps' test line and valve introduced a risk of flooding that was not fully recognised. [2.3]

The lack of a non-return facility on the overboard discharge from the emergency bilge pumps. [2.3]

## SECTION 4 - RECOMMENDATIONS

**The owners of *P&OSL Canterbury*** are recommended to:

1. Check, at the next opportunity, that the overboard discharges of the vessel comply with regulations.

2. Reposition the starters of both emergency bilge pumps to ensure they are not affected by any of the flooding conditions the vessel is required to withstand by regulation.

3. Consider connecting the emergency bilge pumps' test line to a holding tank, or similar, to avoid the possibility of pumping into the bilges.

4. Modify the bilge system's mimic panel in the machinery control room so that it shows the test valve and line for the emergency bilge pumps.

**The Maritime and Coastguard Agency** is recommended to:

5. Address, as a matter of urgency, the delay in approving the stability information of this, and possibly other, UK-flagged ro-ro vessels.

**Marine Accident Investigation Branch**
**April 2002**