Report on the investigation of

the grounding of

mv *Lysfoss*

Sound of Mull, Scotland

7 May 2001

Marine Accident Investigation Branch
First Floor
Carlton House
Carlton Place
Southampton
United Kingdom
SO15 2DZ

Report No 23/2002
July 2002

Extract from

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 OF ABBREVIATIONS AND ACRONYMS

AB	-	Able Seaman
ARPA	-	Automatic Radar Plotting Aid
BA	-	British Admiralty
CPP	-	Controllable Pitch Propeller
DNV	-	Det Norske Veritas
DOC	-	Document of Compliance
GPS	-	Global Positioning System
gt	-	Gross tonnage
ICS	-	International Chamber of Shipping
IFO	-	Intermediate Fuel Oil
IMO	-	International Maritime Organization
ISO	-	International Organisation for Standardisation
MBA	-	Master of Business Administration
MCA	-	Maritime and Coastguard Agency
NTM	-	Notice to Mariners
OOW	-	Officer of the Watch
PEC	-	Pilotage Exemption Certificate
SCOPIC	-	Special Compensation P and I Clause
SEPA	-	Scottish Environment Protection Agency
SERAD	-	Scottish Executive Rural Affairs Department
SMC	-	Safety Management Certificate
SMS	-	Safety Management System

SOLAS	-	Safety of Life at Sea
SOSREP	-	Secretary of State’s Representative for Salvage and Intervention
STCW	-	Standards of Training, Certification and Watchkeeping
UKHO	-	United Kingdom Hydrographic Office
UTC	-	Universal Co-ordinated Time
VDR	-	Voyage Data Recorder
Cable	-	one tenth of a nautical mile

SYNOPSIS

At 0630 (UTC+2) on 7 May 2001, the Norwegian-registered cargo ship *Lysfoss* ran aground at the northern entrance to the Sound of Mull while on passage from Lysekil in Sweden to Belfast. The chief officer was alone on the bridge and, because of several anomalies in his account, and the absence of any recorded navigational data, it has not been possible to establish with any certainty the sequence of events immediately before the accident.

SOSREP reported the accident to the MAIB at 0753(UTC+2) on 7 May 2001, and an investigation began that day. The ship was refloated on 11 May. Although some pollution was caused by escaping fuel bunkers, this was generally contained, and is not believed to have affected any aquaculture in the immediate vicinity.

It is considered that several factors contributed to the action or inaction of the chief officer, or mechanical failure, to result in grounding. These included:

- The passage through the Sound of Mull and its approaches did not allow the same freedom of movement normally expected when coasting, and also provided limited sea room in which to take action to prevent grounding.
- The master did not consider it necessary to take any additional precautions for the passage through the Sound of Mull and its approaches.
- The voyage had not been properly planned and the charts had not been prepared in accordance with The Norwegian Maritime Code or the ICS Bridge Procedures Guide.
- The chief officer was alone on the bridge.
- The chief officer was probably not aware of all navigational dangers.
- There were several shortcomings in the company's shipboard procedures.
- Instructions for the safe navigation of the ship were of limited scope.
- The company had not developed a safety culture or an effective safety management system.

Recommendations are aimed at improving the owner's safety management system, with emphasis on making its operating instructions more comprehensive. In particular, they are intended to ensure all passages are properly planned, that appropriate precautions are taken when transiting restricted waters, and that the requirements for additional lookouts can be met at all times.

Lysfoss

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF MV *LYSFOSS* AND ACCIDENT

Vessel details

Registered owner	:	Lys-Line AS
Port of registry	:	Oslo
Flag	:	Norway
Type	:	Pallets Carrier
Built	:	Brodogradiliste “Titovo” – Kraljevica, 1989
Classification society	:	DNV
Construction	:	Steel
Length overall	:	101.7m
Gross tonnage	:	4,471
Engine type	:	Oil engine – diesel
Service speed	:	18 knots
Draught	:	5.8m

Accident details

Time and date	:	0630 (UTC +2) on 7 May 2001
Location of incident	:	56°37.99N Rubha nan Gall Light bearing 280° x 2 miles
Persons on board	:	8
Injuries/fatalities	:	0
Damage	:	Substantial damage to ship’s bottom

1.2 BACKGROUND INFORMATION

Lysfoss was one of eight ships owned and operated by Lys-Line between Scandinavia, Northern Europe and Iberia. The vessels routinely transited the restricted waters off Norway and Sweden, and usually followed the Inshore Traffic Route on the west coast of Scotland when on passage between Ireland and Scandinavia. *Lysfoss* sailed from Lysekil, Sweden, on 4 May 2001 with a cargo of paper, timber, and packaged chemicals in containers on the deck, and was bound for Belfast, Northern Ireland. Her routine fortnightly programme was as follows:

From Ireland		From Scandinavia	
Drogheda	Thursday	Oslo	Wednesday
Hundested	Monday	Larvik	Thursday
Lysekil	Tuesday	Skien	Thursday
Oslo	Wednesday	Lysekil	Friday
		Belfast	Tuesday
		Drogheda	Wednesday

1.3 NARRATIVE

All times are UTC+2. All courses are true.

At about 0355 on 7 May 2001, *Lysfoss*'s chief officer arrived on the bridge to relieve the second officer as OOW. The ship was on a course of 144° at a speed of 12 knots. After the handover, the second officer went to bed, leaving the chief officer on the bridge accompanied by an AB lookout. At about 0550, the chief officer altered course to 117°, towards the northern entrance to the Sound of Mull. The lookout was relieved at 0600.

Between 0610 and 0620, the AB left the bridge to conduct engine room and cargo checks. Before leaving, he spoke to the chief officer who appeared to be fine and, although it was light, he did not see any other vessels or navigation buoys. At 0630, *Lysfoss* grounded. The AB, who was in the cargo hold at the time, possibly felt the ship decelerate slightly, but did not notice any heel before the ship grounded. A chart extract showing *Lysfoss'*s intended route and position of grounding is at **Figure 1**.

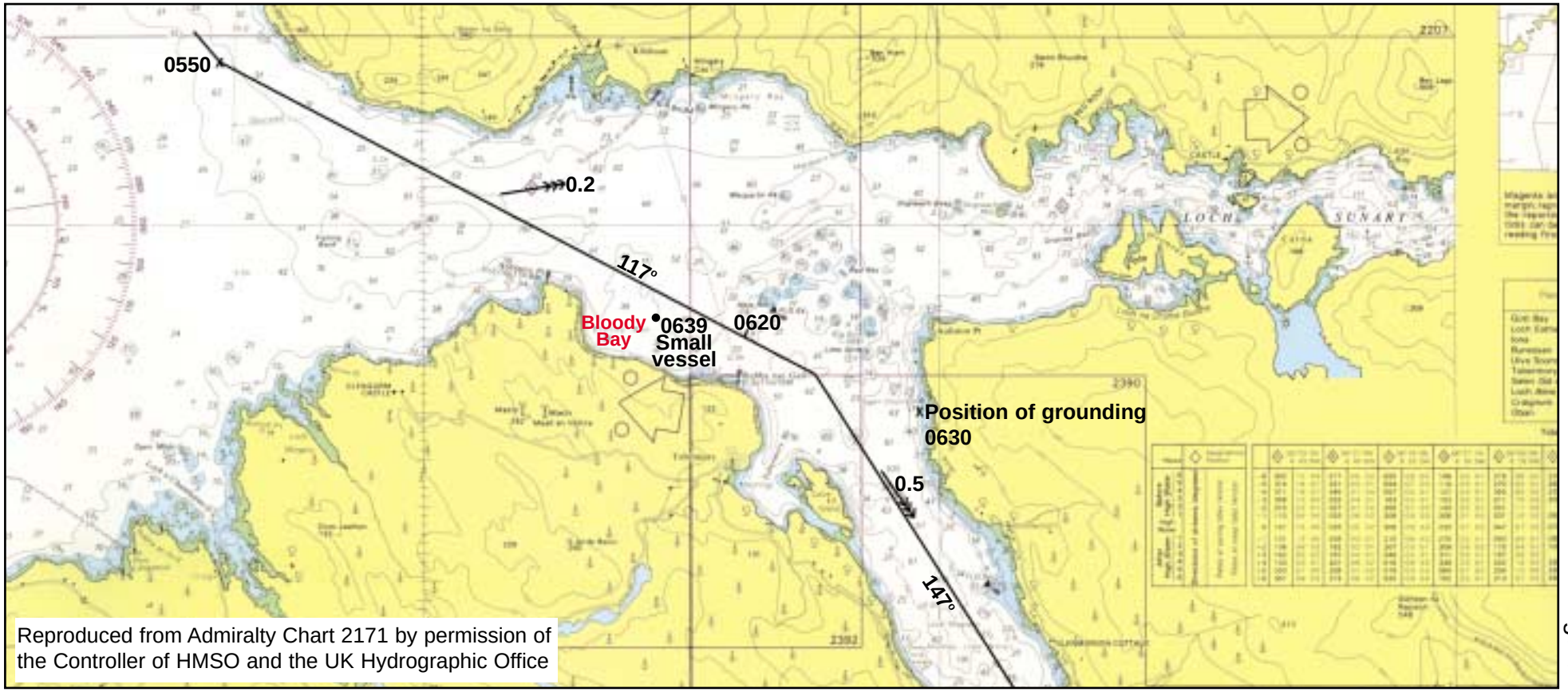


Figure 1

Chart extract showing position of grounding

Woken by the noise and movement as *Lysfoss* ran ashore, the master went straight to the bridge, and the engineer to the engine room. The master did not recognise where the ship was, until he saw the New Rocks buoy astern; he did not see any other vessels. The chief officer was standing next to one of the two bridge chairs and appeared confused. He was holding the steering joystick in both hands, and steering was in manual. Ship's head was 117°. The master immediately moved the pitch control lever **(Figure 2)** from near maximum ahead to zero and then pressed the emergency button to stop the engines. As a shaft generator was in operation, this caused a temporary loss of electrical power. The master asked what had happened, and the chief officer replied "everything is possible, master."

When the chief engineer arrived in the engine room, the main engine and CPP pumps had already stopped, and the diesel generators had automatically cut in to restore power. The propeller pitch was observed to be about 60% ahead.

At 0636, the master called Stornoway Coastguard, and at 0645 Clyde Coastguard assumed responsibility for the co-ordination of the rescue operation. No attempt was made to refloat using the engines. The Tobermory lifeboat arrived on scene at 0715.

Figure 2

Pitch control lever

1.4 THE CHIEF OFFICER'S RECOLLECTIONS

Between 0610 and 0620, a small radar contact was detected at a range of 3 miles on the ARPA display. It was in the vicinity of Calve Island, and by ARPA it was heading between 340° and 350° at 6 knots; its relative track was passing astern. When passing between Ardmore Point and the New Rock lateral buoy, the radar contact, which was now at a range of 2 miles, was correlated with a small vessel seen visually. To pass this vessel at a safe distance, course was altered to 112°. The chief officer believed this was safe to do, because he could not see any apparent dangers ahead. The small vessel, which he estimated was between 7m and 10m in length, was not showing any lights, and the cabin was towards her after end. The cabin was white but the hull was darker. Nobody was seen on board the vessel, which did not appear to be a fishing vessel.

Lysfoss was about 6 cables from the shore directly ahead, when the small vessel passed abeam to starboard at a distance of between 2 and 3 cables. At this point, the second steering motor was started, steering was switched from automatic to manual, and about 20° of starboard helm applied. There was no response, so the chief officer returned the helm to amidships before switching several times between automatic and manual steering. Propeller pitch was also reduced from 100% to 20%. Manual steering was reselected and the helm was put hard-to-starboard when the shore ahead was at a distance of between 2 and 3 cables. Although the ship then began to turn, she also continued to close the shore. Concerned that grounding could not be avoided, the chief officer reversed the helm to port, to try to ground bow-first to reduce damage to the port side. Speed was not reduced further as the chief officer believed this would reduce the effectiveness of the rudder.

1.5 EVENTS FOLLOWING THE GROUNDING

1.5.1 Salvage

Following the grounding a salvage control unit headed by the Secretary of State's Representative for Salvage and Intervention (SOSREP) was mobilised, and a salvage contract consisting of a Lloyd's Open Form with SCOPIC was agreed between the owner and the Smit/Klyne partnership. After removing 40 of the containers stowed on the deck by crane barge, and pressurising ballast tanks with air, *Lysfoss* was refloated at high water during the evening of 11 May. She was then anchored off Tobermory, where extensive diving surveys revealed substantial bottom damage, particularly to the bunker fuel tanks **(Figure 3)**. All fuel oils were then discharged into other vessels before *Lysfoss* was taken in tow for passage to Belfast on 15 May.

Figure 3 - Bottom damage to *Lysfoss*

1.5.2 Environment and pollution

An environment group including the relevant local authorities, SEPA, SERAD, and Scottish Heritage was convened during the evening of 7 May. It identified the oil pollution of local fish farms as the major risk. *Lysfoss* had 30 tonnes of diesel oil and 140 tonnes of IFO on board when she grounded. Approximately 80 litres of diesel oil spilled from a fracture in a diesel tank on her port side, causing light oil contamination from 200m south to 500m north of the ship's position. Beach surveys confirmed that a number of shellfish were killed, but only in a limited area. During the refloating operation, a quantity of IFO, from breached centreline bunker tanks, was also spilled. This was because the oil had been kept in the tanks by hydrostatic pressure, and the ship's movement had caused it to escape. A significant percentage of this oil, however, was recovered by booming, while much of the remainder dispersed through evaporation, along with natural biodegrading. None of the local fish farms are believed to have been affected.

1.5.3 Norwegian maritime inquiry

After the ship's arrival in Belfast, the Norwegian authorities conducted an inquiry on 18 May into the circumstances of the grounding. The inquiry was held in the Mission to Seafarers, with the Norwegian Consulate General presiding. The inquiry was open to the public, and the master, chief officer, AB lookout, and chief engineer were called as witnesses. At the inquiry, the chief officer apologised for what had happened and believed that the grounding might have resulted from human error. He also stated that he was very shocked, and it was difficult for him to remember what had happened.

1.5.4 Port State Control inspection

While alongside in Belfast, MCA surveyors conducted a Port State Control Inspection. Other than the hull damage caused by the grounding, no material defects were noted; the steering gear was tested and found to be working correctly. The ship appeared clean and well maintained, which MCA surveyors reported was a consistent feature of Lys-Line ships visiting Belfast.

After discharging her cargo, *Lysfoss* was permitted to proceed in ballast and under escort to Drammen in Norway, for permanent repair. The permission to sail was given on the provisos that a passage plan for the voyage was made, and that the voyage was undertaken in favourable weather conditions. Initially, MCA surveyors considered the proposed passage plan to be too sparse, and that two of the course intersection waypoints were unnecessarily close to land. As a result, the plan was amended. Concern was also expressed that, up to 12 hours before sailing, the master had made no attempt to obtain medium range weather forecasts to cover a voyage estimated to take 3.5 to 4 days. *Lysfoss* arrived in Drammen on 23 May 2001.

1.6 THE CREW

1.6.1 General

The crew comprised eight persons: the master, chief officer, second officer, two chief engineers, two ABs, and a cook. The additional chief engineer was carried to conduct a handover while on passage.

1.6.2 The master

The master first went to sea in 1983. He had served with Lys-Line between 1985 and 1987, and again from 1990. He was promoted within Lys-Line and had sailed as a master since 1996. The master was well acquainted with *Lysfoss,* having served onboard for about 2.5 years. He had sailed this route on about 100 previous occasions, and held PECs for all Scandinavian ports routinely visited. He believed that Lys-Line was a good company to work for.

1.6.3 The chief officer

The chief officer first went to sea in 1994. He became a second officer in 1996, and a chief officer in 1998 with the Estonian Shipping Company, serving mainly in general cargo ships. Having joined Lys-Line in December 2000, he initially served as second officer in *Lysfoss* and was promoted to chief officer in April 2001. He also held the opinion that Lys-Line was a good company to work for.

Lys-Line generally employed chief officers on 3-monthly contracts, separated by breaks of about 6 weeks. Since joining *Lysfoss*, the chief officer had made about seven round trips through the Sound of Mull and had been on watch for about three of these. At sea, he kept the 0400 – 0800 and 1800 – 2400 watches, and had 14 hours rest on both 5 and 6 May.

After completing his watch at 2400 on 6 May, the chief officer had something to eat, then went to bed at about 0030. He had about 3 hours sleep before he was woken again at 0345. The chief officer felt fine when he arrived on the bridge to take over the watch; he had not drunk alcohol for about 3 weeks, was not taking any form of medication, had not taken any drugs, and did not feel tired. The only shiphandling experience the chief officer had had on board was unberthing the ship in Hundorsted, Sweden.

1.7 ENVIRONMENTAL CONDITIONS

Sunrise was at 0625, and it was a fine, clear day with good visibility. It was spring tides, and the predicted height of tide was 4m. The predicted tidal steam was 0.2 knot in an easterly direction off Ardmore Point, and 0.5 knot in a south-easterly direction in the Sound of Mull.

1.8 PASSAGE PLANNING

1.8.1 Route selection

During her passages between Ireland and Scandinavia, *Lysfoss* routinely followed the Inshore Traffic Route on the west coast of Scotland which, in addition to the Sound of Mull, also includes passages through Kyle Akin, Kyle Rhea, and the Sound of Islay. This route, which is shown at **Figure 4** was used in preference to an alternative route via the Little Minch. The Inshore Traffic Route is about 8 miles shorter and is more sheltered than the alternative route; it is also reported to have better mobile telephone coverage.

The selection of the route taken was left entirely to the master, although it was recognised by Lys-Line's senior management that the Inshore Traffic Route offered protection from the bad weather prevalent on the west coast of Scotland, and was also frequently used by other Lys-Line vessels.

1.8.2 Chart preparations

The passage was planned by the second officer and approved by the master. Tracks for the passage through the Sound of Mull were shown on chart BA 2171 (New Edition dated 16 July 1991, and corrected to NTM 1328/2001) in ink. The scale of this chart is 1:75000, and although larger scale charts of the area were available, they were not used. In addition to the tracks drawn on Chart BA 2171, courses to make good, waypoints at each course intersection, and parallel indices based on Ardmore Point for the 117° and on Calve Island for the 147° track, were also shown. No wheel-over positions for any course alterations were shown, tidal diamond information had not been calculated, and shallow waters, which were dangerous to the safe navigation for a ship of her draught, were not highlighted.

1.8.3 Navigational constraints

The following information about the Inshore Traffic Route is given in the UKHO's Sailing Directions for the West Coast of Scotland.

This route is recommended only for small vessels, due to the limiting conditions in Kyle Akin…

***Controlling depth**. Kyle Akin has a least depth of 8.8m…in the fairway of the channel passing S of Eileanan Dubha. The least depth in the channel passing N of Eileanan Dubha is 9m.*

***Controlling height and width**. Skye Bridge, with a minimum vertical clearance of 30m over a navigable width of 80m, spans the W entrance to Kyle Akin.*

Figure 4

Reproduced from Admiralty Chart 2635 by permission of the Controller of HMSO and the UK Hydrographic Office

The Inshore Traffic Route

Additional information regarding the Sound of Islay includes:

..the Sound is not recommended for medium sized vessels and above, due to a rocky bank, with a least depth of 9.1m over it, and also due to the strength of the tidal streams.

The Sound of Mull has a navigable width of about 0.4 mile at its southern end. The Sound of Islay has a navigable width of about 0.3 mile at its centre.

1.8.4 Instructions to the master

Instructions on passage planning are contained in Annex A to Part 16 of the Norwegian Maritime Code, which includes:

The intended voyage shall be planned in advance, taking into consideration all pertinent information, and any course laid down shall be checked before the voyage commences…

Prior to each voyage the master of every ship shall ensure that the intended route from departure to the first port of call is planned using adequate and appropriate charts and other nautical publications necessary for the intended voyage, containing accurate, complete and up to date information regarding those navigational limitations and hazards which are of a permanent and predictable nature and which are relevant to the safe navigation of the ship.

These instructions, however, do not specify what detail should be shown on the charts or passage planning documentation.

1.8.5 Additional guidance

Guidance on passage planning is provided in the ICS Bridge Procedures Guide, which states that the route plan should incorporate the following details:

- *planned tracks showing the course of each leg;*
- *leg distances;*
- *any speed changes required en route;*
- *wheel-over positions for each course alteration, where appropriate;*
- *turn radius for each course alteration, where appropriate;*
- *maximum allowable off-track margins for each leg.*

It also states:

At any time during the voyage, the ship may need to leave the planned route temporarily at short notice. Marking on the chart the relatively shallow waters and minimum clearing distances in critical sea areas is but one technique which

will assist the OOW when having to decide quickly to what extent to deviate without jeopardising safety and the marine environment….The route plan should also…identify contingency actions at waypoints, and allow for collision avoidance in line with the COLREGS.

1.9 CONDUCT OF THE PASSAGE

1.9.1 Navigation

Track intersections were input as waypoints in the GPS receiver. Alarmed guard zones could have been set around these waypoints but were not. As the wheel-over positions for the planned alterations of course were not calculated or plotted, they had to be estimated by eye.

The GPS receiver was interfaced with the Racal Decca ARPA radar display and the tracks connecting the GPS waypoints were displayed as a red line. The parallel indices, based upon Ardmore Point and Calve Island, were also shown on the ARPA display. Neither the second radar display nor the echo sounder, which were available, was used.

The last recorded GPS position plotted on the chart was at 0550. A mark was also annotated across the planned track to indicate the ship's position at 0620 as she passed the New Rocks buoy **(Figure 1)**.

1.9.2 Precautions

a. Sound of Mull

The master was aware that the Sound of Mull was used by much larger ships than *Lysfoss*, and in his opinion, it was not 'narrow waters' referred to in the Lys-Line management manual. He believed the area could be transited in the normal coasting state, and therefore delegated responsibility for the safe navigation of the ship to the OOW; he did not order additional material or manning precautions. The master had last visited the bridge at 2230 on the evening before the grounding, and did not intend to return until about 0745.

b. Kyle Akin

For passage through Kyle Akin it was the usual practice for the master to join the OOW and lookout on the bridge and take responsibility for the navigation. It was also usual practice for the master to take the helm for this transit, as well as when berthing and unberthing. Other measures usually taken included the operation of both steering motors and steering by hand, and making an anchor ready for letting go. In poor weather, the bow thruster was also started and was available if required. The echo sounder, however, was not routinely used.

1.10 DEFINITIONS

In the Mariner's Handbook (NP 100), published by UKHO, the following definitions are given:

Restricted waters: Areas which, for navigational reasons such as the presence of sandbanks or other dangers, confine the movements of shipping to narrow limits.

Coastal waters: The sea in the vicinity of the coast (within which coasting trade is carried out).

Coasting: Navigating from headland to headland in sight of land, or sufficiently often in sight of land to fix the position of the ship by land features.

A definition of 'narrow waters' could not be found in any of the authoritative references researched.

1.11 LOOKOUT ROUTINES AND ROUNDS

Instructions for the provision of lookouts is provided in STCW 95, in which Section A-VIII/2 Part 3 states:

1. *The officer in charge of the navigational watch may be the sole lookout in daylight provided that on each such occasion:*

   a. *the situation has been carefully assessed and it has been established without doubt that it is safe to do so;*

   b. *full account has been taken of all relevant factors, including, but not limited to:*

      - *state of weather,*
      - *visibility*
      - *traffic density*
      - *proximity of dangers to navigation*
      - *the attention necessary when navigating in or near traffic separation schemes; and*

   c. *assistance is immediately available to be summoned to the bridge when any change in the situation so requires.*

Similar instructions are also contained in the Norwegian Maritime Code. It is implicit in both STCW 95 and the Norwegian Maritime Code, that the OOW should not be the sole lookout during darkness.

The ABs alternated watches, changing over at 0600, 1200, 1800 and 2400, but were only required to be on the bridge as lookouts when it was dark. When acting as bridge lookout, they were expected to leave the bridge for 5 to 10 minutes in each hour to conduct rounds of the engine room and cargo hold. Rounds of the unmanned engine room were conducted in the interests of safety to allow the early detection of fuel, oil, and water leaks, whereas the rounds of the cargo hold were intended to prevent the cargo from being damaged. One of Lys-Line's principal cargoes is paper products, which can be easily damaged by poor handling, stowage or moisture. During cargo rounds, the AB checked to ensure that lashings were correct, and that air bags used to protect the cargo were properly inflated. It was the OOW's decision when to release the lookout to conduct these rounds, the frequency of which was usually increased in bad weather. There was no written requirement for these rounds to be conducted, although the practice had been routine since about 1985, and was expected by Lys-Line's senior management.

1.12 BRIDGE EQUIPMENT

1.12.1 General

The ship was not fitted with a VDR, or course and engine-movement recorders. A personal computer was sited on the bridge to assist with the ship's administration and to facilitate communications via e-mail. No instructions were issued regarding the use of this computer, nor on the use of personal mobile telephones while on watch.

1.12.2 Steering gear

An automatic pilot was fitted and either hand or automatic steering could be selected. Hand steering could be operated in either 'follow up' or 'non-follow up' modes, and the automatic pilot could be overridden at any time by a joystick control. Two steering pumps were fitted, and both were working correctly. The start/stop controls for the steering pumps, the manual steering/automatic pilot changeover switch, and the override joystick were co-located on the same console **(Figure 5)**. No previous problems had been experienced with the steering, which had been tested, and functioned correctly, in Lysekil on 4 May, and again by the master and chief engineer immediately after the grounding.

1.12.3 Watch alarm

A watch alarm was fitted, which had to be reset at 12-minute intervals. After 12 minutes a light illuminated for 30 seconds, followed by a buzzer sounding for 2 minutes. If the alarm was not reset during this period, an alarm sounded in the engineer's cabin and engine room. The time interval on the watch alarm could be reduced to 6 minutes. It was possible to disable the watch alarm by removing its power fuse which was located in an unlocked cabinet on the bridge.

Figure 5

The main steering console

1.13 MANOEUVRING DATA

The time taken to move the rudder from 30° to port to 35° to starboard, with one steering motor running, was 14 seconds. The time taken with two steering motors running was 7 seconds. The ship was designed to have the rudder respond quickly with the navigation of restricted waters in mind. A copy of the manoeuvring diagram, which was displayed on the ship's bridge, includes turning circle and stopping distance information **(Annex A)**. When a substantial amount of helm was applied at 12 knots, a noticeable degree of heel was usually experienced. The minimum speed required for the steering to be fully effective is reported to be about 7 knots.

1.14 PREVIOUS GROUNDING

On 18 March 2001, shortly after entering Rosfjorden, *Lysfoss* experienced a total electrical failure. As a result, all manoeuvrability was lost, and the vessel grounded at Hausviksodden. The master in command during this grounding was not the same master in command on 7 May.

1.15 SAFETY MANAGEMENT

1.15.1 The ISM Code

a. Background

The International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code) provides an international standard for the safe management and operation of ships, and for pollution prevention. It was adopted by the IMO in 1993, and came into force on 1 July 1998 via SOLAS Chapter IX, 'Management and Safe Operation of Ships'. It applies to all passenger ships, oil and chemical tankers, gas and bulk carriers, and cargo high-speed craft of 500gt and over, making international voyages. For all other ships of 500gt and over, making international voyages, it will apply from 1 July 2002.

b. Objectives

The objectives of the code are to ensure safety at sea, prevention of loss of life and injury, and prevention of damage to the environment. It requires owners and operators to set in place a Safety Management System (SMS), in which management procedures, for all activities affecting safety and environmental protection, are conducted in accordance with legislative and company requirements. An SMS should allow companies to measure performance against a documented system, and enable them to identify areas for improvement in safe practices and pollution prevention measures. The ISM Code states:

Every company should develop, implement and maintain a Safety Management System which includes the following functional requirements:

1. *a safety and environmental protection policy;*
2. *instructions and procedures to ensure safe operation of ships and protection of the environment in compliance with relevant international and flag state legislation. The various tasks involved should be defined and assigned to qualified personnel.*
3. *defined levels of authority and lines of communication between, and amongst, shore and ship board personnel;*
4. *procedures for reporting accidents and non-conformities with provisions;*
5. *procedures to prepare for and respond to emergency situations; and*
6. *procedures for internal audits and management reviews.*

With respect to the master's responsibility and authority, the code states:

> *The Company should clearly define and document the master's responsibility with regard to:*
>
> 1. *implementing the safety and environmental protection policy of the Company;*
> 2. *motivating the crew in the observation of that policy;*
> 3. *issuing appropriate orders and instructions in a clear and simple manner;*
> 4. *verifying that specified requirements are observed; and*
> 5. *reviewing SMS and reporting its deficiencies to the shore-based management.*

c. Certification

Certification under the ISM Code is conducted by flag states, but can be delegated to recognised organisations such as classification societies. Two types of certification exist. The Document of Compliance (DOC) is issued to companies whose shore-side aspects of the SMS comply with the requirements of the ISM Code. The DOC is specific to ship type for which the SMS is implemented. The Safety Management Certificate (SMC) is issued to a ship when her company has completed a satisfactory assessment for a DOC, and her onboard management operates in accordance with the SMS.

1.15.2 Lys-Line

DNV first issued a DOC to Lys-Line in 1996. This certificate was renewed in 2001 in accordance with the regulations. Lys-Line also had ISO 9002 accreditation. Lys-Line's managing director, who was a qualified naval architect and also had an MBA, stated that the reasons for obtaining accreditation in both ISM and ISO 9002 were ethical and commercial; safe operation was desirable in itself and a quality operation attracted business.

A requirement of the ISM Code is that every company should designate a person or persons:

> *To provide a link between the Company and those on board….The responsibility and authority of the Designated Person or persons should include monitoring and safety pollution prevention aspects of the operation of each ship and ensuring that adequate resources and shore based support are applied, as requested.*

The company's marine superintendent had been the Designated Person for 4.5 years. He was an engineer, who had previously served in the Royal Norwegian Navy. All of the management personnel of Lys-Line had either engineering, naval architect, financial, or administrative backgrounds. None had any significant 'deck' experience, or had been in command of a ship. The company did not nominate a 'senior master' from its seagoing personnel.

1.15.3 *Lysfoss*

DNV first issued an SMC for *Lysfoss* in 1996, which was renewed following an audit on 2 May 2001. During the audit, which included a tour of the ship, a review of relevant documentation, and interviews with all personnel, three non-conformities with the ISM Code were identified. The first was based on the finding that the company's 'exchange of experience' accident report form had not been used for either the grounding on 18 March 2001, or a 'black-out' on 23 March 2001. This report was eventually submitted on 13 June 2001. The second was because a permit had not been issued on two occasions for working in fresh water tanks. The final non-conformity was raised because a tank maintenance plan for January 2001 had not been made out and forwarded to the company.

1.15.4 The management manual

The edition of the management manual which was in use by Lys-Line and its ships was issued in November 2000. The objective of the manual, stated in Chapter 1 was to:

Describe how LYS-LINE conducts its activities ashore, and on board to meet its business philosophy and its safety and quality policy……We have made the point of making it as useful and practical as possible.

Copies of articles 7.2 (instructions to the master), and 7.4.4 (departure/arrival port and sea voyage) are at **Annex B**. Section 132 of the Norwegian Maritime Code, which is referred to in Article 7.2 and covers navigation, states:

The master shall ensure that the navigation and management of the ship accords with good seamanship.

1.15.5 Master's orders

The master issued verbal orders and noted instructions, such as when to be woken and when to use two steering motors, on the navigational charts in use. He was of the opinion that neither a night order book, nor master's standing orders were necessary, as they were not required by the Norwegian Maritime Code.

1.15.6 Action taken by Lys-Line following the grounding

The master raised an 'exchange of experience' form on the grounding on 7 May. Referring to the lack of a written passage plan, and master's standing and night orders, which had been commented upon by the MCA and Norwegian maritime investigators, the master stated:

On M/S Lysfoss these things we will start with from 07.05.01. However these things have never been practice on these ships but was the only thing that was criticised by both governments, and will definitely be a question by port state every time we get in UK ports.

On 30 May 2001, the superintendent issued a circular to all vessels owned by Lys-Line, instructing masters to implement voyage planning, and master's standing orders and night order books.

After discussions among Lys-Line managers regarding possible causes of the grounding, its chairman decided that the personal computers sited on the bridges of all its ships were a potential distraction for an OOW. As a result, the chairman ordered that they should be removed.

1.16 THE SMALL VESSEL

The small vessel, which the chief officer states prompted him to alter course several minutes before the grounding, has not been identified, despite requests for information being published in local and fishing newspapers.

Other than the chief officer, there were no other known witnesses to the grounding. A group of Swedish zoologists studying porpoises in Bloody Bay saw, and filmed, *Lysfoss* as she passed to the north of their position. Shortly after, they also saw a small vessel, heading west, pass to the north of Bloody Bay, and fixed her position by theodolite as she entered and exited their area of interest. The position of this vessel at 0639 is shown at **Figure 1**.

SECTION 2 - ANALYSIS

2.1 AIM

The purpose of the analysis is to determine the contributory causes and the circumstances of the accident as a basis for making recommendations to prevent similar accidents in the future.

2.2 SCOPE

In the absence of witnesses to the grounding, other than the chief officer, and without a VDR, or automatic course and propeller pitch recordings, the chief officer's account cannot be corroborated. Although it is feasible that the small vessel, recorded north of Bloody Bay at 0639, might have been the same vessel described by the chief officer, thereby supporting his account, his admission of having difficulty remembering what had happened, along with several anomalies, cast significant doubt on its accuracy.

- First, no problems were experienced with the steering gear before or after the accident.
- Second, if the ship had been manoeuvred in the manner described, this would have resulted in a degree of heel that would probably have been noticed by the AB doing rounds.
- Third, the turning data shows that with maximum helm applied, the advance for a 90° should have been about 200m. It should have been possible successfully to avoid the shore if the helm was applied hard to starboard when between 2 and 3 cables away.
- Fourth, after several alterations to port and starboard, the likelihood of the ship grounding on the same heading as her base course is small.
- Fifth, it would be extremely coincidental for the position of the grounding to be as close to the intersection of her base course of 117° and the shore as shown at **Figure 1**.
- Finally, the reduction in propeller pitch to 20% is not supported by the master's actions when he arrived on the bridge. The pitch indicated in the engine room, after the CPP pumps had stopped, is consistent with the master's reduction of pitch immediately followed by a shutdown of the main engine, and the consequent loss of electrical power to the CPP pumps.

These anomalies indicate that course and speed were not altered as recollected by the chief officer. Consequently, as these or any other actions which might have been taken by the chief officer cannot be determined with any degree of certainty, an analysis of the events based upon this account would possibly be

erroneous. Analyses of the numerous potential factors possibly influencing the chief officer's performance which, other than fatigue, or the use of alcohol, medication or drugs, cannot be ruled out, would also be hypothetical and of little value. This analysis will, therefore, necessarily focus on the broader circumstances of the accident, which allowed the actions or inaction of an individual, or a mechanical failure, to cause *Lysfoss* to ground shortly after failing to make a planned course alteration to remain within the navigable channel.

2.3 VOYAGE PLANNING

2.3.1 Commercial considerations

The commercial advantages of using the Inshore Traffic Route in preference to the alternative outer route, were considerable. Notably, it provided shelter from bad weather, which has a high incidence on Scotland's west coast. Bad weather posed a threat to *Lysfoss'*s cargo, which was easily damaged, and could also have made it difficult for her to maintain the required passage speed. The use of the Inshore Traffic Route, therefore, helped to preserve the integrity of her cargo and her tight schedule. The marginally shorter distance and mobile telephone connectivity were also beneficial. In view of these advantages, it was logical that this was the master's preferred route.

2.3.2 Risk assessment and management

When selecting a route, however, many factors, not just commercial ones, must be considered. These include the proximity of dangers, traffic density, the weather forecast, the time of day to transit areas of concern, the strength of the tidal stream, the manoeuvrability of the ship, and bridge manning, including the experience of the watchkeepers. Environmental factors, such as the impact of pollution, and the commercial use of the marine environment by others, must also be borne in mind. While *Lysfoss* had the draught and manoeuvrability to enable her to navigate safely while following the Inshore Traffic Route, it is evident her use of this route took her closer to the shore, which had several disadvantages. First, it took her closer to navigational dangers. Second, it caused her to navigate in close proximity to areas of aquaculture, which were particularly sensitive to pollution. Finally, it took her into sheltered waters, which provided a safe haven for many small craft, including fishing vessels, and in which the probability of encountering such vessels was high.

It was the master's responsibility to assess the increased risks of opting for the Inshore Traffic Route, and to put in place any precautions or control measures considered necessary to manage this risk. Such measures can normally include: the master's presence on the bridge; preparing an anchor ready for letting go; using a trained helmsman to steer in manual steering; having both steering motors running; ensuring engineering personnel are readily available in case of mechanical failure; having additional electrical generating capacity

available; and adjusting passage speed to transit areas of concern in favourable conditions. However, because the master did not believe the Sound of Mull to be 'narrow waters', referred to in the management manual, or assess the risks of using the Inshore Traffic Route to be higher than when 'coasting', none of these, or any other precautions, were considered or taken.

2.3.3 Assessment of narrow waters

'Narrow waters' was a term used in the management manual, but was not defined. This, however, is not unusual. What makes waters narrow, restricted, or coastal, has always been a source of debate among mariners and lawyers alike. The decision of which waters were, and which were not, narrow therefore was left to the master's judgment. In this case, the master's familiarity with Scandinavian waters, which are among the most restricted in the world, probably induced an element of complacency in his attitude to navigating in waters posing less of a challenge. Such complacency was reinforced by his repeated successful use of the Sound of Mull without having taken additional precautions. The master's initial acceptance of the passage plan from Belfast to Drammen, which the MCA surveyors considered took the ship unnecessarily close to the shore, was possibly another example of the master's relaxed attitude to the proximity of navigational dangers.

Unless internal ship precautions for the transit of a particular stretch of water are made compulsory by flag states, harbour authorities or shipowners, a master must not only categorise the waters himself, he must also decide what additional precautions are appropriate. In making this judgment, however, he must take into account measurable factors other than his own experience and competency. In particular, the degree of freedom of movement that is possible, and the time or distance available to prevent grounding following human error or machinery breakdown, must be considered.

In the Sound of Mull and its approaches, while the sea room within which to manoeuvre was considerably greater than in a number of other areas frequently negotiated by the master, it did not allow the same freedom of movement normally expected when 'coasting'. For example, when between the New Rocks buoy and Rubha nan Gall, only 4 cables of safe water was available on each side of the planned navigational track. Also, the grounding of *Lysfoss,* so soon after failing to alter course as planned, demonstrated the limited sea room which was available, in which action could have been taken to prevent error or machinery breakdown resulting in grounding. This accident shows that the identification of restricted waters, and, importantly, the taking of appropriate precautions against the unexpected, is a crucial aspect of passage planning. Had the master been more critical of the risks involved in transiting the Sound of Mull and its approaches, and taken the normal precautions when transiting Kyle Akin, the probability of human error or mechanical failure causing the *Lysfoss* grounding on 7 May, would have been considerably reduced.

The presence of the master on the bridge, would have been of particular value. He would have been able to closely monitor the actions of the chief officer, who was significantly less experienced than himself in operating in restricted waters, and also to provide timely advice. This would have been particularly beneficial in the areas of application of the collision regulations, and manoeuvring characteristics. It is probable that, had the master accompanied the chief officer on the bridge, he would have been well placed to take the action required to prevent the ship from running aground. The master's presence on the bridge during the passages through the restricted waters of the Inshore Traffic Route, however, would have been very demanding in terms of time. Such demands could be potentially onerous, and therefore need to be identified and carefully considered when selecting a route.

2.3.4 Preparations

The lack of a written passage plan, and the chart preparation, which was approved by the master, was incomplete when judged against the broad requirements of the Norwegian Maritime Code, and the detailed guidance provided in the ICS Bridge Procedures Guide. The plan shown on chart BA2171 did not provide the OOW with sufficient information either to follow accurately the planned track or to allow him to safely deviate from it when required.

In coastal and open waters, where there are no immediate dangers, the requirement for a ship to depart from her planned track when taking action required by the Collision Regulations, does not normally cause a problem. In the Sound of Mull and its approaches, however, where there is limited safe water in which to alter course for other shipping, it is imperative that whoever has responsibility for safe navigation is aware of the extent of the navigable water available to allow appropriate action to be taken. Ideally, the information to enable him to do this is marked on the chart in use, as this allows appropriate action to be taken in good time. In this case, however, it was not. If the chief officer did alter course to 112° when between Ardmore Point and the New Rock lateral buoy, the ship must have passed very close to the Little Stir rock sited to the north of the ship's planned track. This rock was covered at the time because of the height of tide, and, being neither visible nor highlighted as a danger on the chart, it is likely that the chief officer was not aware of its presence. It is, therefore, perhaps fortunate that a more catastrophic accident did not result.

The chief officer would have more easily recognised the navigational dangers had the larger scale charts that were available been used. Using a small scale chart to transit a particular area can be convenient, as it reduces the number of occasions to change from one chart to another, which take up the lone watchkeeper's valuable time. It can also, however, make safety information much less apparent.

When navigating in restricted waters, it is also important that planned course alterations are executed as accurately as possible. This can only be achieved if the wheel-over positions and turn radii are calculated and shown, and tidal stream information is taken into account. Estimating a wheel-over position by eye might be acceptable given the accuracies required when navigating in open water, but not when navigating close to dangers. The use of a guard zone on a GPS receiver, set around a wheel-over or course intersection point, might also have been a useful warning to the chief officer that he was passing through the planned course alteration.

2.4 EMPLOYMENT OF LOOKOUTS

The chief officer was the only person on the bridge, and, therefore, was the sole lookout when *Lysfoss* grounded. As it was daylight, this was permissible under the requirements of STCW 95 and the Norwegian Maritime Code, providing several factors, including the proximity to navigational dangers, had been carefully considered. The ship, however, was approaching an 8-cable wide channel when the AB left the bridge to conduct rounds, and it is therefore apparent that the timing of his departure was governed through routine rather than careful deliberation. The requirement for the AB to conduct rounds of the engine room and cargo hold appear to have been of greater importance than the need for an additional lookout.

The rounds of the engine room and cargo hold were conducted for logical reasons, but they conflicted with the international requirement to provide an additional lookout, particularly during darkness, which was introduced, for equally logical reasons. The AB on watch could either act as lookout on the bridge, or conduct rounds: he could not do both. It is considered, therefore, that the simultaneous requirements of lookout and safety, and cargo rounds, cannot be met, unless the ship's manning is increased or electronic surveillance and monitoring systems, or similar are introduced. The usefulness of a bridge lookout should not be underestimated. Had the lookout been on the bridge instead of in the cargo hold, he would have been well placed to provide immediate support to the chief officer.

2.5 SAFETY MANAGEMENT

2.5.1 General

Lys-Line was a reputable company, for which both the master and chief officer enjoyed working, and which appeared to keep its ships well maintained. It also opted to certify its ships under the ISM Code, although this would not have been compulsory until 1 July 2002. The grounding of *Lysfoss*, however, highlighted several significant shortcomings in its shipboard procedures. These included:

- the inadequacy of the passage planning;
- the failure to take appropriate precautions when transiting the Sound of Mull and its approaches;

- the requirement for the AB lookout to leave the bridge to conduct safety and cargo rounds;

- the lack of guidance regarding the use of the computer and mobile telephones on the bridge; and

- the absence of master's standing or night orders. In light of this accident, these shortcomings indicate that the instructions issued were inadequate to ensure the safe operation of the ship.

2.5.2 Management or operational manual

A company's operational or management manual lies at the heart of the ISM Code. Examination of the management manual produced by Lys-Line shows that the instructions and guidance relating to the safe navigation of the ship was limited to article 7.4.4. The instructions in this article were of limited scope, particularly with regard to passage planning, precautions to be taken when transiting narrow waters, and the employment of the bridge lookouts. They did not provide the watchkeeping personnel with a workable framework in which to navigate the ship safely in all situations. The instructions provided to the master regarding safe navigation were limited to ensuring the ship was navigated in accordance with good seamanship. The management manual was, therefore, not as *useful and practical as possible* as described in its introduction.

Writing operational manuals of good quality is not easy. An author must have a detailed knowledge of all mandatory rules and regulations, and relevant codes of practice. He must also have knowledge, and preferably experience, of the practical aspects of ship operations. Finally, an author must be able to write in a style readily understandable by the intended users. These requirements probably could not have been met by the Lys-Line management ashore, who had no 'deck' experience at sea. Had this expertise been available within the management structure, or had the company's seagoing personnel been involved in writing it, it is probable that more comprehensive instructions regarding safe navigation could have resulted.

The company's instructions for the safe navigation and, therefore, the operation of its ship, were not detected and reported as non-conformities by DNV during both the initial and renewal audits. It must be remembered, however, that audits only check selected samples, and although an SMC might be issued, this does not indicate that all areas have been checked and that there is no room for improvement.

2.5.3 Safety culture

A company must continually review its instructions and procedures, not only to ensure that all statutory requirements are complied with, but also to ensure its operations are conducted safely. Within the ISM code, this should be driven from a commitment from the senior management via its safety policy, and achieved through management reviews, feedback from accidents and non-conformities, and internal audits. However, the late submission of the 'exchange of experience' form for the grounding in March 2000, and the content of the 'exchange of experience' form for the grounding on 7 May 2001, are evidence that the safety culture could be enhanced on board *Lysfoss* and within Lys-Line. The report on the first grounding was only submitted after being identified as a non-conformity during the renewal audit; senior management had not previously noted its absence. The second inferred that written passage planning, and master's standing and night order books should be introduced to avoid being targeted during future port state control inspections; there was no comment regarding the possible benefits that such action might bring.

Although it cannot be determined what role, if any, the computer on the bridge played in the events leading to this grounding, the decision to remove the computer from the bridges of all Lys-Line ships immediately following the grounding was positive, and taken quickly. If the potential distractions to bridge watchkeepers caused by computers, and other equipment such as mobile telephones, are to be minimised, companies and masters must carefully consider the impact of such equipment, and issue clear and practical instructions regarding their use. This had not been done in this case.

SECTION 3 - CONCLUSIONS

3.1 FINDINGS

3.1.1 Causes and contributing factors

1. The Inshore Traffic Route was preferred for commercial reasons. [2.3.1]

2. The proximity of navigational dangers was closer when using the Inshore Traffic Route in preference to the alternative route. [2.3.2]

3. There was a high probability of encountering small craft when using the Inshore Traffic Route. [2.3.2]

4. The master did not consider the Sound of Mull and its approaches to be 'narrow waters' or assess the risks of using the Inshore Traffic Route to be higher than when 'coasting'. [2.3.2]

5. The precautions which can normally be adopted when transiting restricted waters were not taken. [2.3.2]

6. The master's familiarity in operating within the restricted waters of Scandinavia, probably induced an element of complacency in his attitude towards navigating in waters posing less of a challenge. [2.3.3]

7. The waters in the approaches to the Sound of Mull did not allow the same freedom of movement normally expected when coasting, and provided limited sea room in which to take action to prevent error or mechanical failure from resulting in grounding. [2.3.3]

8. The master was insufficiently critical of the risks involved in transiting the Sound of Mull and its approaches and did not take the precautions normally taken when transiting Kyle Akin. Therefore, the probability of human error or mechanical failure causing *Lysfoss* to ground on 7 May was considerably increased. [2.3.3]

9. The chief officer was alone on the bridge and, therefore, was unable to benefit from any timely advice or assistance from the master. [2.3.3]

10. The lack of a written passage plan, and the chart preparation, which was approved by the master, was incomplete when judged against the broad requirements of the Norwegian Maritime Code, and the detailed guidance provided in the ICS Bridge Procedures Guide. [2.3.4]

11. The detail shown on chart BA2171 did not provide the OOW with sufficient information to either follow the planned track accurately or to allow him to safely deviate from it when required to do so. [2.3.4]

12. If a larger scale chart had been used, navigation dangers would have been more apparent to the chief officer. [2.3.4]

13. The chief officer was the sole lookout when *Lysfoss* grounded. [2.4]

14. The requirement for the AB to conduct rounds of the engine room and cargo hold was considered of greater importance than the need for an additional lookout. [2.4]

15. There were several significant shortcomings in the company's shipboard procedures. [2.5.1]

16. The instructions issued by Lys-Line regarding the safe navigation of the ship were of limited scope. [2.5.2]

3.1.2 Other findings

1. Several anomalies cast doubt over the chief officer's recollection of events immediately before the grounding. [2.2]

2. The chief officer's actions probably were not influenced by fatigue, alcohol, medication or drugs. [2.2]

3. It is likely that the chief officer was not aware of the presence and close proximity of Little Stir Rock, and it is fortunate that a more catastrophic accident did not result. [2.3.4]

4. Had the lookout been on the bridge, he would have been well placed to provide immediate support to the chief officer. [2.4]

5. Had 'deck' expertise been available within the management structure, or had the company's sea-going personnel been involved in the writing of the operations manual, it is probable that more comprehensive instructions regarding the safe navigation of the ship could have been produced. [2.5.2]

6. The company's instructions for the safe navigation and, therefore, the operation of the ship, were not reported as non-conformities by DNV during its initial and renewal audits. [2.5.2]

7. There is evidence to indicate that the safety culture on board *Lysfoss* and within Lys-Line could be enhanced. [2.5.3]

SECTION 4 - RECOMMENDATIONS

The owner, Lys-Line, is recommended to:

1. Ensure its ships take appropriate precautions when navigating in restricted waters, including the Sound of Mull and its approaches.

2. Ensure that its ships plan and conduct passages in accordance with the Norwegian Maritime Code and the ICS Bridge Procedures Guide.

3. Implement methods that would allow engine room and cargo hold rounds to be conducted, without prejudice to the keeping of an additional lookout on the bridge as required by STCW 95 and the Norwegian Maritime Code.

4. Review the contents of its management manual pertaining to the safe operation of its ships, and, in the light of this accident, ensure that they are sufficiently comprehensive and clearly written.

5. Critically review its safety management system and consider ways to enhance the safety culture among its personnel.

NOTE: In a letter to the MAIB dated 26 June 2002, Lys-Line intimated that it had fully accepted and implemented the above recommendations.

Marine Accident Investigation Branch
July 2002

ANNEX A

Copy of *Lysfoss*'s manoeuvring data

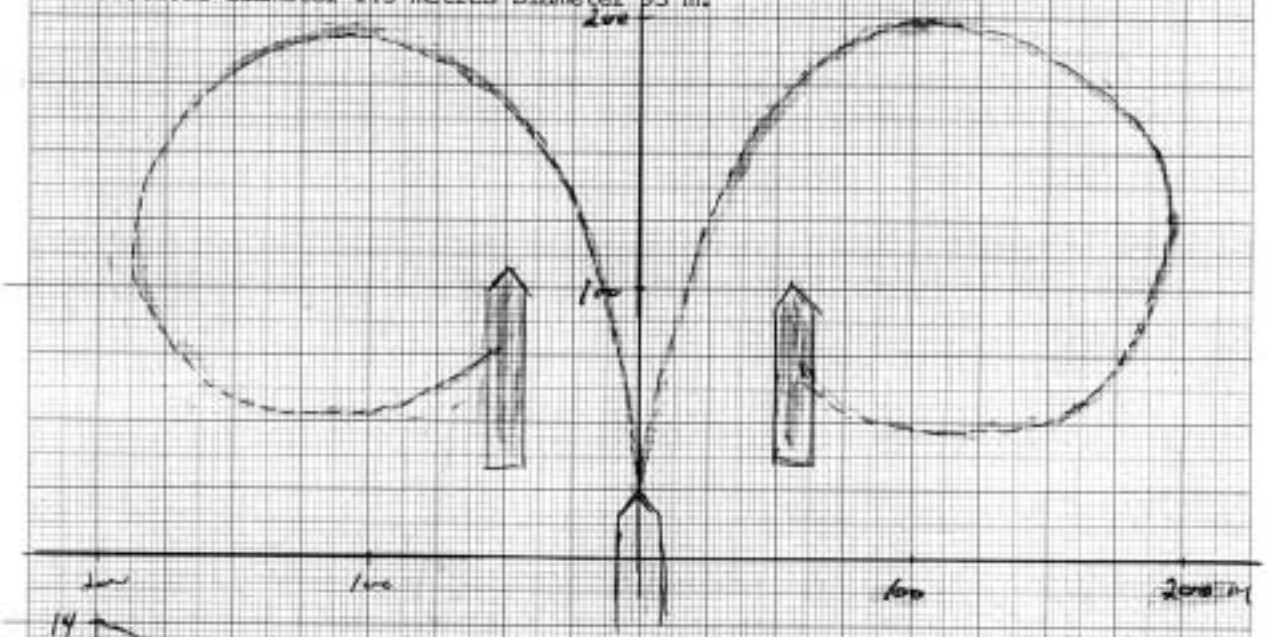
M/S LYSFOSS

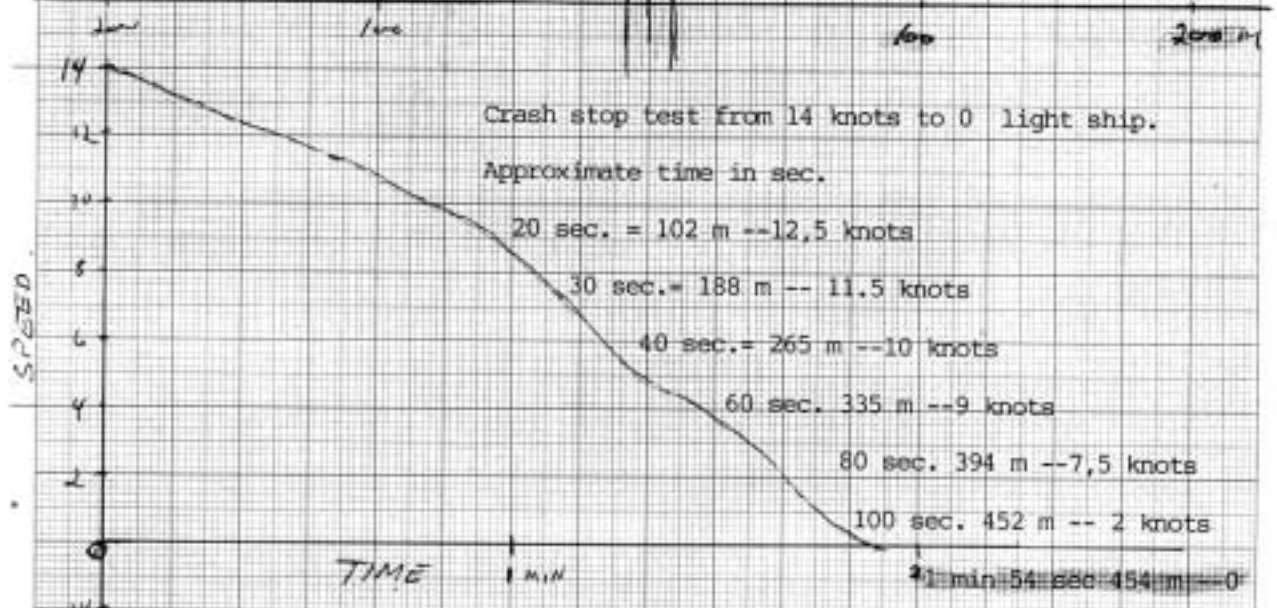
Turning circle test. Rudder 35° to port and starboard.

Approaching speed 13 kn. Final speed 3,3 knots.

Advance 191 metres time 90° = 43 sec. 180° = 1 min 23 sec. 360° = 2 min 52 sec.

Tactical diameter 145 metres Diameter 93 m.





Crash stop test from 14 knots to 0 light ship.

Approximate time in sec.

20 sec. = 102 m --12,5 knots

30 sec.= 188 m -- 11.5 knots

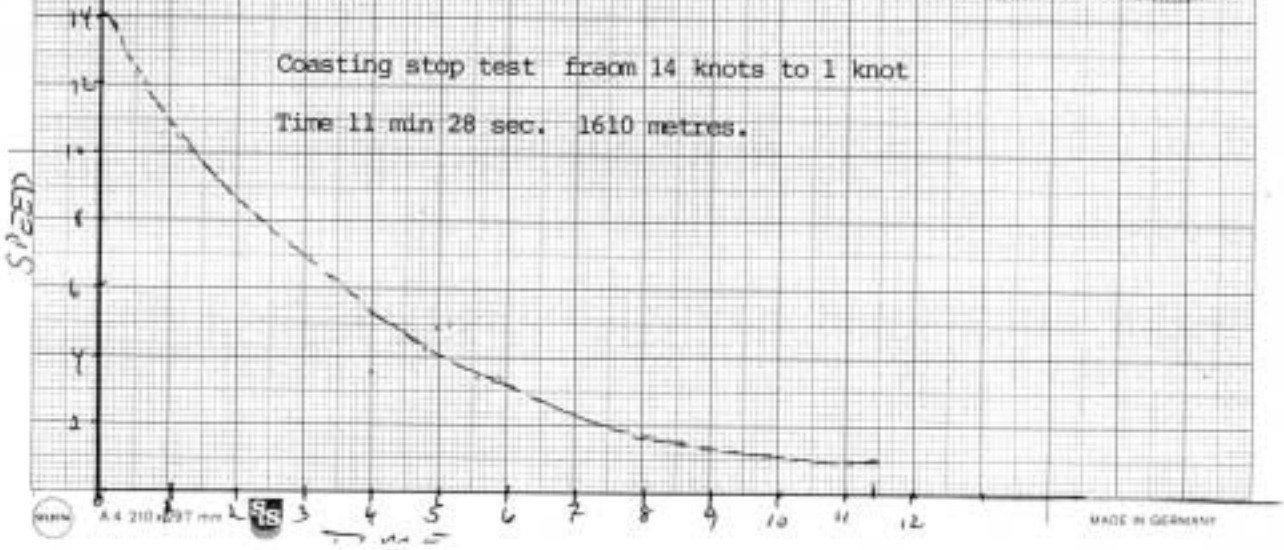
40 sec.= 265 m --10 knots

60 sec. 335 m --9 knots

80 sec. 394 m --7,5 knots

100 sec. 452 m -- 2 knots

1 min 54 sec 454 m --0



Coasting stop test fraom 14 knots to 1 knot

Time 11 min 28 sec. 1610 metres.

ANNEX B

Extract from the Management Manual

7.2 Master

The Master reports to the Maritime Director with regard to operation and maintenance of the vessel, and to the liner departments with regard to cargo and routing.

The Masters responsibility and authority are stated in general in section 131-142, The Master, of The Maritime Code (*Sjøloven*).

> The sections are dealing with seaworthiness, navigation, reporting, loading / discharge, authority, absence, care of cargo, obligations undertaken, liability for damages, rendering of accounts, and repatriation of seamen.

The Masters responsibility is also stated in general in § 106, Responsibilities of shipmaster and shipowner, of The Seaworthiness Act (*Sjødyktighetsloven*). § 106 reads in extract:

> "Responsibility for compliance with provisions contained in or issued by virtue of Norwegian statues to ensure seaworthiness of ships or to protect the interests and safety of those on board, rests with the shipmaster unless otherwise provided in the statue or regulation concerned.

(related to the shipowner, see ch. 3.2)

The Master has thus the total responsibility for and authority over the crew, vessel and cargo, but is free to consult the organisation on shore for evaluation and advice.

In case of a distress situation section 135 of The Maritime Code prevails.

Beyond his traditional tasks the Master has duties to:

- ✓ Chair a safety meeting every six weeks and send a report to the head office.
- ✓ Inform officers and crew in general on the ISM Code, the ISO 9002 Standard and SOPEP.
- ✓ Train Chief Officer in manoeuvring vessel to / from quay
- ✓ Encourage the use of "Exchange of experience" Form 0-40 in reporting near-accidents.
- ✓ Log rest hours on Form 0-73, "Rest hours log".
- ✓ Note past incidents and suggest new actions on Form 0-96, "Notes at shift of vessel's management", for information to / discussion with the next Master before being relieved.
- ✓ Present suggestions to head office for improvements of operations and services.

Ref.: The Maritime Code, 1994 (*Sjøloven*)
The Seaworthiness Act, 1903 (*Sjødyktighetsloven*)

✓ The Chief Officer shall enter the result of the calibration in the forklift checklist, section 6 of the Cargo Safety Manual *(Lastesikringshåndbok)*.

7.4.4 Departure / arrival port and sea voyage 7.4.4

Once on each round voyage the normal control of important instruments shall be formally registered on Form 0-61, "Check of operational equipment and functions".

At departure / arrival and in narrow waters the Chief Engineer or 1. Engineer shall stay in the engine room. Both diesel generators shall be connected to the switchboard. The "dead man alarm" shall be switched on as long as he is in the engine room.

(cont.)

At departure / arrival and in narrow waters the crew shall be prepared for an immediate drop of the anchor(s).

The side door must be closed and secured before leaving a harbour (ch. 7.5.2).and the corresponding bridge alarm lamp shall have turned green. The bridge alarm for water leakage to the well under the side door shall be tested in port on each voyage by lifting the float.

Further, the weather deck hatch covers must also be closed and secured (ch. 7.5.3) before leaving a harbour.

In open sea when the auto pilot is engaged, the "dead man alarm" is automatically switched on ("Lysholmen" has no alarm).

The engine room is normally not manned (E0). The machinery alarm shall be switched over from engine room to bridge control before leaving the engine room.

All vessels (with the exception of "Lysholmen") receive weather charts on Navitex facsimile equipment and may better plan the sea voyage.

The sea voyages shall be reported on Form 0-70, "Voyage report".

-o-

The duty officer on the bridge should be prepared for the following emergency situations:

✓ **Black-out**

The emergency navigation lights shall be switched on and the regulatory signals to be given. The Chief Engineer shall immediately be called and the crew informed on the intercom. Vessels nearby and shore to be advised as necessary. The Chief Engineer to report on the situation as soon as possible.

✓ **Failure of remote control of steering gear or of propeller**

The Chief Engineer shall immediately be called and via the intercom in the engine room respectively

- ✓ manually operate the magnet valves on hydraulic pumps for steering gear.
- ✓ manually operate the push buttons or the hydraulic valves on the propeller gear.

(Ref: Regulations of 30 June 1987, Watchkeeping etc.)