Report on the investigation

of the collision between

Bruce Stone

and

Loverval

Purfleet Deepwater Berth, River Thames

21 December 2000

Marine Accident Investigation Branch
First Floor
Carlton House
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United Kingdom
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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.

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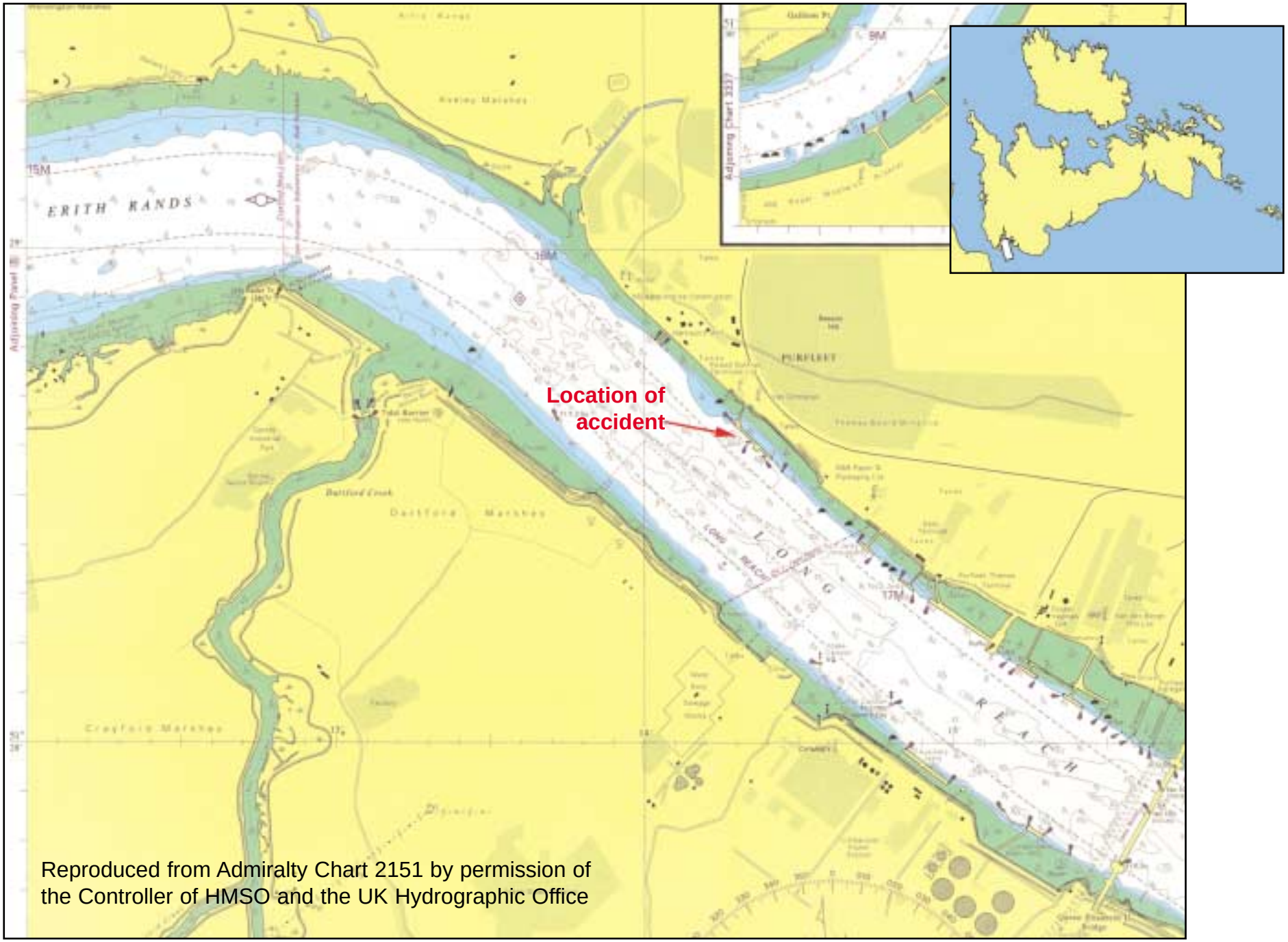
GLOSSARY OF ABBREVIATIONS

AB	Able Seaman
bhp	brake horse power
IMO	International Maritime Organization
ISM	International Safety Management Code
kW	kilowatt
m	metre
MCA	Maritime and Coastguard Agency
MGN	Marine Guidance Note
MSN	Merchant Shipping Notice
PLA	Port of London Authority
ro-ro	Roll-on Roll-off
STCW 95	Standards of Training, Certification and Watchkeeping 1995
UTC	Universal Co-ordinated Time
VTS	Vessel Traffic Services


Location of accident
ERITH SANDS
PURFLEET
LONG REACH
Reproduced from Admiralty Chart 2151 by permission of the Controller of HMSO and the UK Hydrographic Office

SYNOPSIS

While on passage down the River Thames, from Fulham to Gravesend, the tank barge *Bruce Stone* collided with the ro-ro cargo vessel *Loverval*, at Purfleet Deep Water Berth where *Loverval* was secure alongside and in the process of discharging cargo. *Bruce Stone* was in ballast; her normal cargo was gas oil.

The accident was reported to the MAIB (Marine Accident Investigation Branch) on 21 December 2000 and an investigation began that day.

There were no injuries or pollution. *Loverval* was holed above the waterline on her port side; *Bruce Stone* sustained only superficial bow damage. However, the potential for a more serious accident was there; especially if *Bruce Stone* had been carrying cargo.

The cause of the accident was *Bruce Stone* deviating from her intended track because her mate had fallen asleep while on watch.

Contributory causes were:

- the mate suffering from the effects of fatigue caused by long hours of duty;
- lack of quality rest and the alcohol he had recently consumed;
- no additional person on watch during the hours of darkness;
- the absence of a fully operational watch alarm.

Recommendations are addressed to the owner and manager of the vessel, Thames Shipping, to:

- Introduce specific guidelines in its *Quality, Safety and Environmental Manual* with respect to hours of work and rest periods, with the aim of eliminating fatigue among watchkeepers.
- Consider the employment of an additional person to act as lookout/watchkeeper on those vessels operating continually for long periods, especially during the hours of darkness.
- Consider fitting watch alarms on all of its vessels.

Recommendations have also been made to the Maritime and Coastguard Agency (MCA) to:

- Consider issuing a Marine Guidance Note, directed specifically at domestic vessel owners and operators, which encompasses the relevant advice contained in *MGN 84 (F), MGN 137(M&F)* and *MSN 1682(M).*
- Consider extending the proposed derivative of the *ISM Code* to domestic tankers.

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF *BRUCE STONE, LOVERVAL* AND ACCIDENT

Vessel details		*Bruce Stone*
Registered owner	:	Thames Shipping
Manager	:	Thames Shipping
Port of registry	:	London
Flag	:	United Kingdom
Type	:	Tank Barge
Built	:	1964, Wivenhoe
Construction	:	Steel
Length overall	:	43.67m
Gross tonnage	:	357
Engine type	:	Gardner diesel
Service speed	:	8 knots
Accident details		
Time and date	:	0146 (UTC), 21 December 2000
Location of incident	:	51° 30’N 000° 11’W, Purfleet Deep Water Berth, River Thames
Persons on board	:	Three
Injuries/fatalities	:	None
Damage	:	Superficial

Vessel details		*Loverval*
Registered owner	:	Cobelfret
Manager	:	Euroship Services
Port of registry	:	Luxembourg
Flag	:	Luxembourg
Type	:	ro-ro cargo
Built	:	1978, Lodose Varv AB - Lodose
Classification Society	:	Norske Veritas
Construction	:	Steel
Length overall	:	161.37m
Gross tonnage	:	10931
Engine power and type	:	7755kW (10400 bhp) Sulzer diesel
Service speed	:	17 knots
Other relevant info	:	Bow thruster
Accident details		
Time and date	:	0146 (UTC), 21 December 2000
Location of incident	:	51° 30’N 000° 11’W, Purfleet Deep Water Berth, River Thames
Persons on board	:	Ship’s crew and stevedores
Injuries/fatalities	:	None
Damage	:	Holed above waterline - port side

Figure 1

Bruce Stone

Figure 2

Loverval

Figure 3

External damage to *Loverval*

Figure 4

Internal view of damage to *Loverval*

1.2 DESCRIPTION OF VESSELS

BRUCE STONE

Bruce Stone, built of steel in 1964, specifically as an estuarial tanker for the carriage of petroleum on the River Thames, was of standard design with cargo tanks from forward to amidships and the engine room aft. Above the engine room was the crew's accommodation, with the wheelhouse forward.

She was equipped with the following navigational equipment: a standard magnetic compass, a VHF radio and a relative motion radar.

In addition to the navigational equipment, wheel and engine telegraph in the wheelhouse, there was a talk-back system between the wheelhouse and accommodation, a medium wave radio, a heater and a seat.

No watch alarm was fitted.

LOVERVAL

Loverval, built of steel in 1978, was a conventional stern ramp door ro-ro cargo vessel, with her accommodation, superstructure and bridge aft.

1.3 BACKGROUND

Bruce Stone was owned and operated by Thames Shipping, a small shipping company based in Gravesend. In addition to *Bruce Stone* the company owned and operated five similar tank barge vessels, all trading on the River Thames and carrying various cargoes.

Bruce Stone was engaged on a regular voyage, carrying cargoes of gas oil along the River Thames from the British Petroleum (BP) base at Coryton, Shellhaven, to Swedish Wharf, beyond Fulham, where she discharged.

The voyage was undertaken several times a week and normally took approximately 4.5 hours depending on whether sufficient tide was available during the voyage to complete the passage. The round trip from Coryton to Swedish wharf, including loading and discharging, took from 14 to 16 hours, depending on the tides.

The number of cargoes carried during any one week depended entirely on demand for the services of the vessel. Sometimes it was a 24-hour operation, but it was not unusual for the vessel to be secured at her berth in Gravesend for periods of one to two days, between work schedules.

The ro-ro cargo vessel *Loverval* was owned by Cobelfret and managed by Euroship Services. She was engaged in the north European ro-ro trade, and had just completed a voyage to the continent before berthing at Purfleet Deep Water Berth on the River Thames.

1.4 THE CREW (*BRUCE STONE*)

Bruce Stone carried a crew of three: the master, a mate and an engineer.

The master was an experienced river man. He had over 8 years' experience on the River Thames, and was the holder of a provisional Waterman's and Lighterman's licence issued by the Waterman's Hall. He had also completed a Port of London Authority (PLA- 2) 4-week training course, a prerequisite to the issue of a Waterman's and Lighterman's licence.

He had been employed aboard *Bruce Stone* as master for over two years.

The mate, in addition to being an experienced river man, had spent several years on sea-going vessels as an AB, and held a Boatmaster's grade 2 licence issued by the MCA. He also held a pilot exemption certificate, issued by the PLA. He had been employed aboard *Bruce Stone* and the company's other vessels for several years.

The engineer was also an experienced river man.

All three crew members resided in Gravesend.

1.5 WATCHKEEPING *(BRUCE STONE)*

The navigation watch on board *Bruce Stone* was shared between the master and the mate. There was no fixed procedure for the time spent on a navigational watch. The mate relieved the master as and when required, and likewise the master relieved the mate.

Only one man was on watch at any given time. No additional lookout was employed, apart from the standard practice of having a lookout forward when navigating between the London bridges.

1.6 WORK AND REST PERIODS

The nature of the job on board *Bruce Stone*, coupled with having to work in conjunction with the tides when navigating the River Thames, meant that it was not unusual for the crew to go for long periods without rest.

Some days they managed up to 12 hours rest; other days, no rest at all. Both the mate and the master, whenever relieved, slept only when they felt it was necessary. They did not always take advantage of their off-duty periods for sleeping.

Both watchkeepers preferred, whenever possible, to wait until the vessel returned to her moorings at Gravesend between voyages, when they could return home to sleep.

1.7 THE WORKING WEEK

The crew of *Bruce Stone* was employed by Thames Shipping on a 40-hour week basis. They were paid for hours spent aboard the vessel, whether on duty or not. Any additional hours spent on board were classed as overtime.

It was common practice for crew members on one vessel to be interchangeable with another vessel belonging to the company as and when the demand for personnel required. Part of the working week could be spent on board one vessel, and the remainder spent on board another.

This arrangement suited both the company and the employee, in so much as it was impracticable for the company to employ a full complement of crew for each vessel because of the intermittent demand for them. It also meant that overtime for the employee was, in most cases, readily available.

Both the mate and the master felt it was necessary to work the available overtime in order to earn a reasonable wage. A clause in their contracts of employment stated: *"you will be expected to work a reasonable amount of overtime when required in addition to longer normal hours".*

From Monday 18 December 2001, the beginning of the working week, until the time of the accident, 0110 Thursday, the mate had worked for 43 hours, and the master 41 hours.

1.8 ENVIRONMENTAL CONDITIONS

Throughout the incident the wind was easterly force 2 to 3. Visibility was 8 to 9 miles, and the tide in the River Thames at Purfleet Deep Water Berth was ebbing.

1.9 NARRATIVE OF EVENTS

At 1014 on 20 December 2000, *Bruce Stone* sailed from her moorings at Gravesend for the BP refinery at Coryton, with the master, the mate and the engineer on board.

The mate had previously joined another one of the company vessels, *Tommy,* at 2200 the night before. After joining that vessel he turned in at 2300 and slept only fitfully, due to shipboard noises, until 0545 when he was called for duty. He remained on duty until he joined *Bruce Stone* at 1000.

At 1115, *Bruce Stone* arrived at Coryton and was loaded with a cargo of 400 tonnes of gas oil for the voyage to Swedish Wharf where she was due to discharge that evening. On completion of loading at 1230, she set sail for her moorings at Gravesend to await sufficient depth of water on the flood tide so she could proceed further upriver.

Bruce Stone was at her moorings from 1430 until 1700, during which time the crew prepared and ate a festive lunch; they also shared a bottle of wine.

On leaving the moorings at Gravesend, the mate took the navigation watch until they reached the Thames Barrier at 1855, when he was relieved in the wheelhouse by the master. The mate remained awake for the remainder of the voyage to Swedish Wharf.

After a period of 10-15 minutes alongside at Fulham Power Station, to await more flood tide, *Bruce Stone* arrived at Swedish Wharf at 2115. She then began discharging her cargo. While the cargo was being discharged, both the master and the mate went ashore. They visited a nearby public house, where they each consumed two pints of beer and then purchased three meals of fish and chips from the local fish shop.

Both men returned to the vessel at approximately 2210. The cargo was discharged by 2315 and the crew let go for the voyage downriver. Initially the master was on watch in the wheelhouse, and the mate was engaged as lookout forward until the vessel cleared the London bridges shortly after midnight. On 21 December at approximately 0010 the mate relieved the master in the wheelhouse. Both the master and the engineer then turned in.

The mate navigated the vessel downriver from the wheelhouse seat. The wheelhouse heater was on. At 0046, the vessel cleared the Thames Barrier and at 0138 the mate recorded clearing Crayfordness point and visually passing the TOSCA barge.

His next recollection was waking up and seeing another vessel dead ahead. He also heard VTS calling. He put the engines full astern immediately, but his actions were too late to prevent *Bruce Stone* from colliding with *Loverval*'s port quarter at 0150. *Loverval* had berthed at Purfleet Deep Water berth at 0140 and was just about to start discharging.

Bruce Stone's master was woken immediately by the sound of the collision, and rushed to the wheelhouse to find out what had happened. Once he realised they had been involved in a collision he took charge, and informed VTS of the situation. VTS advised him that it had lost track of the vessel on the north shore, some minutes previously, and had been trying to make contact with the watchkeeper.

VTS asked if there was any damage to *Bruce Stone* or injuries to her crew, and then instructed her to proceed to moorings at Greenhithe to await the arrival of the harbourmaster's launch.

It then contacted *Loverval* to enquire the same and was informed, some minutes later, that there were no injuries but that the vessel had suffered hull damage above the waterline on the port side.

At 0220, *Bruce Stone* made fast to the moorings at Greenhithe. The harbourmaster arrived shortly after. Once the harbourmaster was on board, both the master and the mate were routinely breathalysed. The master passed the breathalyser test, but the mate failed. However, the mate did not fail a second breathalyser test 20 minutes later.

After the habourmaster had completed preliminary reports regarding the collision, *Bruce Stone* was allowed to proceed to her regular moorings at Gravesend, arriving there at 0412 on 21 December 2000.

1.10 PUBLISHED ADVICE

Marine guidance notes, issued by the MCA as and when the need arises, contain advice for shipowners, operators, masters, skippers, deck officers and crews of all UK ships worldwide, and other ships operating in UK waters.

Marine Guidance Note *MGN 137 (M+F)* entitled *Look-out During Periods of Darkness and Restricted Visibility* is a reminder to all UK ships wherever they may be, and other ships in UK territorial waters, that they are strongly advised not to operate with the officer of the watch as the sole lookout during the periods of darkness. An additional lookout should be posted in the interests of safety.

Marine Guidance Note *MGN 84 (F)* entitled *Keeping a Safe Navigational Watch on Fishing Vessels* is directed at fishermen, but very relevant in this accident. It contains advice on various aspects of keeping a safe navigational watch including watch arrangements, fitness for duty, navigation, navigational equipment including the fitting of watch alarms, duties and responsibilities and the need for a lookout.

The provisions of the *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, incorporating the 1995 amendments (STCW 95),* applicable to masters, officers and watchkeepers on seagoing merchant ships, includes a mandatory code pertaining to manning and operational matters. Merchant Shipping Notice *MSN 1682(M)* entitled *Safe Manning, Hours of Work and Watchkeeping,* refers to the code in respect of hours of work and watchkeeping.

The Code addresses watchkeeping, and sets out certain principles to be observed in keeping a navigational watch. It permits the officer of the watch to be the sole watchkeeper by day but not by night, although the wording of the text makes this only implicit.

With respect to hours of work, the code requires the following:

…All persons who are assigned duty as officer in charge of a watch… shall be provided a minimum of 10 hours rest in any 24 hour period…

…The hours of rest may be divided into no more than two periods, one of which shall be at least 6 hours in length.

…The minimum period of 10 hours may be reduced to not less than 6 consecutive hours provided that any such reduction shall not exceed beyond two days…

1.11 ISM CODE

The *International Safety Management (ISM) Code,* which will be mandatory and applicable to all seagoing merchant vessels, outlines certain procedures to be followed on board ship and by management ashore. The code introduces procedures to ensure the safe operation of ships in compliance with relevant rules, such as those contained in *STCW 95.*

It also addresses the need for a safety and environmental protection policy, lines of communication between personnel, ashore and afloat, procedures for reporting accidents, and procedures for responding to emergency situations.

In December 1998, the UK shipping minister endorsed in principle, and subject to the outcome of consultation, the proposal to extend the safety management approach to UK ships which operate within domestic waters.

The MCA took forward, with a small working group, the development of a derivative of the *ISM Code.* This derivative of the code, which does not specifically address hours of work or watchkeeping, is now in draft stage and aimed at domestic passenger ships of classes III - VI in light of the *Marchioness/Bowbelle* accident on the River Thames on 20 August 1989. It is not intended to apply to other domestic vessels.

1.12 THAMES SHIPPING

As part of its management structure, in accordance with *BS EN ISO 9002 Quality Systems,* Thames Shipping had produced a *Quality, Safety and Environmental Manual* for distribution among its vessels and employees.

This contained instructions and guidance, which covered various operational procedures and policies. Relevant sections of the manual included: *Standing Orders for Masters, Bridge Watchkeeping,* which contained various advice on watchkeeping, and the company's drug and alcohol policy.

Thames Shipping had not issued any guidelines or instructions for its crews with regard to hours of work and rest periods, or the manning of navigational watches. The company had adopted a zero tolerance in respect to drugs, and only in exceptional circumstances would it accept the minimum levels as stated in road traffic law regarding alcohol.

1.13 IMO

Although, again, only applicable to seagoing vessels, but very relevant to this accident, the UK government, on 24 April 1998, in light of a number of other accidents investigated by the MAIB where the primary cause was the officer of the watch falling asleep, submitted a paper to the IMO sub-committee on safety of navigation, highlighting these accidents and concluding:

These accidents would not have occurred had an effective watch alarm been correctly set for the prevailing circumstances. The incidents demonstrate the need for ship owners to consider fitting effective watch alarms irrespective of the watch structure on board their vessels.

While vessels are required to be manned so that the officer of the watch is properly rested, it is clear that an element of fatigue was present in the incidents investigated by the MAIB. It is also a requirement that a lookout is provided on the bridge at night. In these cases there is no doubt that the absence of a lookout contributed to the watchkeepers falling asleep. The UK does not condone non-compliance with IMO requirements.

Although most of these incidents occurred at night when sole watchkeeping is not permitted, there is clear evidence that fatigue can be a problem for sole wathckeepers during daylight hours. The UK believes that watch alarms significantly enhance navigational safety. Encouragingly, an increasing number of ships are being fitted with such watch alarm systems, providing them with a valuable safeguard against watchkeepers falling asleep. The effectiveness of this important safety feature would be improved through the development of a performance standard.

The sub-committee was invited to note the information provided and to consider inviting the committee to add the development of a performance standard for watch alarms systems to the sub-committee's work programme.

A further paper, submitted in January 2001, by the correspondence group on casualty analysis to the sub-committee, recommended application of *STCW 95* to domestic tankers, since these vessels present the same (or greater) hazards as deep sea tankers.

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 to prevent similar accidents from occurring in the future.

2.2 GENERAL

Fortunately, there were no injuries as a result of this accident, and both vessels sustained limited damage. However, there was the potential for a more serious accident.

Bruce Stone was in ballast at the time of the collision. Had she been carrying her normal cargo of gas oil, and had she been holed as a result of the collision, as was *Loverval,* the consequences could have been quite different, possibly resulting in explosion, injuries and pollution.

2.3 WORK AND REST PERIODS

Bruce Stone's mate had been awake from 0545 on Wednesday until 0110 the following day, the time of the collision; a period of 19 hours and 25 minutes.

The last time he had slept was for just over 6 hours, spent aboard another vessel. However, at that time he had slept only fitfully, and consequently the quality of rest was poor. It is concluded that he was suffering from fatigue when he fell asleep while sitting down on watch in a warm wheelhouse.

The fact that he had consumed two pints of beer a couple of hours previously and some wine earlier on in the day, contrary to Thames Shipping's drug and alcohol policy, only aggravated the situation.

It was not unusual for both the master and the mate to work what could be considered as excessive hours. In some cases this amounted to an additional 30 hours per week, on top of the normal 40 hours, which was not necessarily spread evenly over the week. This resulted in long periods without rest, and led to fatigue.

Opportunities for both the master and the mate to obtain rest between watch periods were available but, because their off-duty periods were often short, it was felt that the quality of rest which could be obtained would not make it worthwhile.

Had Thames Shipping provided guidance on hours of work, provision could have been made for adequate rest periods.

Eliminating the element of fatigue from watchkeepers would have prevented this accident. Regulated hours of work and rest, in line with the advice given in *MSN 1682(M),* would have reduced the likelihood of fatigue.

2.4 ONE-MAN BRIDGE OPERATION AT NIGHT (OMBON)

Lone watchkeeping during the hours of darkness was common practice on board *Bruce Stone*.

A second man on the bridge acting as lookout during the hours of darkness, in line with the advice given in *MGN 137 (M&F),* could have ensured that the mate remained awake, and in any event, he could have realised that something was amiss in time to prevent the collision.

In addition to a second man on the bridge, fitting a fully operational bridge watch alarm, in line with the advice given in *MGN 84 (F),* also could have ensured that the mate remained awake.

2.5 REGULATIONS

Various regulations and codes of practice, which do not apply to domestic vessels, govern the operation of seagoing vessels.

Arguments are being put forward by the industry for the adoption, by domestic shipping, of relevant parts of these regulations and codes on the basis that domestic shipping can present the same, or even greater hazards, than seagoing vessels.

Examples of this can be seen in the proposal to extend a derivative of the *ISM Code* to domestic passenger vessels and recommendations to IMO for domestic tankers to be included in the application of *STCW 95.*

If the *ISM Code* and *STCW 95* had been applicable in the operation of *Bruce Stone*, a safety management system, and minimum standards of operation, would have been in place which probably would have prevented this accident.

SECTION 3 - CONCLUSIONS

3.1 FINDINGS

1. There was the potential for a more serious accident, resulting in explosion, injury or pollution. [2.2]

2. *Bruce Stone*'s mate was suffering from fatigue. [2.3]

3. The consumption of alcohol was a contributory factor to the mate suffering from fatigue. [2.3]

4. The quality of rest obtained by the mate before his period of duty was poor. [2.3]

5. It was not unusual for both the mate and the master to work excessive hours. [2.3]

6. Off-duty periods were often short. [2.3]

7. Appropriate company guidance regarding hours of work and watchkeeping might have prevented this accident. [2.3]

8. The employment of an additional watchkeeper/lookout, especially during the hours of darkness, could have ensured that the mate remained awake. [2.4]

9. The fitting of a fully operational watch alarm could have ensured the watchkeeper remained awake. [2.4]

10. Had the *ISM Code* and *STCW 95* been applicable in the operation of *Bruce Stone*, the accident probably would have been prevented. [2.5]

3.2 CAUSES

The cause of the accident was *Bruce Stone* deviating from her intended track because the mate had fallen asleep on watch.

3.3 CONTRIBUTORY CAUSES

1. The mate suffering from the effects of fatigue caused by long hours of duty, lack of quality rest and the alcohol he had recently consumed.

2. The absence of an additional person on watch during the hours of darkness.

3. The absence of a fully operational watch alarm.

SECTION 4 - RECOMMENDATIONS

Thames Shipping is recommended to:

1. Introduce specific instructions and guidelines in its *Quality, Safety and Environmental Manual* with respect to hours of work and rest periods with the aim of eliminating fatigue among watchkeepers.

2. Consider the employment of an additional person to act as lookout/watchkeeper on those vessels operating continually for long periods, especially during the hours of darkness.

3. Consider fitting watch alarms on all of its vessels.

The Maritime and Coastguard Agency is recommended to:

4. Consider producing a Marine Guidance Note, directed specifically at domestic vessel owners and operators, which encompasses the relevant advice contained in *MGN 84(F), MGN 137(M&F)* and *MSN 1682(M).*

5. Consider extending the proposed derivative of the *ISM Code* to domestic tankers.

Marine Accident Investigation Branch
August 2001