Report on the investigation of

the cargo shift, abandonment, and grounding of

mv *Kodima*

in the

English Channel

1 February 2002

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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

C	-	Celsius
cm	-	centimetre
Code of Practice	-	See 1.6.1
DWT	-	Dead Weight Tonnage
GPS	-	Global Positioning System
IFO	-	Intermediate Fuel Oil
IMO	-	International Maritime Organisation
m	-	metre
MO	-	Meteorological Office
m^3	-	Cubic metre
m^2	-	Square metre
NUC	-	Not Under Command
RNAS	-	Royal Naval Air Station
rpm	-	Revolutions per minute
SOSREP	-	Secretary of State's Representative for Maritime Salvage and Intervention
TSS	-	Traffic Separation Scheme
USA	-	United States of America
UTC	-	Universal Co-ordinated Time
VHF	-	Very High Frequency

SYNOPSIS

On 1 February 2002, the Maltese, 6395gt cargo ship *Kodima* was on passage from Sweden to Libya carrying 10168 m^3 of timber in her holds and on deck. Between 1900 and 1950 her deck cargo shifted to port causing a list of 15° and, although course was altered towards Falmouth Bay, England, the list, compounded by the ship rolling in heavy seas, continued to increase. By 0450 the following morning it had reached 40°, and the ship's main engine and generators had become inoperable. With the ship stopped in the water about 20 miles from Falmouth, and drifting to the north-east, the master and crew were evacuated by helicopter. Attempts to secure a towline were unsuccessful, and *Kodima* eventually grounded on Tregantle Beach, Whitsands Bay at 1855.

At 0744 the following day, SOSREP informed the MAIB of the cargo shift and an investigation was started later that day. The investigation was conducted with the full co-operation of the Malta Maritime Authority, which concurs with the report's conclusions and recommendations.

Kodima was refloated on 16 February and towed to Falmouth. No significant oil pollution resulted from the grounding or from the subsequent salvage operations, but about 70% of the timber cargo was lost overboard and swept on to local beaches.

It is considered that several factors contributed to the cargo shifting, including:

- The wind was south-west force 8 to 9, or higher, and the seas were heavy.
- The vibration, deck movement, and water hitting the timber deck cargo, resulting from the ship pounding into the heavy seas, caused the timber deck cargo to settle.
- The wire lashings had not been checked for 32 hours and were not sufficiently tight.
- Large amounts of water probably found its way under the tarpaulin covering the timber deck cargo and lubricated the smooth plastic coverings.
- After 1920, the wind and sea were between 25° and 30° on the starboard bow, which caused the ship to roll more heavily.

It is also considered that following the onset of a list, several factors prevented *Kodima* from proceeding to Falmouth Bay. These include:

- The list and ship's movement caused fuel to be lost from the generator fuel oil service tanks.
- The list and ship's movement caused the fuel system to the generators to become air-locked.
- It was not possible to jettison the timber deck cargo.
- The main engine could not be re-started.

The recommendations made are aimed at encouraging compliance with, and improvements to, the relevant Code of Practice.

Photograph courtesy of FotoFlite

Kodima

SECTION 1 - FACTUAL INFORMATION

1.1 PARTICULARS OF MV *KODIMA* AND ACCIDENT

Vessel details

Registered owner	:	Kodima Shipping Limited
Manager(s)	:	Technical – INOK N.V., Antwerp Commercial – Atlantic Ice Carriers, Rotterdam
Port of registry	:	Valletta
Flag	:	Malta
Type	:	General cargo/timber carrier
Built	:	1989, Gdanska Shipyard, Poland
Classification society	:	Russian Register of Shipping
Construction	:	Steel
Breadth	:	19.31m
Length overall	:	131.6m
Gross tonnage	:	6395
Engine power and/or type	:	Oil engine, direct drive
Service speed	:	13.5 knots
Charterers	:	Solchart, Finland

Accident details

Time and date	:	Cargo shift –1900 on 1 February 2002 Grounding – 1855 on 2 February 2002
Location of incident	:	Cargo shift - Approximate position, 49°21'N, 004°03'W – 171° Eddystone Rocks Lt. 50 miles Grounding – 50°21.5N, 004°17.4W – Tragantle Beach, Whitsand Bay
Persons on board	:	16
Injuries/fatalities	:	None
Damage	:	Constructive total loss

1.2 BACKGROUND INFORMATION

Kodima, formerly *Kapitan Glotov*, was a general cargo motor vessel built in Poland in 1989, and registered in Valletta, Malta. She was owned by Kodima Shipping Limited of Malta, her technical managers were INOK N.V. of Antwerp, and her commercial managers were Atlantic Ice Carriers in Rotterdam. Although *Kodima* was mainly used to carry bulk cargo, she also occasionally carried timber and was certified under the timber load line regulations. At the time of the accident, *Kodima* was operating under a time charter for a single voyage for Solchart of Finland, and was carrying timber from Sweden to Libya.

1.3 NARRATIVE

All times are UTC and all courses are true.

1.3.1 Passage from Norrkoping

Kodima sailed from Norrkoping, Sweden, at 2015 on 25 January 2002 and, after disembarking the pilot at 2345, anchored at 0018 the following day in the vicinity of Gustaf Dalen Light to allow the cargo lashings over her deck timber cargo to be tightened. This was conducted overnight in smooth sea conditions and an air temperature of –3°C. The ship weighed anchor at 0700 and the passage during 26-27 January passed without incident. *Kodima* then anchored at 0907 on 28 January in the lee of Skagen after receiving warnings of force 10 to 11 winds. The master immediately reported his actions to the ship's managers. Twenty-three other ships were also seen to be sheltering from the weather.

Throughout the day the wind steadily increased, and by 1800 was south-westerly at 31 knots, gusting to 51 knots. As the weather front was forecast to pass through *Kodima's* position during the early hours of 29 January, the amount of anchor cable used was increased from 4.5 shackles to 6 shackles, and the engine was kept at immediate readiness. The master also remained on the bridge from 2200. At 0400 *Kodima* started to drag her anchor, and the main engine was used at dead slow ahead to maintain position. During this period, wind speed was observed on board as high as 70 knots, and spray was seen breaking over the forecastle on to the timber cargo.

By 1000 the wind strength had eased slightly and, following the receipt of a weather forecast predicting south-westerly winds force 4 to 5, the master decided to continue the voyage. The anchor was weighed at 1100, and *Kodima* proceeded at full ahead sea speed (approximately 160 rpm to make 13.5 knots through the water). This speed was maintained until about midnight when manoeuvring full ahead (approximately 150 rpm to make 12.5 knots through the water) was ordered because the ship was heading directly into a wind which was gusting up to about 60 knots over the deck. The sea-state was 6-7, and waves were breaking over the forecastle on to the deck cargo. Speed was further reduced between 0227 and 0533 on 30 January by adjusting the revolutions to 135 rpm. By 1000, speed had again been increased to full ahead sea speed, and although waves were again logged breaking over the forecastle on to cargo and the ship was pitching, the motion was not uncomfortable and there was no pounding and little rolling. Thereafter, conditions improved and a speed made good of between 10 and 12 knots was maintained towards the English Channel.

1.3.2 Passage through the English Channel

When *Kodima* left the Dover Strait TSS at about 2300 on 31 January, the weather and sea conditions again started to deteriorate, and although the ship was pitching easily into the sea, some spray was being shipped over the forecastle. Conditions worsened overnight and by 0800 when in the Casquets TSS, the sea was considerably rougher and caused the ship to vibrate and the propeller to race as she pitched into the waves. In view of this, along with the weather forecasts and storm warnings received, the master reduced speed to manoeuvring full ahead at 0822, and transferred control of the engines to the engine room. Speed was reduced again at 0933, when the engine was put to Half Ahead (approximately 130 rpm to make 8.8 knots through the water).

During the day, with the wind gusting up to about 60 knots, the ship continued to pound into the waves, and speed made good over the ground reduced to about 6.7 knots. At 1600, the second officer recorded in the deck log that the ship was rolling heavily and that waves were breaking continually over the forecastle. He also recorded that two wooden uprights in the vicinity of No 4 hold had been washed away. The master did not consider it necessary to slow down further, and wanted to maintain steerage and proceed to the south of the Ushant TSS, where better weather and sea conditions were forecast. He based the speed required to maintain steerage on the speed indicated by the GPS receiver.

By 1900, speed made good over the ground had reduced to between 2.1 and 4.3 knots, the ship was rolling about 3-4°each side, and yaw was about 6° either side of the base course of 230°. Shortly after 1900, two loud cracks were heard coming from the main deck by the master and chief officer on the bridge. The deck lights were switched on immediately and manual steering was selected. Initially, nothing untoward was seen, and the master confirmed with the chief engineer that there were no problems in the engine room. At about 1920, however, it was noticed that two further uprights were missing from the after section of No 4 hold hatch cover, on the port side, and that the ship now had a slight list to port. The master realised that the cargo must have shifted and, at about 1930, course was adjusted to port to 190° and speed increased to manoeuvring full ahead to close the French coast, which was about 28 miles away. The deck lights were also switched off. Although the most direct course to the French coast was between 165° and 170°, the master altered to 190° to keep the wind and sea within 25° to 30° of the starboard bow. On the new course, although the pitching eased, the ship rolled more heavily, and yaw increased to about 9° either side of the course.

At about 1950, *Kodima* experienced a sudden movement and immediately took a list of 10°-15° to port. Descriptions of the movement before the list vary, and include: *the ship shook as if being struck by a large wave; the ship rolled to port, and before returning to the upright, rolled to port for a second time but to a greater angle; and the ship was lifted then fell into a trough*. Immediately after the list had developed, speed was reduced to half ahead, and the deck lights were switched on again. It was seen that the upper tiers of the deck cargo had shifted about 0.5m to port, and all of the uprights on the port side had been broken. The packages on the top two rows of the deck cargo had been distorted into a rhomboid-like shape, and the stow on the starboard side was no longer vertical when compared to the uprights.

Course was altered very slowly to starboard to a heading of 300°, then 330°, in an attempt to shift the cargo back to starboard by putting the wind and sea on the port beam. On these headings, the motion was more comfortable and, at 2000, speed was again increased to full ahead manoeuvring to close Falmouth Bay as quickly as possible. The NUC lights were also switched on. Following discussion with the ship's technical managers, and reference to the ship's stability book, the master ordered the chief engineer to ballast wing tanks 4A and 3C on the starboard side. This helped to stabilise the ship, but it did not reduce the list, and the ship remained to port of upright during her roll cycle. At 2200, course was adjusted to 310° to head for the anchorage area in Falmouth Bay. With the wind and sea now on the port quarter, the ship was rolling gently, and there were no sudden or violent movements. Speed made good was about 8.7 knots, and the list was now as high as 28° to port.

At 2240, a director of the ship's technical managers contacted the ship and advised the master that the safety of the crew was the top priority.

At 0121 on 2 February, when 28 miles from Falmouth, the ship experienced a total electrical failure, and the main engine stopped. The emergency generator cut in automatically and supplied power to key bridge equipment, including the VHF radio. The ship was then stopped in the water and from about 0200, the deck cargo on top of No 2 hold hatch cover started to be washed overboard. As a result, the master sent a navigational warning concerning the loss of his deck cargo, which was received and acknowledged by the Goonhilly Down 102 relay station.

At this point, the master considered it would be advantageous if some of the other deck cargo was jettisoned. Shortly after 0200, the chief officer, accompanied by the boatswain and an able seaman, went to the starboard side of the main deck to cut the aft-most lashing wire. Initially, a hacksaw and an axe were used, but after electrical power was restored at about 0300, an angle grinder was used to cut through most of the strands, and the wire then parted under the weight of the cargo as the ship rolled to port. The cargo, however, did not move. As the next lashing wire could only be reached by moving along the edge of the bulwark outside the cargo stow, the chief officer considered it to be too dangerous to attempt to cut any more and, at 0340, he returned to the bridge to brief the master. The ship was now listing 30° to port and rolling up to 37°, and there was only one layer of timber packages remaining on No 2 hold hatch cover. No packages, however, appeared to have been lost from elsewhere.

At 0450, electrical power, other than that provided by the emergency generator, was again lost, and the master called Falmouth Coastguard on VHF radio channel 16. He informed them that his engine had stopped, his deck cargo had shifted, and that the ship had a 30° list to port. The ship was now 20.8 miles from Falmouth Bay and drifting in a north-north-easterly direction at a rate of about 2 knots.

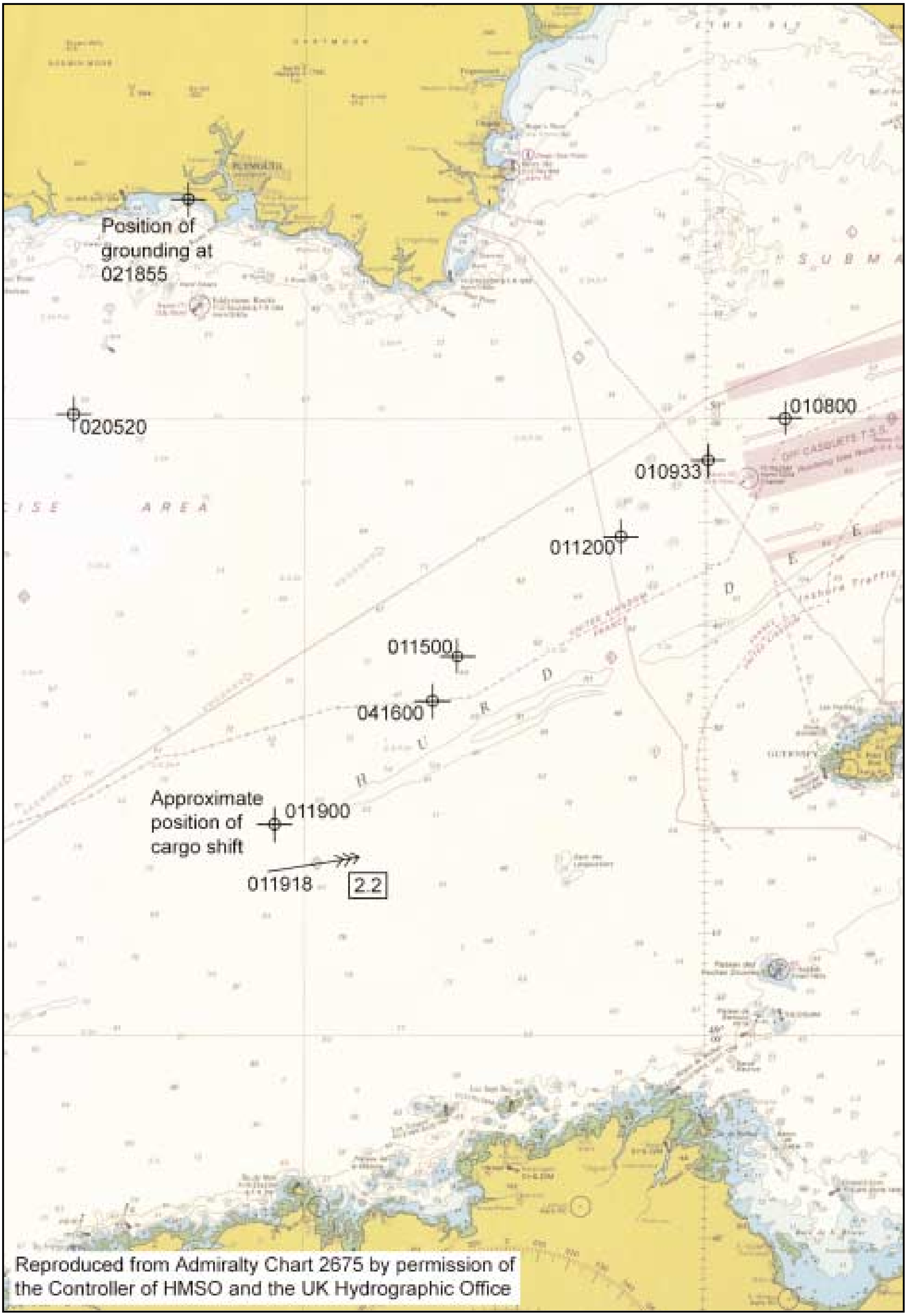
At about 0520, the chief engineer informed the master that there was little else he could do. As the list had now increased to about 40°, the master decided to ask Falmouth Coastguard for external assistance. As a result, two rescue helicopters were launched from RNAS CULDROSE, which arrived on the scene shortly before 0700. The crew were then winched off *Kodima* from on top of the deck cargo on top of hold No 4, and landed to RNAS CULDROSE. As the crew left, the list had increased to about 45° and the port deck edge was immersed in the sea. All of the cargo stowed on No 2 hatch cover had been lost overboard, but the tarpaulins covering the cargo on top of No 3 and No 4 hold hatch covers were still in place. An approximation of *Kodima*'s track between 0800 on 1 February, until her grounding, is shown at **Figure 1**.

1.3.3 In the engine room

Immediately following the onset of the list to port at 1950, the chief engineer went to the engine room. After being informed by the on-watch engineer that there was no problem with the machinery, the chief engineer ordered No 2 generator to be started and placed on load. No 1 generator was already running. He also ordered the electrician to attend in the engine room and for all loose items of equipment to be stowed. The chief engineer then called the bridge. He was told that the list was caused by a deck cargo shift, and that he was to keep the engine room on stand-by and to remain in the engine room.

The chief engineer completed ballasting wing tanks Nos. 4A and 3C at about 2200. Between 2200 and 2300, the service tank low/high alarms started to operate intermittently. These alarms were both audio and visual. In view of the increasing list, the chief engineer ordered the steering gear to be checked, and the funnel doors and flaps to be closed. The second engineer, who also confirmed that the temperatures and pressures on the main and auxiliary machinery were normal, undertook these actions.

Figure 1



Approximation of *Kodima*'s track

At 0118, No 1 generator suddenly slowed down and stopped. No 2 generator remained on load and continued running for a further 2 minutes before also stopping. Numerous alarms started to sound, and the main engine stopped because of the loss of its auxiliary services. The chief engineer quickly started No 3 generator and placed it on load. He also sent for the third engineer who was asleep. With electrical power restored, the main engine auxiliaries were reset and the main engine restarted to run at dead slow ahead, only to stop again after a few minutes when No 3 generator ran down and stopped.

On arrival in the engine room, the third engineer checked the diesel oil service tanks but found it difficult to estimate how much fuel was in them because of vessel movement and oscillation of the levels within the sight glass. He estimated about 4.5 tonnes was in No 20 service tank (outboard) and about 5.0 tonnes was in No 26 service tank (inboard). The two diesel oil service tanks had been topped up by the third engineer during the 0400 – 0800 watch the previous morning; No 20 had been filled to about 7.5m^3, and No 26 to about 8.5m^3.

Attempts were made to get No 3 generator restarted. The third engineer opened the vent cock on the engine-mounted fuel filter but, despite using the hand-priming pump, only air came out. Inspection of the duplex main fuel filter revealed that there was no fuel present there either. After the filters had been re-secured, the hand-priming pump was again used until fuel eventually appeared at the vent cock at the engine side. With fuel now present, No 3 generator was restarted and ran for about 3 minutes before, once again, slowly running down and stopping. Again, investigation showed only air present at the vent cock.

The third engineer then shut the run-down valve from No 26 service tank while efforts were concentrated on starting No 2 generator, on which both the main fuel filter and the engine side filters were vented, and the system pressurised using the hand priming pump. Several minutes later, fuel was seen at the filter vents and, by 0300, No 2 generator was running and taking load. At this point all the engineering staff were in the engine room.

With electrical power restored, the main engine was prepared for restarting. However, as the loss of electrical power had, in turn, resulted in the loss of steam pressure at the boiler, the main engine fuel had fallen below its operating temperature. While the fourth engineer prepared to re-fire the boiler, however, the second engineer reported that there was a leak in a pipe from a port side sea chest, causing sea water to spray over a large area. The sea chest was isolated, but soon after, the main engine fuel boost pump stopped and a low pressure fuel alarm sounded. The electrician investigated and found that water spray from the sea chest leak had saturated both the operating and the stand-by boost pump motors causing the circuit breaker to trip. The operating motor had burnt out, but the stand-by one was considered to be salvageable if dismantled and dried. At about 0315, the stand-by motor was removed to the workshop and work started on stripping the motor and drying out the windings. This work was interrupted for about 20 minutes while the electrician arranged for a power supply for an angle grinder to cut deck cargo lashings. During this time No 3 generator was vented and primed ready to restart if the need arose.

On the electrician's return, it was decided that it would be quicker to steam out the motor and then blow through with compressed air to drive out the moisture. At about 0445, the master visited the engine room but the chief engineer was unable to give him any indication how long it would take before the main engine could be restarted. Minutes later, at about 0450, No 2 generator slowed and stopped again. The chief engineer immediately sent the third and fourth engineers, together with the motorman, to vent No 2 generator and try to restart it again. Meanwhile, the chief engineer started No 3 generator, which ran for about 20 seconds and then stopped. The same happened when No 2 generator was restarted. The chief engineer then informed the master that without electrical power the main engine could not be restarted.

With the list now approaching 40° and no main electrical power, the chief engineer ordered all sea chests, shipside valves and fuel valves to be closed. At about 0530 with the vessel listing to 42°, the master ordered the chief engineer to evacuate the engine room, and for staff to assemble in the accommodation with lifejackets.

1.3.4 Salvage

After the crew had been evacuated, *Kodima*, with the tugs *Far Sky* and *Segan* in attendance, continued to lose her deck cargo as she drifted to the north-east. Attempts to secure a towline were unsuccessful, and *Kodima* eventually grounded on Tregantle Beach, Whitsands Bay at 1855. She settled with about a 15° starboard list with her bow towards the beach. Initial damage assessments, conducted on 3 February, indicated that the engine room was flooded, that the hatch covers to No 4 hold were missing, and that the hatch covers to No 3 hold had been lifted. Substantial amounts of the timber cargo had been lost overboard.

A salvage control unit, under the direction of SOSREP, was established in Plymouth and, although hampered by bad weather conditions, *Kodima* was refloated on 16 February and towed to Falmouth. No significant oil pollution resulted from the grounding or from the subsequent salvage operations. About 70% of the timber cargo, however, was lost overboard and was swept on to local beaches.

Kodima was sold for disposal by her owners while the ship was in Falmouth.

1.4 ENVIRONMENTAL CONDITIONS

The surface analysis, and its corresponding model of winds and significant wave heights for 1800 on 1 February produced by the MO **(Figures 2 and 3)**, show that wind was south-west gale force 8 gusting 9, and that the expected significant wave height was between 6m and 7m. Wind speeds recorded in the deck log indicate that the wind gusted to between storm 10 and violent storm 11 on occasions. Sunset was at 1708, civil twilight was at 1746, and nautical twilight at 1825. Moonrise was at 2021. It was spring tides, HW Dover was at 1328, and *Kodima* was in the influence of a south-westerly tidal stream until about 1830, when it turned east-north-easterly. At the time of the cargo shift, the rate of the tidal stream was about 1.5 knots.

1.5 THE CARGO AND LOADING CONDITIONS IN NORRKOPING

Kodima was loaded with 10,168m³ of sawn timber in packages, of which about 3,700m³ were loaded on deck. 2764m³ had been loaded into the holds in Orskarr on 6 January 2002, and the remainder was loaded in Norrkoping between 23 and 25 January. The weight factor of the cargo was 0.55/0.56 and the overall gross weight of the cargo was about 5,700 tonnes. The timber stowed on deck was contained in packages of about 1m high, 1m wide and in varying lengths of between 3m and 5m with square, rather than ragged or 'broom', ends. The packages were secured with four or five metal bands, depending on their length, and covered in plastic sheeting for protection. It has not been possible to determine the type of plastic sheeting used, but it is believed that the sawmills, which supplied the timber, did not commonly use abrasive plastic sheeting. The cargo was stored in a warehouse before loading.

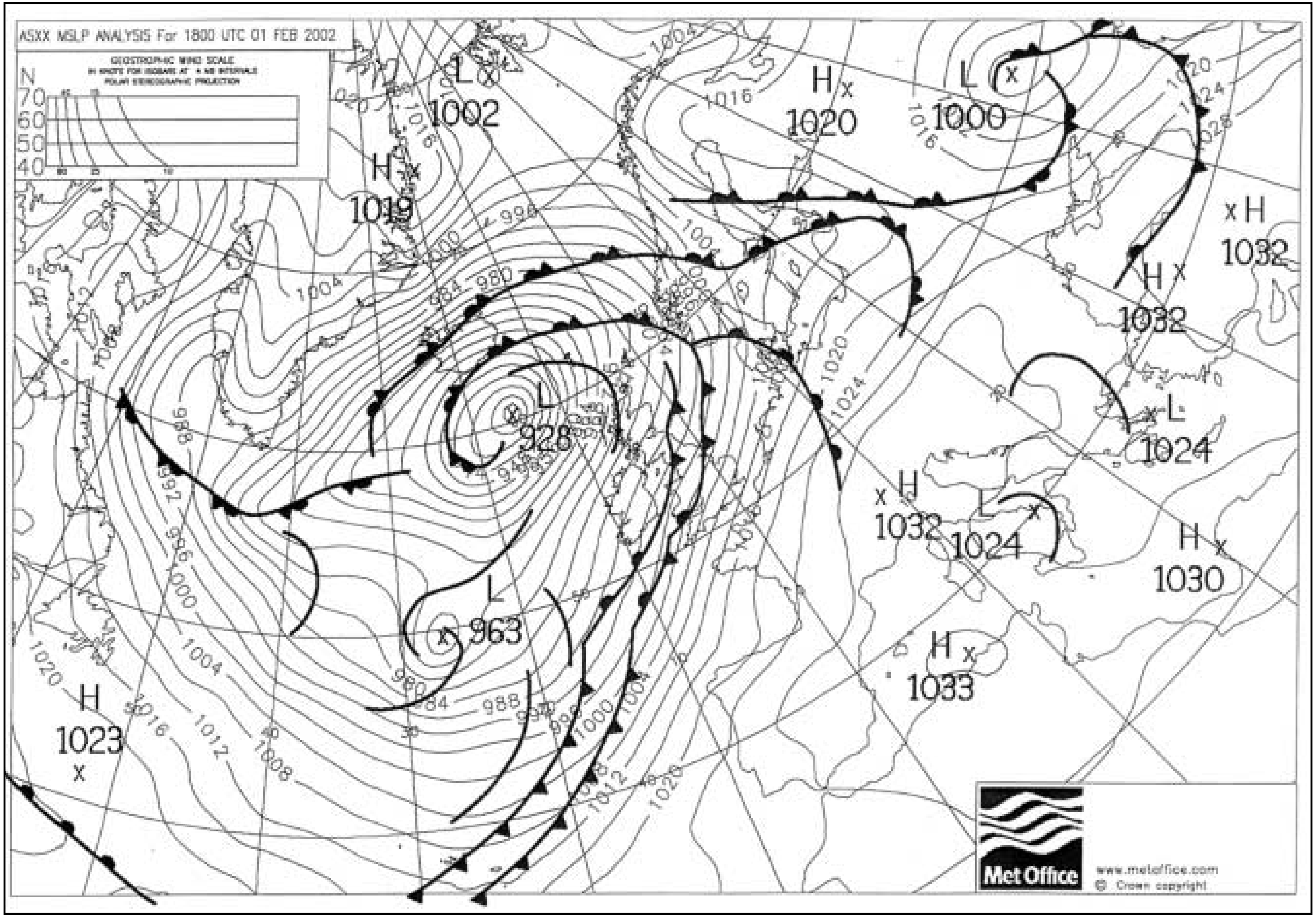
The temperature on 23 and 24 January was between 0.5°C and 5.6°C, and snow fell overnight to a depth of 4cm. On 25 January, there was a light dusting of snow, and the temperature ranged between –3.5°C and –4.5°C.

1.6 CARGO STOWAGE AND LASHING

1.6.1 Code of Safe Practice

The provisions contained in the *IMO Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 1991* are recommended for all vessels of 24m or more in length, engaged in the carriage of timber deck cargoes. A copy of the Code (without appendices B and C) is at **Annex A**.

Reproduced courtesy of the Met Office



Surface analysis for 1800 UTC on 1 February 2002

Figure 2

Reproduced courtesy of the Met Office

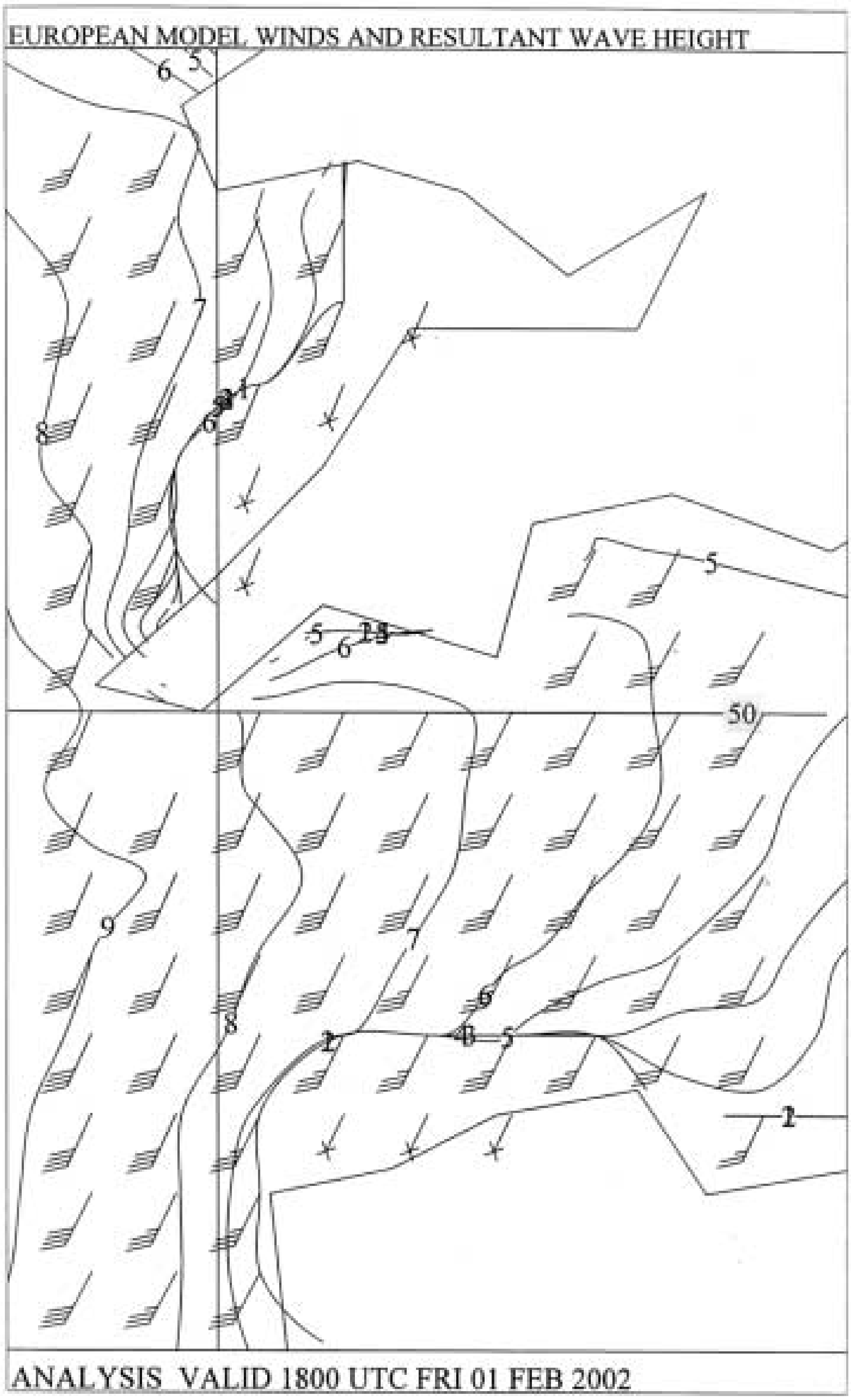


Diagram showing predicted significant wave heights at 1800 on 1 February 2002

1.6.2 General

Kodima was a single deck vessel with four cargo holds. The hatch to No 1 hold was on the forecastle head.

The ship's cargo securing manual had been approved by the Russian Register. Twenty-two uprights were fitted in sockets on each side of the deck at fixed intervals of 3m. Each upright was made from timber, and was 30cm diameter and between 4.4m and 6m long. Instructions in the cargo securing manual stated:

When stacks are merely stowed longitudinally in two, three or four layers until the start of the voyage, uprights are to be fitted….When stacks are stowed longitudinally in two three or four layers and clearances between stacks and the sides of the ship are within permissible limits of shift towards the diametric centre line, uprights are optional, or they may be removed after the entire block of stacks is finally secured by lashings.

No reference to hog wires used in conjunction with uprights was made in these instructions because the approving authority considered that, when strengthened by hog-lashings, uprights might obstruct attempts to jettison packaged timber deck cargo in an emergency situation.

Forty-four lashing wires, secured to strong points on the deck at intervals of about 1.5m, were fitted. The wires were of 16mm diameter and were tested and certified in 1997 by the Russian Register of Shipping. Integral to the wire lashings were a turnbuckle to allow tightening, a pelican hook for quick release, and chain for adjustment of length **(Figure 4)**.

1.6.3 Preparations

When the ship arrived in Norrkoping during the evening of 22 January, the chief officer was provided with the cargo list detailing the total weight, numbers of packages, and numbers of bills of lading. The wires were also secured to the strong points on the deck, and draped over the bulwarks to keep them clear. The port side uprights had been fitted before arrival, in the expectancy of being starboard side to.

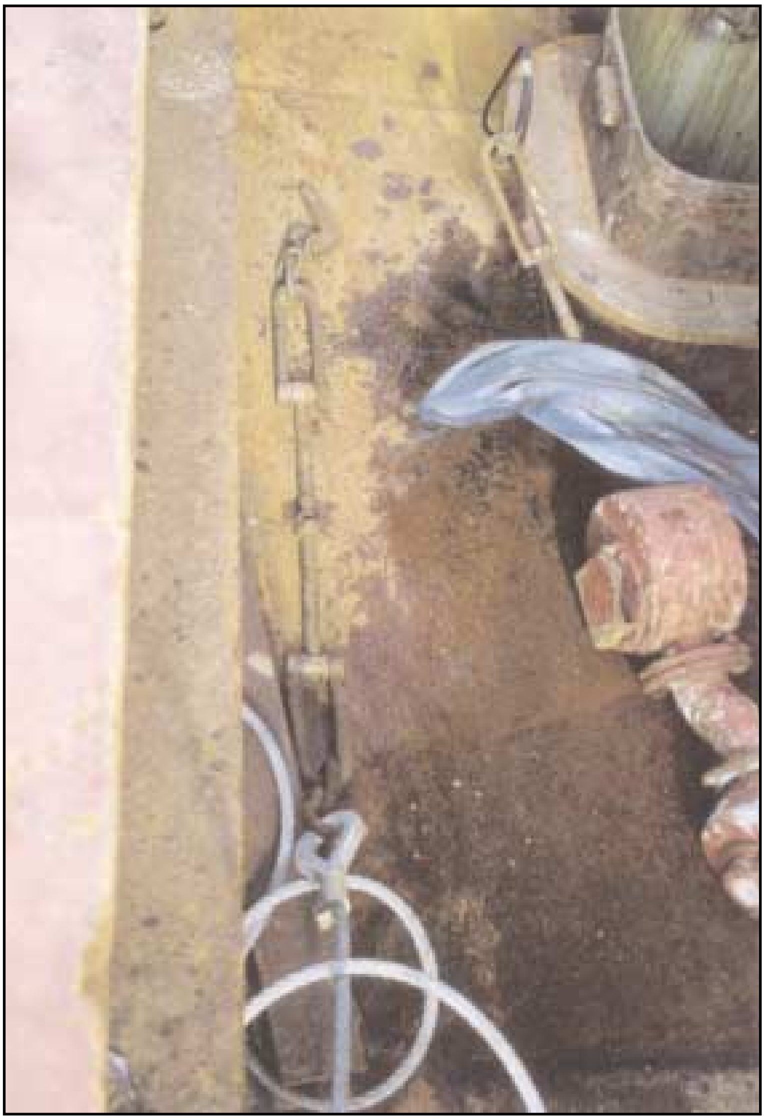
Before loading the cargo, all hold bilges were sounded to ensure that they were empty, and the bilge alarms were tested and found to be working correctly.

1.6.4 Loading and stowage

Loading of the holds was completed on 23 January. Before loading on top of the hatch covers could begin, however, it was necessary to place packages in the wells between the hatches **(Figure 5)**, and on deck between the hatch comings and the bulwark **(Figure 6)** to facilitate a level stow and avoid large void spaces.

Packages used adjacent to the bulwark were identified by the stevedores, and were unbanded, repacked, and rebanded to the appropriate sizes by the ship's crew. Once this had been completed, the uprights were erected along the starboard side, snow was swept from the hatch covers, and the loading of the deck cargo commenced.

Figure 4



Photograph showing wire lashing
with turnbuckle and pelican hook

Figure 5

Photograph showing space between hatch hold covers

Figure 6

Photograph showing packages placed between
the bulwark and hold hatch covers

Two gangs of stevedores were used, one starting at the forward end of No 2 hold hatch cover, and the other starting at the aft end of No 4 hold hatch cover. Both worked towards each other. Packages were packed around obstructions on the deck, including hold air vents **(Figure 7)**, over sounding pipes **(Figure 8)**, and dunnage was placed on top of the packages located between the hatch coamings and ship's-side bulwarks to keep the stow level. Other than in the wells between the hatches, all of the timber packages were stowed longitudinally and, after the first tier had been loaded, the stevedores placed 5cm thick dunnage along the outer edge of the stow in order to angle the outer packages inboard slightly. Three tiers of timber packages were stowed on the hatch cover to hold No 2, and four tiers on the hatch covers to holds No 3 and No 4, with fewer packages being used on the uppermost tiers. The chief officer estimated that the height of the deck cargo was slightly less than 4m above the hatch covers. The length of the stow was about 66m, being from immediately forward of the main superstructure, to aft of the forecastle housing.

The deck cargo filled the fore and aft passageways on both sides of the ship in way of the hatch covers to holds No 2, No 3, and No 4, and as the ship did not carry equipment to provide secure and safe access along the length of the stow, none was rigged. Access to the forecastle was via a ladder at the front of the main superstructure **(Figure 9)** then across the top of the deck cargo.

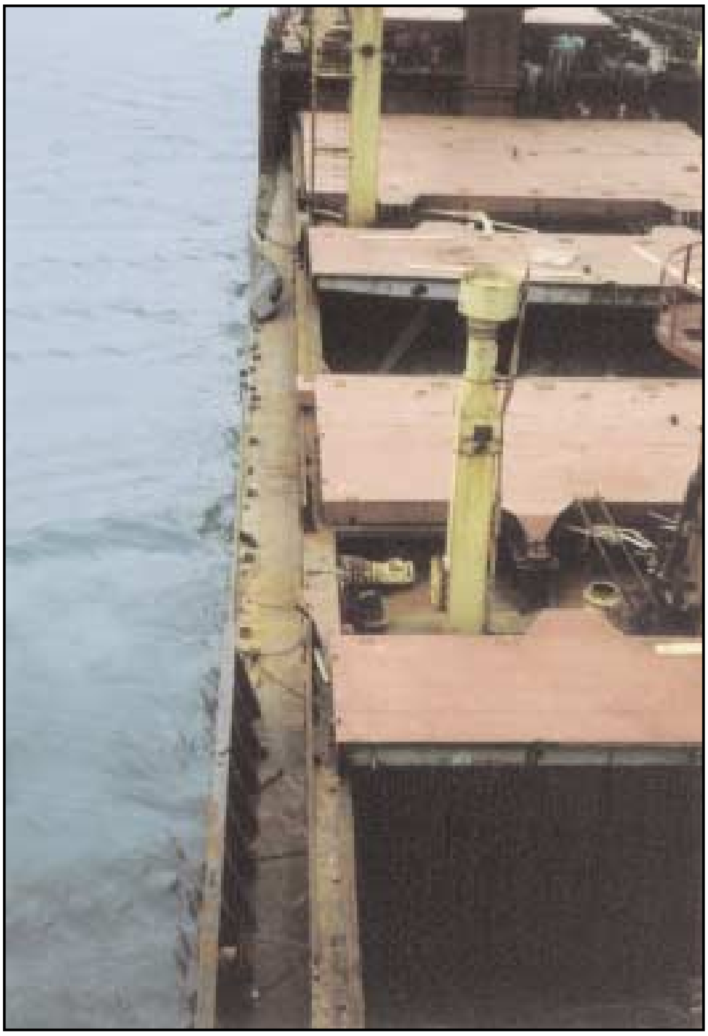
1.6.5 Securing

Before loading, tarpaulin was laid under the foremost row of packages on No 2 hold hatch cover, so that it would be tightly secured. Deck cargo loading was completed at 1305 on 25 January, and the timber was covered with tarpaulin. Three rope and timber lashing arrangements (similar to pilot ladders) were then spread over the tarpaulin on each of the hatch covers, and the main wire lashings connected. The tarpaulin ropes were secured to the bulwark, and loose timber was laid over the sides of the tarpaulin, and nailed to the packages underneath.

On sailing, all 44 lashings had been connected, but only the lashings over the cargo stowed on top of hold No 2 had been tightened. The lashings over the cargo on top of holds 3 and 4 were tightened while at anchor overnight. Eleven of the crew helped secure the lashings, and three tightening machines were used, each requiring two people to operate. The chief officer supervised the operation, and worked on top of the stow throughout the process. After each turnbuckle had been tightened, the tension was checked by jumping on the wire, and an assessment of whether the wire lashings were sufficiently taut was based on the presence of a slight gap between the wire and the top of the stow at the centre. The ship's Cargo Securing Manual stated:

Lashings should always be tightened. Before putting to sea, at least half of the working travel of all turnbuckles should be free.

Figure 7



Photograph showing hold air vents

Figure 8

Photograph showing sounding pipes between the hold hatch covers

Figure 9

Photograph showing ladder used to access the top of the timber deck cargo

1.6.6 Daily checks at sea

After leaving the anchorage, it was the boatswain's responsibility to check the lashings daily. During his checks while on passage, the boatswain reported that only three or four turnbuckles required adjustment on each occasion, and only by a couple of turns. When the boatswain had completed his daily check, he reported to the chief officer, and an entry was made in the deck log at noon. The boatswain was able to conduct this check each day, apart from 1 February. The last occasion the lashings were checked before the accident was between 0900 and 1100 on 31 January. No check was made on 1 February because the boatswain and the chief officer agreed that it was too dangerous to go on top of the deck cargo in the prevailing conditions. The master was informed of this decision at about 1000.

1.6.7 Previous timber cargo

Kodima had last carried a timber cargo from Finland to Tunisia in March 2001, when about 9,700m³ of timber were shipped. On that occasion, the timber packages were only stowed on top of the hold hatch covers, not in the passageways between the holds and bulwarks. Different securing points on the deck, which were closer to the hatch coamings, were also used.

1.7 STABILITY

Before sailing from Norrkoping, the ship was upright, and draughts taken from the jetty and recorded in the deck log were 7.35m forward and 7.82m aft. As the water at Norrkoping was fresh, the chief officer calculated the corresponding sea water draughts to be 6.96m forward and 7.5m aft, with a mean of 7.27m. The chief officer also calculated the ship's metacentric height to be 0.71m, corrected to 0.46m after allowing for free surface effect. The ship's minimum permissible metacentric height was 0.1m. Although it was reported by the stevedores that the ship had a permanent list to port during the loading, the crew did not confirm this.

In addition to her normal load lines, *Kodima* was also marked with timber load lines. These lines were calculated on the premise that a full timber deck cargo would be carried, and a separate set of cross-curves of stability produced for this condition. This allowed *Kodima* to load to a deeper draught than would otherwise be the case. The ship's summer timber load line was at 7.41m draught, which gave a freeboard of 1.424m, while her winter load line was at 7.205m, which gave a freeboard of 1.629m. Ships engaged in the carriage of timber deck cargoes, which are provided with, and make use of their timber load line, should comply with Regulation 44 of the Load Line Convention. A copy of this regulation is at **Appendix D to Annex A**.

With a 1.5m freeboard, deck edge immersion was calculated to occur at an angle of about 40°. In relation to the angle of list, the ship's cargo securing manual stated:

In an emergency situation with a list greater than 23.5 degs, it can be expected that lashings will break and the cargo of wood will fall overboard, thus creating excess buoyancy and stability and prolonging the survivability of the ship.

The ship sailed with 68.5 tonnes of diesel and 514 tonnes of IFO. All of the double bottom ballast tanks were full, which was a requirement when carrying timber cargoes. Initially, the chief officer's stability calculations were made manually but were checked by computer on 26 January, and found to be about the same as his original calculations. It was the chief officer's normal practice to recalculate the stability figures every 4 to 5 days using the on-board computer, taking into account updated tank readings provided by the chief engineer. This enabled him to ensure the ship maintained acceptable stability throughout the voyage.

It was the boatswain's responsibility to check the levels in the ballast tanks. This could be achieved via sounding ports on deck, or via gauges in the engine room. When carrying timber on deck, the ballast tanks could only be checked via the gauges in the engine room because the deck cargo blocked access to the sounding ports on deck. The ballast tanks were last checked by the boatswain using the gauges in the engine room on the morning of 1 February, and he recollects them all being empty. Manual soundings of the bilges were also not possible after the cargo had been loaded, but the bilges were routinely pumped out at sea every 3 to 4 days, even if the alarms did not sound. No bilge alarms sounded during the passage.

1.8 WEATHER FORECASTS

The ship received weather reports via Navtex and from VHF broadcasts from coastal stations; Area 2 forecasts were also received via Inmarsat C and prognoses from the Deutscher Wetterdienst, Bodendruck via facsimile.

Forecasts from the MO received on 1 February 2002 included:

At 0013 (gale warning issued 31 January at 2255)–*Thames Dover Wight – southwesterly severe gale force 9 now decreased gale force 8, increasing severe gale force 9 soon.*

At 0906 (issued at 0600 UTC) – *Thames Dover Wight Portland southwest 6 to gale 8, increasing severe gale 9. Plymouth southwest 7 to severe gale 9, perhaps storm 10 later. Biscay southwest, 7 to severe gale 9 in northwest, 5 or 6 in southeast. Outlook for following 24 hours:..gale force winds expected in all areas.*

At 1830 (issued at 1800 UTC) –*Plymouth southwest 7 to severe gale 9, occasionally storm force 10 at first…Northwest Biscay southwest 6 to gale 8, occasionally severe gale 9. Outlook for following 24 hours…strong to gale southwesterly winds expected in all areas, moderating and becoming cyclonic in Lundy and Fastnet.*

The following forecasts for Metarea 2 were also received from Meteo France:

At 0013 (issued at 2100 UTC on 31 January) *Forecasts to Saturday 2 at 00 UTC West Brittany, North Biscay, Northwest of South Biscay: southwest 7 or 8, increasing 9 soon. Severe gusts. Sea becoming high soon…Outlook for next 24 hours threat of gale or severe gale in all areas except South Biscay.*

At 0926 (issued at 00 UTC) Warning NR 50 – *West Brittany, North Biscay, Far northwest of South Biscay continuing to 02/12UTC at least southwest 7 or 8, decreasing in east soon. Severe gusts. High sea.*

At 1458 (issued at 0900 UTC) – *Forecasts to Saturday 2 at 12 UTC West Brittany, North Biscay, Northwest of South Biscay, decreasing 4 to 6 in east soon. Severe gusts. Very rough. Locally high.*

At 2200 (issued at 2015 UTC) Warning NR 51 – *West Brittany, West of North Biscay continuing to 02/18UTC southwest 7 or 8, occasionally 9 overnight. Gusts. High Sea.*

INOK N.V. had issued instructions for the procedure to be followed on receipt of a storm warning. An extract of this is shown at **Annex B.** Diagrams showing the relevant forecast areas are at **Figures 10 and 11**.

Figure 10

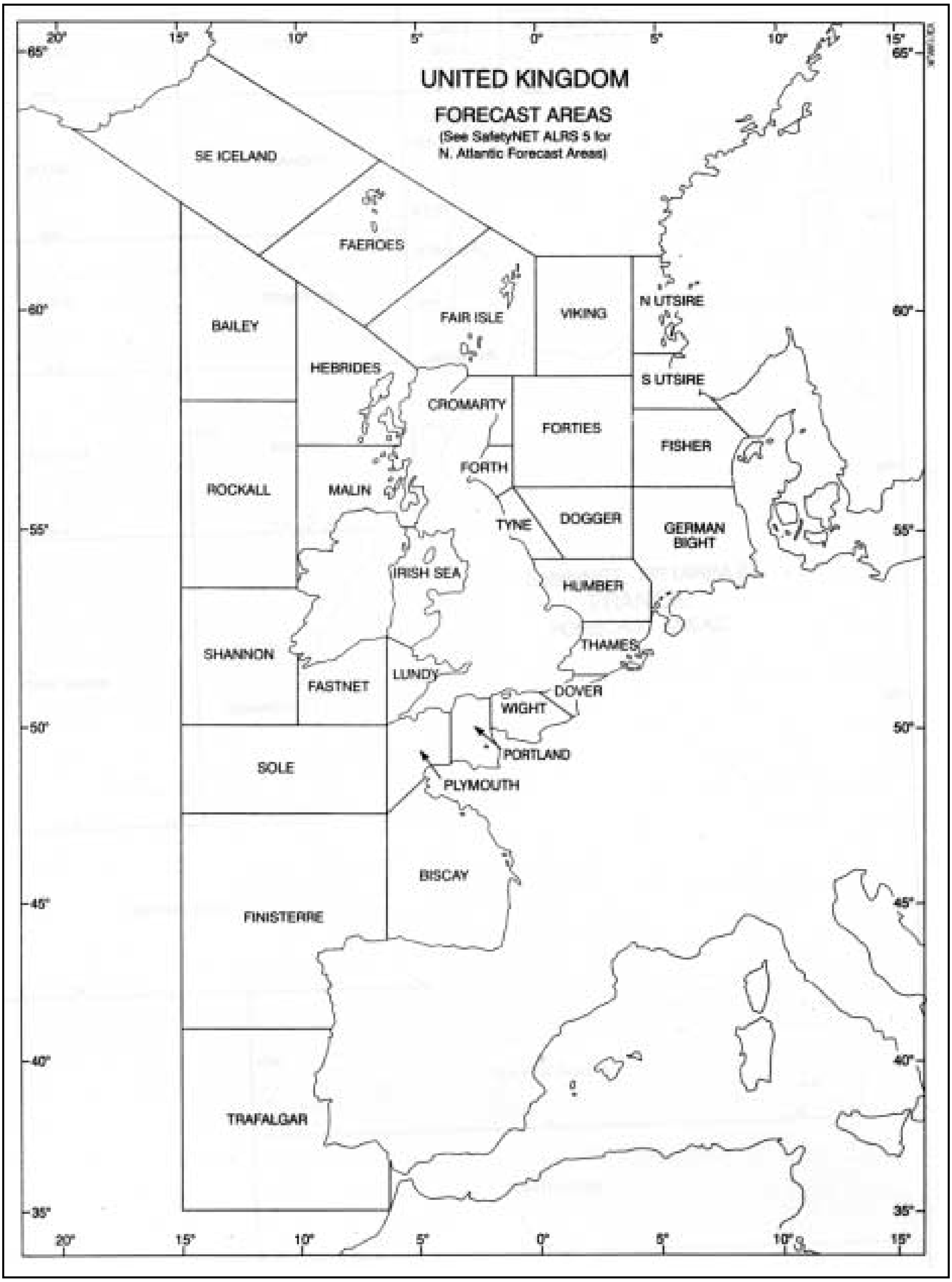


Diagram showing the United Kingdom forecast areas

Figure 11

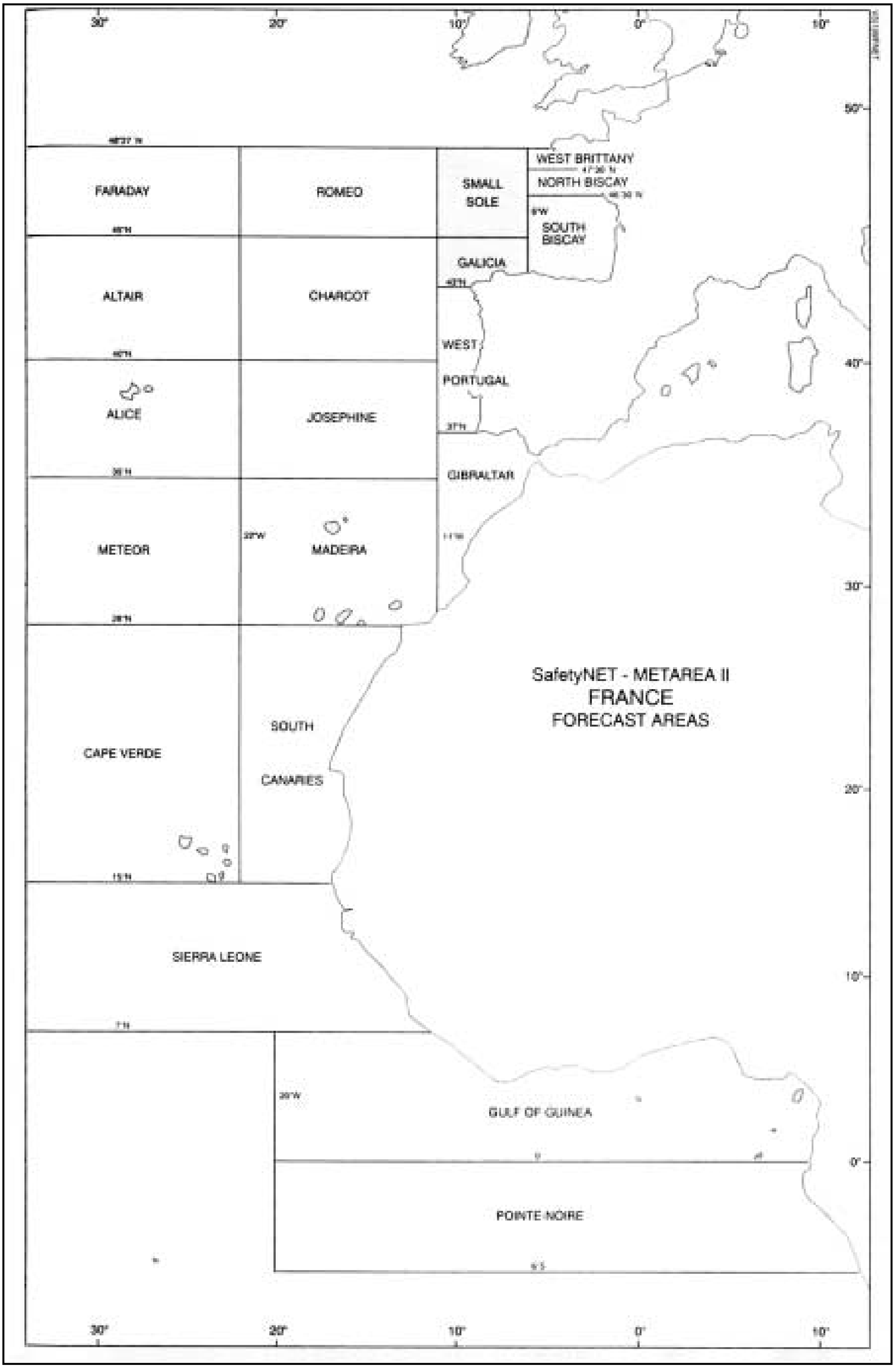


Diagram showing Metarea II France forecast areas

1.9 RELEVANT CREW

1.9.1 The master

The master had been at sea for 25 years, had first served as a master in 1991, and had experience of carrying timber cargoes. This was his third contract on board *Kodima*, which started on November 29 in Mobile, USA. Although the master had been on the bridge for much of the night of 28 January, he had managed a regular sleep thereafter, and had between 8 and 10 hours rest on 1 February. He did not feel tired, and had not consumed any alcohol, medication or drugs.

1.9.2 The chief officer

The chief officer first went to sea as a cadet in 1981 and qualified as chief officer in 1992. Having joined the INOK Crewing Company of Petrozavodsk in 1997, he initially worked as second officer on board bulk general cargo ships carrying steel products between Bremen, Germany and Northern Spain. In 1999 he joined mv *Olma*, *Kodima's* sister ship, as chief officer, and carried mainly bulk cargoes between Norway and the USA; no deck cargoes were carried. The chief officer first served on board *Kodima* between November 2000 and May 2001, and had rejoined on 27 November in Mobile, USA. At sea he kept the 0400 to 0800, and 1600 to 2000 watches.

The chief officer had about 8 years experience of carrying deck cargoes, including timber, from ports in the Barents, White, and Black Seas, and Estonia, during which time he had been responsible for their stowage and lashing. He had been on board *Kodima* as chief officer when timber was carried from Finland to Tunisia in March 2001. This was his second voyage on the ship carrying timber, and the first time he had used this securing arrangement.

1.9.3 The chief engineer

The chief engineer first served in this capacity in 1976. This was his second contract on board *Kodima*, which he joined on 27 November 2001 in Mobile.

1.9.4 The second officer

This was the second officer's second contract on *Kodima*, and he had served on board the ship for 8 months altogether. During his first contract, he had undertaken the duties of cargo officer when the ship last carried timber, and had supervised the loading. He last joined the ship on 27 November in Mobile, USA. At sea he kept the 0000 to 0400, and 1200 to 1600 watches.

1.9.5 The boatswain

The boatswain had been at sea since 1986 and had been a boatswain for over 10 years. This was his second contract on board *Kodima*; the first was from November 2000 to May 2001, and he started his second on 27 November in Mobile, USA. His duties on board included checking the cargo lashings and the ballast tanks.

1.10 RELATIONSHIP WITH CHARTERER

Included in the instructions issued by the charterer were the requirements for the master to send a daily report and to proceed at maximum speed, unless otherwise directed. Following its receipt of the master's report, while *Kodima* was at anchor off Skagen, Solchart sent a message to the ship via Inmarsat C, advising the master that another of its chartered vessels in the North Sea off Rotterdam had reported the wind as being 260° at force 5. The message also asked the master to explain why he was still at anchor. A representative of Solchart later telephoned the master and asked why he was still at anchor when a 14000dwt vessel had passed the Skagen overnight, and another in the North Sea had reported only force 5 winds. The master replied that a 14000 dwt vessel would have a freeboard of 3m, whereas that of *Kodima* was only 1.5m. He also advised the representative that the wind was storm force 10, and had only just started to abate. The master recollects that the representative then responded by advising him that if he did not get underway immediately, one day's hire would be deducted for the delay, and indicated that the owners might not then decide to employ him again. The master immediately contacted the ship's technical and commercial managers and informed them of what had happened. They supported the master's action and asked him to prepare a report on the matter. The master stated that the discussions with the charterer on 29 January did not worry him, or affect his decision-making later in the voyage.

The master also stated that he had sailed from *Kodima* before all the lashings had been tightened, on the instructions of the charterer. The charterer denied having put any pressure on the master to sail from Norrkoping, and stated that it was the master who arranged the sailing time. It also denied having put any pressure on the master to get underway while at anchor off Skagen.

1.11 INSPECTION IN FALMOUTH

MAIB inspectors visited *Kodima* in Falmouth following the accident. Damage seen included the ship's side, where a large section of the port bulwark had been ripped away **(Figure 12)**, deck fittings that had been sheered off, the hatch cover to hold No 3 had been lifted, and the hatch cover to hold No 4 was missing **(Figure 13)**. The engine room had also been flooded after the ship had been abandoned because of its access hatch on the port aft first level superstructure deck (or poop deck) being carried away by heavy seas when the list was about 45° and the deck edge submerged. The water level had extended up to, and including, the middle levels of the engine room, as well as reaching close to the deckhead of the engine control room.

Although many of the wire lashings had been cut and moved during the salvage operation, five had a stranded appearance, indicating that they had parted **(Figure 14)**. There was also some evidence that some of the lashings might have failed at the turnbuckle. All of the lashings seen appeared to be in good condition.

Figure 12

Photograph showing damage to port bulwark

Figure 13

Photograph showing the damage to No 4 hold hatch cover

Figure 14

Photograph of stranded wire lashing

1.12 ACTION TAKEN BY INOK N.V.

In March 2002, INOK N.V. conducted an internal investigation into the accident, which made several technical and organisational recommendations. These were (translated from Russian):

1. *Consider the possibility of introducing a safe emergency release system for deck cargo fastenings (perhaps a type of emergency release securing line)*
2. *Carry out a full inspection of the air ventilator gooseneck locks, and on the fuel tanks consider increasing their height.*
3. *When in storm conditions, at least twice in every watch air should be purged from the input filters, and checks made of the fuel level in the service tanks, the oil in the sumps, and the water in the expansion tanks, to prevent air from getting into the systems.*
4. *When at sea in storm conditions, check the ballast once in every watch (if there is no way of measuring it – carry out a number of test pumpings).*
5. *Draw up and introduce….a check list entitled 'Preparing the ship for sea with a deck cargo of timber'.* (A copy of the check list, which was subsequently produced is at **Annex C**).

Following the accident, INOK N.V. also issued a circular to all its ships' masters regarding decisions to anchor to shelter from bad weather, which stated:

> *"INOK" will always support any decision you may take whose [sic] intention is to safeguard the ship and its cargo.*

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 occurring in the future.

2.2 STABILITY

There is no reason to doubt that *Kodima* was in a stable condition. Before sailing from Norrkoping, the ship was upright and was not overloaded. Her metacentric height was 0.36m above the allowable minimum, which should have provided an appropriate margin of stability. It was also 0.11m below the maximum recommended in the Code of Practice, which should have helped avoid excessive initial stability resulting from violent motion in heavy seas. This was evident from the fact that, although the heavy weather encountered on entering the North Sea and during passage through the English Channel caused the ship to pitch, rolling appears to have been neither extreme nor violent.

Although not uniform along its length, it is considered that the overall height, and extent of the timber cargo, in both length and breadth, were generally in accordance with the requirements of paragraph 3.2 of the Code of Practice.

2.3 COMPACTNESS OF THE STOW

The achievement of a compact stow, when loading timber cargoes, is essential, but can also be extremely problematic. In this case, difficulties were caused by the difference in height between the deck and the top of the hatch covers **(Figures 6 and 15)**, the presence of the wells between the hatches **(Figure 8)**, the numerous obstructions in the stowage area **(Figure15)**, and the differing lengths of the timber packages. Although such difficulties made the presence of some void spaces unavoidable, appropriate measures to keep these to a minimum appear to have been taken, and there is no evidence to suggest that the stow was not compact. In particular, the repacking and placement of timber packages in the gaps between the bulwarks and hatch coamings was a prudent action to take.

2.4 ACCESS

The stowage of timber cargo in the passageways either side of the hatch coamings, however, cut off the only convenient accesses to the forecastle deck from the accommodation. In such circumstances, Chapter 5 of the Code of Practice requires guard lines or rails to be fitted down one or both sides of the cargo, or at least a lifeline rigged above it. No such requirement was included in the ship's cargo securing manual, and no equipment to comply with this requirement was carried, although lifelines had been checked by the Russian

Register during the ship's last periodic inspection in New Orleans on 7 July 2001. As a result, when connecting, tightening and checking the lashings, and when gaining access to the forecastle deck to anchor on 26 and 28 January, the crew had to work, or walk, on the top of the timber cargo without any measures in place to ensure their safety. The lack of a safe access across the timber deck cargo inevitably affected the ability to check the wire lashings on the deck cargo safely in adverse weather.

Timber packages were also stowed over sounding pipes located in the wells between the hatch covers. This was contrary to the advice in the Code of Practice, and meant the sounding pipes were inaccessible throughout the voyage.

Figure 15

Photograph showing deck obstructions and height differences

2.5 SECURING ARRANGEMENTS

2.5.1 Wire lashings

The pitch of the wire lashings was in accordance with the requirements of the Code of Practice, and the lashings had been tested and certified by the Russian Register of Shipping. They also appeared to be in good condition when seen in Falmouth. Although several of the wire lashings might have parted at some point following the cargo shift, there is no evidence of this occurring at an early stage. Indeed, other than the lashing which had been cut by the chief officer, all of the lashings on the after holds were intact when the crew were evacuated. Contrary to the advice contained in the cargo securing manual, it is probable that the pitch and strength of the wire lashings was sufficient to retain the timber cargo to a deck angle of about 45°, the angle at which deck edge immersion occurred. The initial apparent shift of the whole cargo, therefore, cannot be attributed to the catastrophic failure of the wire lashings.

However, it is evident that the lashings were not sufficiently tight to prevent the cargo from moving towards the port side in the sea conditions which prevailed. This might have been because of several factors, including the methods of checking the tension of the lashings, the inability to check the lashings during the 32 hours prior to the cargo shift, and the elongation of the wire lashings as the strain on them increased.

Standing on a wire lashing to test its tightness is rough and ready, and far from foolproof. Unfortunately, other known alternatives such as kicking it, or hitting it with a stick are just as subjective, and probably give equally variable results. In this case, although there is nothing to indicate that the checks made by the chief officer and boatswain were not done conscientiously, they might have been more accurate had alternative means of checking the tension in the wires been available. The MAIB, however, is not aware of any equipment or methods which can easily facilitate the frequent and accurate measurement of tension in a cargo lashing when at sea.

The decision not to check the lashings on 1 February was made on the basis that it was too dangerous and, given the conditions and lack of safe access across the top of the stow, this decision cannot be faulted. Even if safe access had been provided, it is likely that it would have been unsafe to check the tightness of the lashings on 1 February 2002, in the conditions that prevailed. Unfortunately, these conditions increased the probability of the cargo settling and the lashings loosening. The ship's motion, vibration, the weight of water hitting the cargo, the increased weight of the cargo due to water absorption, and the elongation of the wire lashings during shock loading, would have undoubtedly contributed to the cargo shifting. Had it been feasible to check and tighten the lashings during 1 February, although it cannot be determined whether the lashings would have prevented the cargo from shifting to some degree, they might have prevented the timber cargo from shifting to the extent it did.

While probably not contributing to the cargo shift, the MAIB considers the departure from Norrkoping with the lashings securing the cargo on top of the after hold hatch covers not tightened, was dangerous and not in accordance with the UK's Code of Safe Working Practices for Merchant Seamen (article 29.1.4), or the ship's cargo securing manual.

2.5.2 The use of uprights

The Code of Practice for ships carrying timber cargoes states that:

uprights should be fitted when required by the nature, height or character of the timber deck cargo.

The use of uprights when carrying packaged timber deck cargo, therefore, is discretionary, and few ships appear to fit them. When they are fitted, they are generally used to facilitate accurate cargo stowage during loading, to enable guard lines to be rigged for the safety of stevedores, and to assist the crew in detecting a cargo shift. They are not intended to be strong enough to contain a deck cargo; this is the purpose of the wire lashings. In this case, therefore, although uprights were fitted, it is not surprising that they were not.

Sections 1 and 3 of Appendix A to the Code of Practice advises:

Hog lashings are normally used over the second and third tiers and may be set 'hand-tight' between stanchions. The weight of the upper tiers when loaded on top of these wires will further tighten them.

The aim of having the hog wires applied in this manner is to assist in obtaining as even tension as possible throughout, thus producing an inboard pull on the respective uprights.

Had hog wires been fitted, it is not known whether the uprights could have retained the timber packages during the shift, but they would have provided better support, and might not have broken as easily as they appeared to.

2.6 THE CARGO SHIFT

As is frequently the case, *Kodima*'s timber cargo shifted in adverse weather conditions. Such conditions would have jeopardised the integrity of the stow, both through the resulting motion of the ship, and the speed and weight of water shipped over the bow and on to the timber cargo.

Kodima was heading directly into a south-west gale with significant wave heights reaching between 6m and 7m. In such conditions, extreme wave heights might have reached in excess of 14m. The ship had been pitching into the waves for most of the day on 1 February, and had been pounding during the afternoon and evening. During this period, it is highly likely that the shuddering caused by this motion, particularly when pounding, would have caused the timber deck cargo to settle. Furthermore, the amount of water which was shipped over the bows, exacerbated by the ship's low freeboard, would also have had a detrimental effect on the integrity of the stow. As demonstrated by the removal of the uprights at 1600, water was occasionally hitting the timber deck cargo with considerable force, and reaching as far as the hatch cover to hold No 4. This would also have caused the timber cargo to settle, and could possibly have moved some of the packages. It is also likely that a lot of water found its way under the tarpaulin, which, in addition to lubricating the smooth plastic sheeting covering the packages, might also have become trapped and reduced stability. Lubricated by the sea water, the already low friction coefficient of the non-abrasive plastic coverings would have reduced further, making the timber packages more prone to shifting. As it had not been possible to tighten the lashings during the day, the longer the ship experienced these conditions, the likelihood of the deck cargo shifting increased.

The breaking of the two uprights at 1900 was the first indication that the cargo had started to shift, and the master acted promptly. However, the alteration of course, and increase in speed to seek shelter from the French coast, resulted in more extreme deck movement. In particular, with the sea now between 25° and 30° on the starboard bow, the angle of roll inevitably increased. Given the descriptions of the ship's movement immediately before the cargo shift at 1950, it is likely that a roll to port initiated the shift, possibly induced by a large wave striking the starboard bow.

2.7 DECISION-MAKING

In view of the ship's freeboard and the deck cargo carried, the decision on 28 January, to anchor in the lee of Skagen and shelter from predicted storm force conditions was a prudent measure to take. In hindsight, had similar action been taken immediately upon receipt of the forecast at 0013 on 1 February, which predicted severe gale or storm force conditions throughout the English Channel, it is probable *Kodima* would have been able to find a safe haven in which to shelter. Unlike in the vicinity of Skagen, however, shelter from the prevailing weather in the English Channel was not in close proximity to the ship's planned route, and would have necessitated a substantial deviation from the passage plan.

During 1 February, the master reduced speed on three occasions in order to reduce the effects of the ship heading directly into the south-westerly winds and seas. Engine speed was not reduced to below half ahead, however, because the master did not consider it necessary, and also because he wanted to maintain steerage. Following the receipt of the weather forecast from Meteo France at 1458, the master also wanted to maintain a reasonable speed over the ground to pass south of Ushant where better conditions were expected. His assessment of the speed required to maintain steerage was based on speed over the ground taken from the GPS receiver, not speed through the water, which is the speed used in relation to steerage. As half ahead normally gave about 8.8 knots through the water, and as steerage could normally be maintained at about 2.5 knots, it is highly probable that, even taking the conditions into consideration, speed could have been reduced further. Such action would have been appropriate on receipt of the MO weather forecast at 1830 predicting severe gales in Biscay, and when darkness would have made the monitoring of the sea conditions and deck cargo extremely difficult. Had speed been reduced at that time, it is not known whether this would have prevented the cargo from shifting, but it would have reduced the force of the impact of the sea on the bow, and the amount of water taken over the bow.

Following the initial cargo shift at 1900, the master was in an unenviable position and had to make a difficult decision. If he reduced speed and hove to, although this would have resulted in the benefits outlined above, with the deck cargo already shifting, and little sign of conditions improving in the foreseeable future, there was a high probability of the ship's predicament worsening a long distance from the assistance available. Any alteration of course towards the shelter of the coast, however, put the sea on either the port or starboard bow and increased the extent of roll and deck movement. The master chose the latter option, but tried to minimise the ship rolling by keeping the sea as close to the bow as possible while still heading for the lee of the French coast. Unfortunately, the deck movement still proved to be too extreme.

The master stated that the pressure the charterer put on him, to sail from Skagen when transiting the English Channel, did not affect his judgment. Since the charterer denied this anyway, it is considered inappropriate to comment on what effect this might have had on the master's decision-making. Notwithstanding this, it is recognised that commercial needs and requirements for the safe operation of ships frequently conflict, and lead to disagreement between the relevant interested parties. This was evident in the charterer's requirement *to proceed at maximum speed at all times unless otherwise directed*. A master's first responsibility, however, is the safety of his ship and crew, and this should not be adversely influenced by commercial pressure. For this to be the case, a master must have the support of his owner and manager when making safety related decisions. In addition to the circular sent by INOK N.V. to its masters, the emergency plan for actions to be taken in the event of a storm warning **(Annex B)**, also states:

The fact that the list of actions has been carried out in no way prevents the captain from making any decision, should he consider it to be more effective in the conditions prevailing.

These are considered to be appropriate measures of reassurance in this respect.

With regard to the abandonment of the ship, which was listing and rolling up to 45° to port in a south-west gale, with a shifted deck cargo which could not be jettisoned, and without a main engine or any main electrical generation capability, the master's decision to abandon is considered to have been entirely appropriate.

2.8 RELEASE OF THE DECK CARGO

The Code of Practice **(Annex A)** states:

As any cargo shift will in most cases occur in adverse weather conditions, sending crew to release or tighten the lashings on a moving or shifted cargo may well present a greater hazard than retaining an overhanging load. A moving of shifted timber deck cargo should only be jettisoned after careful consideration; jettisoning is unlikely to improve the situation as the whole cargo stack would probably not fall at once. Severe damage may also be sustained by the propeller if it is still turning when the timber is jettisoned.

This is sound advice. Although the wire lashings were fitted with a pelican hook to allow quick release, the operation of these slips would have been difficult and extremely dangerous, given the weight of the cargo acting on the wire lashings and the position of the slips. The attempt to jettison some of the cargo on the high side of the stow was only marginally safer, and it is not surprising the chief officer considered it too dangerous to try and cut a second lashing. Had a remotely operated method of jettisoning the deck cargo been fitted, it is possible the cargo could have been safely jettisoned, particularly as the ship was stopped in the water. This might have returned the ship to a more upright condition. It is thought that such equipment is available, and although not required by the Code of Practice, the recommendation following INOK N.V.'s internal investigation to *consider the possibility of introducing a safe emergency release system* appears appropriate.

2.9 STOPPAGE OF GENERATORS

There is no doubt that the cause of the stoppage of the generators was lack of fuel. The typical effect of fuel starvation on a running diesel engine is a gradual slowing down of engine speed until it eventually motors to a stop. In the case of a loaded generator, the slow-down occurs fairly quickly, with the low voltage trips operating very rapidly once the operating speed drops by about 5%. These characteristics were observed and reported by the chief and third engineers from 0118 on 2 February.

The subsequent venting and bleeding of the fuel system confirmed that the fuel supply system was air locked and, despite frequent venting, this situation continued to occur at irregular intervals until attempts were abandoned at about 0500.

2.10 CAUSE OF FUEL STARVATION

The two fuel service tanks supplying the generators were sited on the port side of the engine room at middle platform level. The normal operating condition on *Kodima* was for both tank generator run-down valves to be open and feeding into a common line down to the generators via the main filters. On a normal sea load condition, the daily fuel consumption per generator is between 1.5 to 1.6 tonnes. As the service tanks were topped up during the morning of 1 February, it is estimated that, by 2000, the fuel tank contents with one generator running would have been about 7.0 m^3 in tank No 20 and 8.0 m^3 in tank No 26. Shortly after 2000, a second generator was started which would have increased the hourly consumption from 0.065 to 0.13 tonnes/hour.

The tank contents at 0100 the following day, 2 February, therefore, should have been in the order of 6.7 m^3 and 7.7 m^3 respectively. The third engineer, however, stated that the tank contents at that time were about 4.5 m^3 and 5.0 m^3.

With the vessel rolling heavily, as well as having an increasing and permanent list, fuel movement within the fuel tanks was both considerable and unpredictable. Basic calculations have been carried out using just the effect of the list and the estimated rolling movements of the vessel. Although the pitching movements of the vessel would also have had an effect, these have been ignored to simplify the results. It has not been possible to determine the actual levels within the fuel tanks at any one time, but it is considered that the combination of ship movement and fuel levels caused fuel to be lost to the overflow tank, and the generator rundown from the tank to be exposed to the atmosphere at various times. With both generator rundown valves open, there might also have been an inter-tank transfer, with fuel gravitating between the two service tanks as the list developed.

The dimensions for each tank when scaled off the available drawings are 3.0m x 2.0m x 1.75m. Although the chief engineer provided slightly different dimensions, namely 3.0m x 2.5m x 1.5m, the scaled dimensions have been used.

Tank connections and distances are as follows:

	No 20 (outer)	No 26 (inner)
Height of overflow outlet above deck	2.65m	2.85m
Height of generator valve above deck	0.60m	0.60m
Distance inner tank wall to generator valve	0.45m	0.88m

These dimensions become significant when considering how the tank contents appear to have diminished by an estimated 35% between 2000 on 1 February and 0100 the next day.

Assuming the tank contents at 2000 were 7.0m^3 and 8.0m^3, the fuel levels within the tanks would be about 2.0m above deck in the outer tank (No 20) and about 2.29m in the inner tank (No 26) - this is based on a tank floor area of 3.5 m^2. Assuming the tank contents at 0118 on 2 February had reduced to 4.5 m^3 and 5.0m^3, the fuel level within the tanks would be about 1.286m above deck in the outer tank (No 20) and about 1.429m in the inner tank (No 26). The following table illustrates how these levels would have fluctuated with the various angles of list and roll.

Table A – The fuel levels at 2000 on 1 February

	Tank No 20 (outer)		Tank No 26 (inner)	
Permanent list + degree of roll	Oil height outer bulkd (m)	Oil height inner bulkd (m)	Oil height outer bulkd (m)	Oil height inner bulkd (m)
No list or rolling	2.0	2.0	2.29	2.29
Up to 15°	2.268	1.732	2.558	2.022
Up to 20°	2.364	1.636	2.654	1.926
Up to 30°	2.577	1.423	2.867 *****	1.713
Up to 40°	2.839	1.161	3.129 *****	1.451

(*) fuel "lost" to the overflow tank

Table B – The fuel levels at 0118 on 2 February

	Tank No 20 (outer)		Tank No 26 (inner)	
Permanent list + degree of roll	Oil height outer bulkd (m)	Oil height inner bulkd (m)	Oil height outer bulkd (m)	Oil height inner bulkd (m)
No list or rolling	1.286	1.286	1.429	1.429
Up to 15°	1.554	1.018	1.697	1.161
Up to 20°	1.650	0.922	1.793	1.065
Up to 30°	1.863	0.709 **+**	2.006	0.852
Up to 40°	2.125	0.447 **+**	2.268	0.590

(+) generator rundown pipe exposed

These are the levels achieved when the list plus roll reached its maximum extent, and are based on the fuel oil being in a static condition. The range between the heights actually achieved would probably have been greater because of the dynamic effects caused by the ship's movement. The movement of the fuel in the tanks was evident by the intermittent operation of the high and low level alarms in the tanks, with the low level alarm operating at about 35% of capacity or at a height of about 0.9m.

Table A shows that, as the overflow pipe from tank No 26 was 2.85m above the tank bottom, and positioned relatively close to the division plate between the two tanks, it is probable that fuel would have been "lost" to the overflow tank at an angle of 30° or greater.

Table B shows that, given the relative positions of the rundown lines to the generators within the service tanks, the generator rundown pipe in tank No 20, would have potentially been exposed to atmosphere when list and roll was in excess of 30°. The fact that No 2 generator ran between 0300 and 0445, after tank No 26 had been isolated, was possibly because more fuel was in the tanks than estimated, and/or the dynamic effects caused by the ship's movement.

In the normal course of events, neither the sea conditions experienced, nor the fuel levels within the service tanks, should have created operational problems for *Kodima*'s electrical generators. The loss of the ship's main generators was caused by her extreme list and movement in the rough seas, which resulted in the generator fuel system becoming air-locked. It was slightly unusual to have both service tank outlets open at the same time, but that was the vessel's operational standard. The advantage of having only one service tank open at any one time is that a full, or nearly full, tank is available in an emergency.

2.11 ENGINEERING STAFF RESPONSE

From the outset, the chief engineer took the appropriate action without waiting for orders from the master. After the initial loss of the generators, however, he faced a difficult task. Without electrical power, the service tanks could not be topped up, and the main engine could not be operated. It is possible, had fuel been transferred to the service tanks between 0300 and 0445 when electrical power was available and the main engine fuel boost pump was being dried, further air-locking of the fuel system might have been avoided. It must be remembered, however, that the main objective at the time was to restore propulsion and, given that the ship was listing and rolling up to 40°, it is considered that the engineering staff performed well in such difficult and demanding conditions.

2.12 ACTION TAKEN BY INOK N.V.

The actions and recommendations resulting from INOK N.V.'s internal investigation appear to be appropriate and, if fully implemented, should help to improve the safety of its ships carrying timber deck cargoes.

SECTION 3 - CONCLUSIONS

3.1 FINDINGS

3.1.1 Cause

Kodima's timber deck cargo shifted as a result of her wire lashings being insufficiently tight to hold the cargo in its stowed position when the ship was transiting heavy seas.

3.1.2 Contributing factors

1. The lashings were not sufficiently tight to prevent the cargo from moving towards the port side in the sea conditions which prevailed. This was possibly because of the imprecise method of checking the tension of the lashings, the inability to check the lashings during the 32 hours before the cargo shift, and the elongation of the wire lashings as the strain on them increased. [2.5.1]

2. *Kodima* was heading directly into a south-west gale with significant wave heights reaching between 6m and 7m. In such conditions, extreme wave heights might have reached in excess of 14m. [2.6]

3. The vibration caused by the ship pounding, and the force of large amounts of water shipped over the bows, caused the timber deck cargo to settle. [2.6]

4. It is probable that a lot of water found its way under the tarpaulin and lubricated the protective plastic sheeting covering the packages of timber. [2.6]

5. The alteration of course to 190°, and increase in speed to full ahead sea speed put the sea between 25° to 30° on the starboard bow, which resulted in the ship rolling more heavily. It is probable that the cargo shift was initiated by a roll to port. [2.6]

6. The crew were unable to jettison any of the timber deck cargo. [2.8]

7. The main engine could not be re-started because both the operating and stand-by boost pump motors had been saturated by salt water from a leak in a sea chest pipe. [1.3]

8. The main electrical generators stopped because of a lack of fuel. [2.9]

9. The lack of fuel to the main generators was caused by fuel being lost from the fuel service tanks to the overflow tank, together with the generator rundown pipes being exposed to atmosphere, when list and roll exceeded about 30°. [2.10]

3.2 OTHER FINDINGS

1. *Kodima*'s stability, together with the overall height, and extent of her timber cargo, were generally in accordance with the requirements of the appropriate Code of Practice. [2.2]

2. There is no evidence to suggest that the stowage of the timber cargo on deck was not compact. [2.3]

3. Safe access should have been provided across the top of the timber deck cargo but was not. [2.4]

4. Timber packages were stowed over sounding pipes located in the wells between the hatch covers, contrary to the advice given in the Code of Practice. [2.4]

5. The pitch of the wire lashings was in accordance with the requirements of the Code of Practice, and the lashings had been tested and certified by the Russian Register of Shipping. They also appeared to be in good condition. [2.5.1]

6. The initial apparent shift of the whole cargo, therefore, cannot be attributed to the catastrophic failure of the wire lashings. [2.5.1]

7. Had a more accurate means of checking the tension in the wires been available, this would have allowed a more reliable check to be conducted. [2.5.1]

8. Had it been feasible to check and tighten the lashings during 1 February, they would have been more likely to have prevented the timber cargo from shifting to the extent it did. [2.5.1]

9. The departure from Norrkoping with the lashings on the after holds not tightened was dangerous and not in accordance with the UK's Code of Safe Working Practice for Merchant Seamen. [2.5.1]

10. Had hog wires been fitted, the uprights would have provided better support, and might not have broken as easily as they appeared to. [2.5.2]

11. Shelter from the prevailing weather in the English Channel was not within close proximity to the ship's planned route, and would have necessitated a substantial deviation from the passage plan. [2.7]

12. Had speed been reduced further, the force of the impact of the sea on the bow, and the amount of water taken over the bow would have been reduced. [2.7]

13. The master's decision to abandon ship is considered to have been entirely appropriate. [2.7]

14. Had a remotely operated method of jettisoning the deck cargo been fitted, it is possible the cargo could have been safely jettisoned, and the ship returned to a more upright condition. [2.8]

15 The engineering staff performed well in difficult and demanding circumstances. [2.11]

16. The actions and recommendations resulting from INOK N.V.'s internal investigation appear to be appropriate. [2.12]

SECTION 4 - RECOMMENDATIONS

The Malta Maritime Authority is recommended to:

1. Ensure that all ships under its jurisdiction, carrying timber deck cargoes, comply fully with the *Code of Safe Practice for Ships Carrying Timber Deck Cargoes 1991*.

The Maritime and Coastguard Agency is recommended to:

2. Propose to the IMO that The *Code of Safe Practice for Ships Carrying Timber Deck Cargoes 1991* be amended to require remotely operated jettisoning devices to be fitted on all ships carrying timber deck cargoes secured with wire lashings.

Marine Accident Investigation Branch
January 2003

ANNEX A

IMO *Code of Safe Practice for Ships Carrying Timber Deck Cargoes 1991*,
(not including Appendices B and C)

Contents

FOREWORD

The Code of Safe Practice for Ships Carrying Timber Deck Cargoes was first circulated by the Organization in 1972 and subsequently amended in 1978.

The continuing occurrence of casualties involving shift and loss of timber deck cargoes, the employment of larger and more sophisticated ships in this trade, the introduction of new techniques and the desirability of having more comprehensive safety recommendations in this particular maritime activity have made it necessary to revise and update the earlier document.

Although this Code is directed primarily at providing recommendations for the safe carriage of timber deck cargo, appendix B contains recommendations applicable to the under-deck stowage of logs.

CHAPTER 1 – GENERAL

1.1 Purpose

The purpose of this Code is to make recommendations on stowage, securing and other operational safety measures designed to ensure the safe transport of mainly timber deck cargoes.

1.2 Application

This Code applies to all ships of 24 m or more in length engaged in the carriage of timber deck cargoes. Ships that are provided with and making use of their timber load line should also comply with the requirements of the applicable regulation of the Load Line Convention (reproduced in appendix D).

1.3 Definitions

Except where expressly provided otherwise, the following definitions apply to the Code.

1.3.1 *Administration* means the Government of the State whose flag the ship is entitled to fly.

1.3.2 *Cant* means a log which is "slab-cut", i.e. ripped lengthwise so that the resulting thick pieces have two opposing, parallel flat sides and in some cases a third side which is sawn flat.

Note: The Code of Safe Practice for Ships Carrying Timber Deck Cargoes, 1991, comprises the annex to resolution A.715(17), the text of which is reproduced at the end of the present publication.

1.3.3 *Fall protection system* means a system which incorporates an adequate anchorage point, a safety harness worn by the person to be protected and a fall arrest device which, when attached to the anchorage point and harness, will permit normal personnel movement but lock immediately if any force is applied to the system.

1.3.4 *Organization* means the International Maritime Organization (IMO).

1.3.5 *Timber* means sawn wood or lumber, cants, logs, poles, pulpwood and all other type of timber in loose or packaged forms. The term does not include wood pulp or similar cargo.

1.3.6 *Timber deck cargo* means a cargo of timber carried on an uncovered part of a freeboard or superstructure deck. The term does not include wood pulp or similar cargo.

1.3.7 *Timber load line* means a special load line assigned to ships complying with certain conditions related to their construction set out in the International Convention on Load Lines and used when the cargo complies with the stowage and securing conditions of this Code.

1.3.8 *Weather deck* means the uppermost complete deck exposed to weather and sea.

CHAPTER 2 – STABILITY

2.1 The ship should be supplied with comprehensive stability information which takes into account timber deck cargo. Such information should enable the master, rapidly and simply, to obtain accurate guidance as to the stability of the ship under varying conditions of service. Comprehensive rolling period tables or diagrams have proved to be a very useful aid in verifying the actual stability conditions.

2.2 The stability of the ship at all times, including during the process of loading and unloading timber deck cargo, should be positive and to a standard acceptable to the Administration. It should be calculated having regard to:

.1 the increased weight of the timber deck cargo due to:
.1.1 absorption of water in dried or seasoned timber, and
.1.2 ice accretion, if applicable;
.2 variations in consumables;
.3 the free surface effect of liquid in tanks; and
.4 the weight of water trapped in broken spaces within the timber deck cargo and especially logs.

2.3 The master should:

.1 cease all loading operations if a list develops for which there is no satisfactory explanation and it would be imprudent to continue loading;

.2 before proceeding to sea, ensure that:

.2.1 the ship is upright;

.2.2 the ship has an adequate metacentric height; and

.2.3 the ship meets the required stability criteria.

2.4 Ships carrying timber deck cargoes should operate, as far as possible, with a safe margin of stability and with a metacentric height which is consistent with safety requirements but such metacentric height should not be allowed to fall below the recommended minimum.*

2.5 However, excessive initial stability should be avoided as it will result in rapid and violent motion in heavy seas which will impose large sliding and racking forces on the cargo causing high stresses on the lashings. Operational experience indicates that metacentric height should preferably not exceed 3% of the breadth in order to prevent excessive accelerations in rolling provided that the relevant stability criteria are satisfied.* This recommendation may not apply to all ships and the master should take into consideration the stability information obtained from the ship's stability manual.

CHAPTER 3 - STOWAGE

3.1 General

3.1.1 Before timber deck cargo is loaded on any area of the weather deck:

.1 hatch covers and other openings to spaces below that area should be securely closed and battened down;

.2 air pipes and ventilators should be efficiently protected and check-valves or similar devices should be examined to ascertain their effectiveness against the entry of water;

.3 accumulations of ice and snow on such area should be removed; and

.4 it is normally preferable to have all deck lashings, uprights, etc., in position before loading on that specific area. This will be necessary should a preloading examination of securing equipment be required in the loading port.

3.1.2 The timber deck cargo should be so stowed that:

* Refer to the Recommendation on intact stability for passenger and cargo ships under 100 metres in length (resolution A.167(ES.IV)), as amended by resolution A.206(VII) with respect to ships carrying timber deck cargoes (reproduced in appendix C).

.1 safe and satisfactory access to the crew's quarters, pilot boarding access, machinery spaces and all other areas regularly used in the necessary working of the ship is provided at all times;

.2 where relevant, openings that give access to the areas described in 3.1.1.1 can be properly closed and secured against the entry of water;

.3 safety equipment, devices for remote operation of valves and sounding pipes are left accessible; and

.4 it is compact and will not interfere in any way with the navigation and necessary working of the ship.

3.1.3 During loading, the timber deck cargo should be kept free of any accumulations of ice and snow.

3.1.4 Upon completion of loading, and before sailing, a thorough inspection of the ship should be carried out. Soundings should also be taken to verify that no structural damage has occurred causing an ingress of water.

3.2 Height and extent of timber deck cargo

3.2.1 Subject to 3.2.2, the height of the timber deck cargo above the weather deck on a ship within a seasonal winter zone in winter should not exceed one third of the extreme breadth of the ship.

3.2.2 The height of the timber deck cargo should be restricted so that:

.1 adequate visibility is assured;

.2 a safe margin of stability is maintained at all stages of the voyage;

.3 any forward-facing profile does not present overhanging shoulders to a head sea; and

.4 the weight of the timber deck cargo does not exceed the designed maximum permissible load on the weather deck and hatches.

3.2.3 On ships provided with, and making use of, their timber load line, the timber deck cargo should be stowed so as to extend:

.1 over the entire available length of the well or wells between superstructures and as close as practicable to end bulkheads;

.2 at least to the after end of the aftermost hatchway in the case where there is no limiting superstructure at the after end;

.3 athwartships as close as possible to the ship's sides, after making due allowance for obstructions such as guardrails, bulwark stays, uprights, pilot boarding access, etc., provided any area of broken stowage thus created at the side of the ship does not exceed a mean of 4% of the breadth; and

.4 to at least the standard height of a superstructure other than a raised quarterdeck.

3.2.4 The basic principle for the safe carriage of any timber deck cargo is a solid stowage during all stages of the deck loading. This can only be achieved by constant supervision by shipboard personnel during the loading process.

3.2.5 Appendix A provides general advice on stowage practices which have proved to be effective for various types of timber deck cargoes.

CHAPTER 4 – SECURING

4.1 General

4.1.1 Every lashing should pass over the timber deck cargo and be shackled to eyeplates suitable and adequate for the intended purpose and efficiently attached to the deck stringer plate or other strengthened points. They should be installed in such a manner as to be, as far as practicable, in contact with the timber deck cargo throughout its full height.

4.1.2 All lashings and components used for securing should:

- **.1** possess a breaking strength of not less than 133 kN;
- **.2** after initial stressing, show an elongation of not more than 5% at 80% of their breaking strength; and
- **.3** show no permanent deformation after having been subjected to a proof load of not less than 40% of their original breaking strength.

4.1.3 Every lashing should be provided with a tightening device or system so placed that it can safely and efficiently operate when required. The load to be produced by the tightening device or system should not be less than:

- **.1** 27 kN in the horizontal part; and
- **.2** 16 kN in the vertical part.

4.1.4 Upon completion and after the initial securing, the tightening device or system should be left with not less than half the threaded length of screw or of tightening capacity available for future use.

4.1.5 Every lashing should be provided with a device or an installation to permit the length of the lashing to be adjusted.

4.1.6 The spacing of the lashings should be such that the two lashings at each end of each length of continuous deck stow are positioned as close as practicable to the extreme end of the timber deck cargo.

4.1.7 If wire rope clips are used to make a joint in a wire lashing, the following conditions should be observed to avoid a significant reduction in strength:

.1 the number and size of rope clips utilized should be in proportion to the diameter of the wire rope and should not be less than four, each spaced at intervals of not less than 15 cm;

.2 the saddle portion of the clip should be applied to the live load segment and the U-bolt to the dead or shortened end segment;

.3 rope clips should be initially tightened so that they visibly penetrate into the wire rope and subsequently be re-tightened after the lashing has been stressed.

4.1.8 Greasing the threads of grips, clips, shackles and turnbuckles increases their holding capacity and prevents corrosion.

4.2 Uprights

4.2.1 Uprights should be fitted when required by the nature, height or character of the timber deck cargo.

4.2.2 When uprights are fitted, they should:

.1 be made of steel or other suitable material of adequate strength, taking into account the breadth of the deck cargo;

.2 be spaced at intervals not exceeding 3 m;

.3 be fixed to the deck by angles, metal sockets or equally efficient means; and

.4 if deemed necessary, be further secured by a metal bracket to a strengthened point, i.e. bulwark, hatch coaming.

4.3 Loose or packaged sawn timber

4.3.1 The timber deck cargo should be secured throughout its length by independent lashings.

4.3.2 Subject to 4.3.3, the maximum spacing of the lashings referred to above should be determined by the maximum height of the timber deck cargo in the vicinity of the lashings:

.1 for a height of 4 m and below, the spacing should be 3 m;

.2 for heights of above 4 m, the spacing should be 1.5 m.

4.3.3 The packages stowed at the upper outboard edge of the stow should be secured by at least two lashings each.

4.3.4 When the outboard stow of the timber deck cargo is in lengths of less than 3.6 m, the spacing of the lashings should be reduced as necessary or other suitable provisions made to suit the length of timber.

4.3.5 Rounded angle pieces of suitable material and design should be used along the upper outboard edge of the stow to bear the stress and permit free reeving of the lashings.

4.4 Logs, poles, cants or similar cargo

4.4.1 The timber deck cargo should be secured throughout its length by independent lashings spaced not more than 3 m apart.

4.4.2 If the timber deck cargo is stowed over the hatches and higher, it should, in addition to being secured by the lashings recommended in 4.4.1, be further secured by:

- **.1** a system of athwartship lashings (hog lashings) joining each port and starboard pair of uprights near the top of the stow and at other appropriate levels as appropriate for the height of the stow; and
- **.2** a lashing system to tighten the stow whereby a dual continuous wire rope (wiggle wire) is passed from side to side over the cargo and held continuously through a series of snatch blocks or other suitable device, held in place by foot wires.

4.4.3 The dual continuous wire rope, referred to in 4.4.2.2, should be led to a winch or other tensioning device to facilitate further tightening.

4.4.4 The recommendation of 4.3.5 should apply to a timber deck cargo of cants.

4.5 Testing, examination and certification

4.5.1 All lashing and components used for the securing of the timber deck cargo should be tested, marked and certified according to national regulations or an appropriate standard of an internationally recognized standards institute. Copies of the appropriate certificate should be kept on board.

4.5.2 No treatments which could hide defects or reduce mechanical properties or strength should be applied after testing.

4.5.3 A visual examination of lashings and components should be made at intervals not exceeding 12 months.

4.5.4 A visual examination of all securing points on the ship, including those on the uprights, if fitted, should be performed before loading the timber deck cargo. Any damage should be satisfactorily repaired.

4.6 Lashing plans

One or more lashing plans complying with the recommendations of this Code should be provided and maintained on board a ship carrying timber deck cargo.

CHAPTER 5 - PERSONNEL PROTECTION AND SAFETY DEVICES

5.1 Suitable protective clothing and equipment, such as studded boots or studded overshoes and hard hats, should be provided for the protection of crew members and workers involved in loading, securing or discharging operations.

5.2 During the course of the voyage, if there is no convenient passage for the crew on or below the deck of the ship giving safe means of access from the accommodation to all parts used in the necessary working of the ship, guard lines or rails, not more than 330 mm apart vertically, should be provided on each side of the deck cargo to a height of at least 1 m above the cargo. In addition, a lifeline, preferably wire rope, set up taut with a tightening device should be provided as near as practicable to the centreline of the ship. The stanchion supports to all guardrails or lifelines should be spaced so as to prevent undue sagging. Where the cargo is uneven, a safe walking surface of not less than 600 mm in width should be fitted over the cargo and effectively secured beneath, or adjacent to, the lifeline.

5.3 Fencing or means of closing should be provided for all openings in the stow such as at masthouses, winches, etc.

5.4 Where uprights are not fitted or where alternatives to the provisions of 5.2 are permitted, a walkway of substantial construction should be provided having an even walking surface and consisting of two fore and aft sets of guardlines or rails about 1 m apart, each having a minimum of three courses of guardlines or rails to a height of not less than 1 m above the walking surface. Such guardlines or rails should be supported by rigid stanchions spaced not more than 3 m apart and lines should be set up taut by tightening devices.

5.5 As an alternative to 5.2, 5.3 and 5.4, a lifeline, preferably wire rope, may be erected above the timber deck cargo such that a crew member equipped with a fall protection system can hook on to it and work about the timber deck cargo. The lifeline should be:

- **.1** erected about 2 m above the timber deck cargo as near as practicable to the centreline of the ship;
- **.2** stretched sufficiently taut with a tightening device to support a fallen crew member without collapse or failure.

5.6 Properly constructed ladders, steps or ramps fitted with guard lines or handrails should be provided from the top of the cargo to the deck, and in other cases where the cargo is stepped, in order to provide reasonable access.

5.7 Personnel safety equipment referred to in this chapter should be kept in an easily accessible place.

CHAPTER 6 – ACTION TO BE TAKEN DURING THE VOYAGE

6.1 Tightening of lashings

6.1.1 It is of paramount importance that all lashings be carefully examined and tightened at the beginning of the voyage as the vibration and working of the ship will cause the cargo to settle and compact. They should be further examined at regular intervals during the voyage and tightened as necessary.

6.1.2 Entries of all examinations and adjustments to lashings should be made in the ship's log-book.

6.2 Voyage planning and ship handling

6.2.1 The master should plan the voyage so as to avoid potential severe weather and sea conditions. To this effect, weather reports, weather facsimiles or weather routeing agencies should be consulted.

6.2.2 In cases where severe weather and sea conditions are unavoidable, masters should be conscious of the need to reduce speed and/or alter course at an early stage in order to minimize the forces imposed on the cargo, structure and lashings. The lashings are not designed to provide a means of securing against imprudent ship handling in heavy weather. There can be no substitute for good seamanship.

6.3 Listing during voyage

If a list occurs that is not caused by normal use of consumables (water and fuel), such a list can probably be attributed to one of three causes, or possibly a combination of same.

Cargo shift

6.3.1 A major shift of deck cargo will obviously be immediately apparent. Deck cargo may however have shifted imperceptibly or there may have been a shift of cargo below decks. An immediate examination should determine whether or not cargo has shifted and if this is the case the master will have several remedies available to him depending upon the exact circumstances.

6.3.2 The ballasting and transferring of ballast or fuel to reduce or correct a list caused by a shifted cargo should, however, be carefully considered since this action would, in all probability, result in a far greater list if the cargo should subsequently shift to the other side.

6.3.3 As any cargo shift will in most cases occur in adverse weather conditions, sending crew to release or tighten the lashings on a moving or shifted cargo may well represent a greater hazard than retaining an overhanging load. A moving or shifted timber deck cargo should only be jettisoned after careful consideration; jettisoning is unlikely to improve the situation as the whole cargo stack would probably not fall at once. Severe damage may also be sustained by the propeller if it is still turning when timber is jettisoned.

Water ingress

6.3.4 The possibility of water ingress should immediately be determined by sounding throughout the ship. In the event that unexplained water is detected, all available pumps should be used to bring the situation under control. Subsequent actions will obviously depend upon whether or not such ingress of water can be controlled by use of pumps.

Angle of loll

6.3.5 If the rolling of the ship prior to the detection of the list has been exceptionally slow and the ship has returned to the upright position in a sluggish manner, this will indicate that the ship has little or no metacentric height remaining. The list is therefore due to the ship lolling to one side and having no righting arm to return it to the upright position. This situation may be rectified by either adding weight to the low part of the ship (ballasting double bottom tanks) or removing weight from the high part (deck cargo). Of the two options, ballasting is usually preferable and if empty divided double bottom space is available, the tank on the lower side should be ballasted first in order to immediately provide additional metacentric height – after which the tank on the high side should also be ballasted. However, special care should be taken in ballasting and deballasting to rectify the situation since this may cause a far greater list to the other side.

6.4 Notification

If a whole or partial timber deck load is either jettisoned or accidentally lost overboard the attention of the master is drawn to chapter V of the International Convention for the Safety of Life at Sea which, *inter alia*, requires a master to communicate information on a direct danger to navigation by all means at his disposal, to ships in the vicinity, and also to the competent authorities at the first point on the coast with which he can communicate. It is required that such information should include the kind of danger (in this case a timber deck load), the position of the danger when last observed, and the time and date (co-ordinated universal time) when the danger was last observed.

Appendix A

Advice on stowage practices

1 GENERAL

1.1 The stowage practices described in this appendix have been found to achieve satisfactory results, provided that account is taken of the recommendations of chapters 1 to 6. Although specific conditions may dictate a departure from these guidelines, the basic principle as detailed in 1.2 should nevertheless be adhered to.

1.2 The basic principle for the safe carriage of timber deck cargo is, as indicated earlier, to make the stow as solid and compact as practicable. The purpose of this is to:

- .1 prevent slack in the stow which could cause the lashings to slacken;
- .2 produce a binding effect within the stow; and
- .3 reduce to a minimum the permeability of the stow.

1.3 Lashings prevent deck cargo from shifting by increasing the friction due to pre-stress forces and counteracting forces on the stow in the direction of possible shifting. The lashings should meet the following criteria:

- .1 the strength of all lashing elements should be at least equal to that recommended in the Code; and
- .2 the necessary tension should be maintained during the whole voyage.

1.4 The shifting of timber deck cargo is due mainly to the following causes which may occur singly or together:

- .1 lashings becoming slack due to compaction of the cargo during the voyage, unsuitable devices for tightening the lashing systems and/or inadequate strength of the lashings;
- .2 movement of the cargo across the hatch covers due to insufficient friction, particularly in ice and snow;
- .3 inadequate strength of the uprights due to poor material properties and/or excessive forces;
- .4 heavy rolling or pitching of the ship;
- .5 impact from heavy seas.

1.5 Great care should be taken to keep the ship in an upright condition during loading as even a slight list will impose a considerable load on the retaining uprights. The necessity for prudent ship handling during the voyage cannot be overstressed; imprudent ship handling can nullify even the best of stowages.

1.6 The lashings should be in accordance with chapter 4 of the Code and may comprise the following types:

- .1 Hog lashings are normally used over the second and third tiers and may be set "hand tight" between stanchions. The weight of the upper tiers when loaded on top of these wires will further tighten them (see figure 1).
- .2 Wire rope lashings which are used in addition to chain lashings. Each of these may pass over the stow from side to side and loop completely around the uppermost tier. Turnbuckles are fitted in each lashing to provide means for tightening the lashing at sea (see figure 2).
- .3 Wiggle wires which are fitted in the manner of a shoelace to tighten the stow. These wires are passed over the stow and continuously through a series of snatch blocks, held in place by foot wires. Turnbuckles are fitted from the top of the footwire into the wiggle wire in order to keep the lashings tight at sea (see figures 3 and 4).
- .4 Chain lashings which are passed over the top of the stow and secured to substantial padeyes or other securing points at the outboard extremities of the cargo. Turnbuckles are fitted in each lashing to provide means for tightening the lashing at sea (see figure 5).

1.7 Systems for securing timber deck cargoes are shown in figures 3, 4, 5, 6 and 7.

2 PACKAGED TIMBER AND CANTS

2.1 Timber packages are usually bundled by bandings fastened mechanically (hard bundled) or by hand (soft bundled). The packages may not have standard dimensions and they are not always flush at both ends. The stowage problem is compounded by differences in the lengths of packaged timber when the packages are stowed on board the ship. Moreover, the master of the ship often has no influence on the order in which the packages are delivered.

2.2 Packages which contain random lengths likely to disrupt the compaction of the stow should not be loaded on deck. Other packages of random lengths capable of compact stowage may be loaded on deck in a fore-and-aft direction but not on exposed surfaces or in the stowage outboard of the hatch coamings (see figures 8 and 9).

2.3 Packages for deck stowage should be solidly made up. They should have bands adequate to prevent slackening or disintegration of the package during the voyage, which could cause a loosening of the stow as a whole. Slack bands on the top surface of the deck cargo are dangerous foot traps.

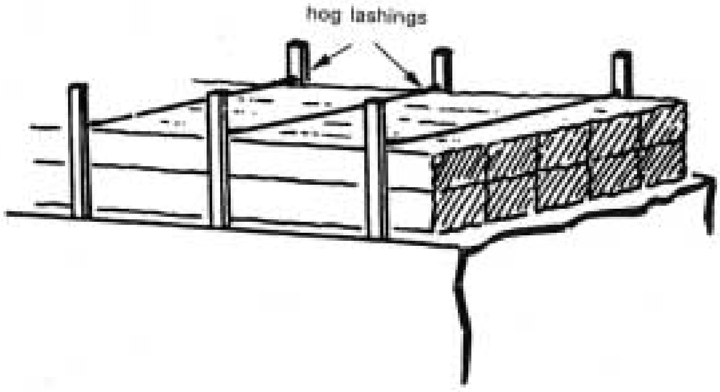


Figure 1

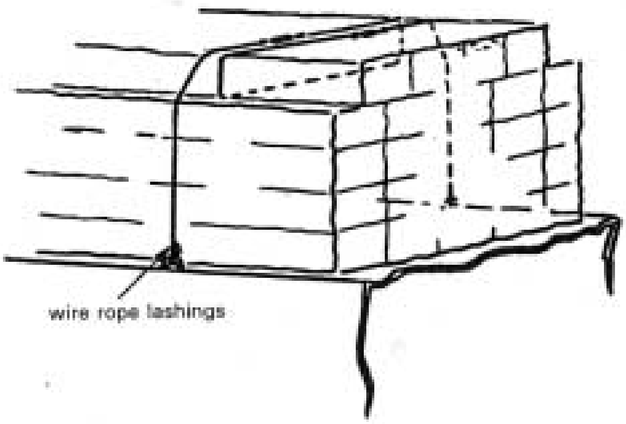


Figure 2

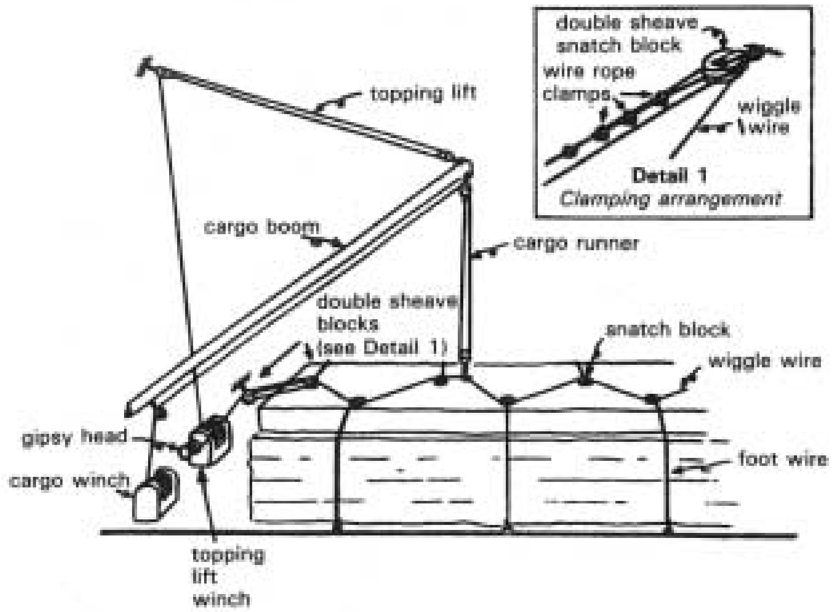


Figure 3

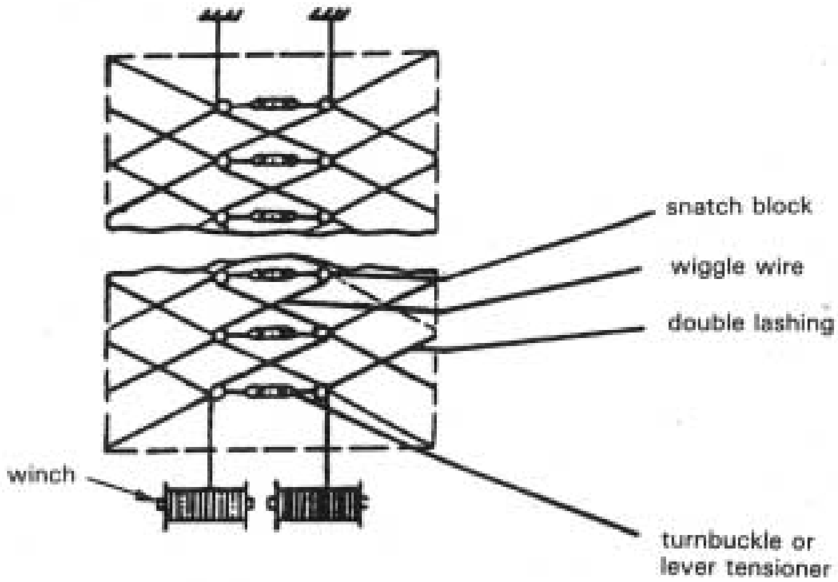


Figure 4

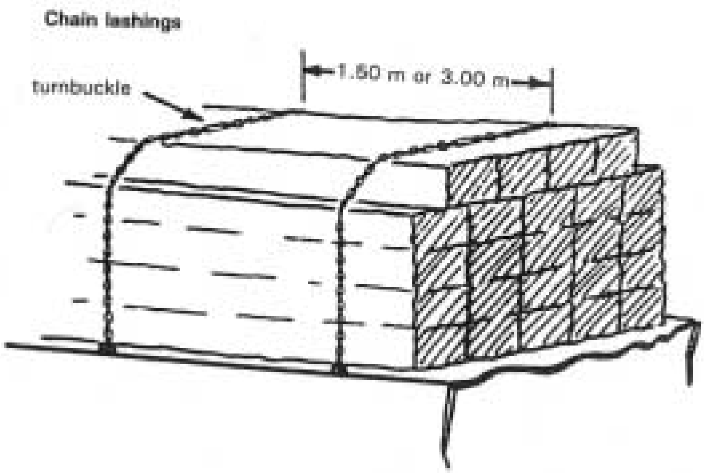


Figure 5

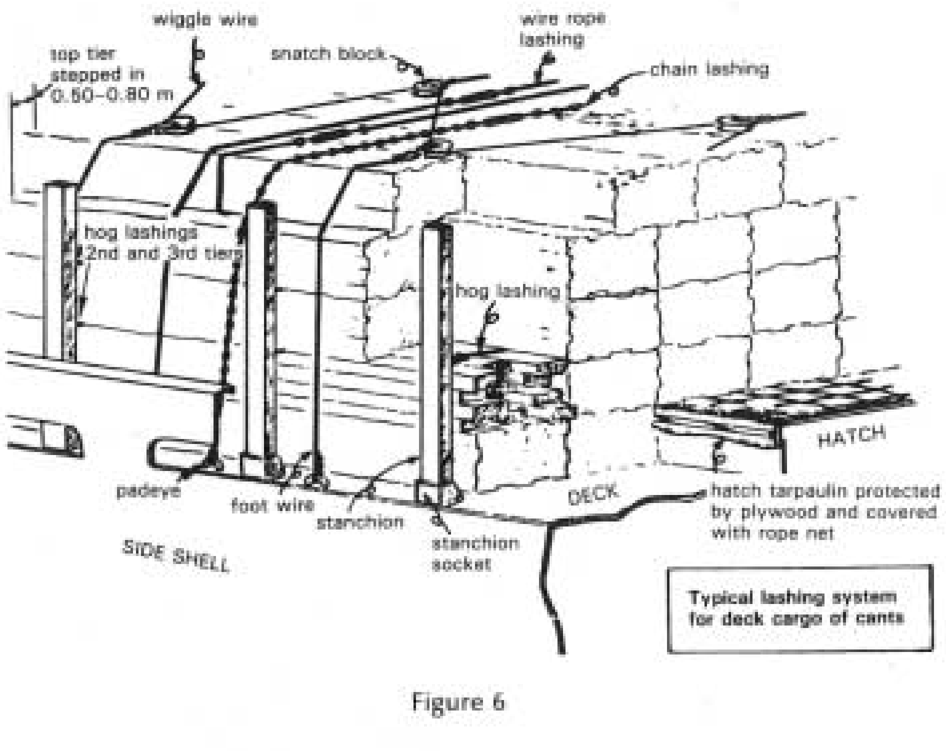
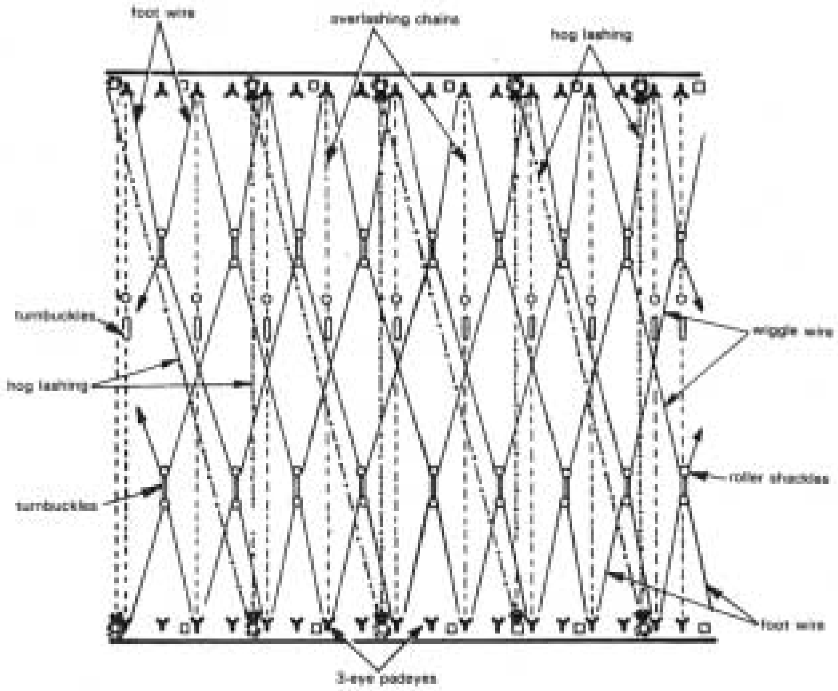


Figure 6



Note: Roller shackles to be affixed between all foot wires and wiggle wires and at least two turnbuckles to be inserted between the wiggle wire and the footwire on each side (port and starboard).

Figure 7

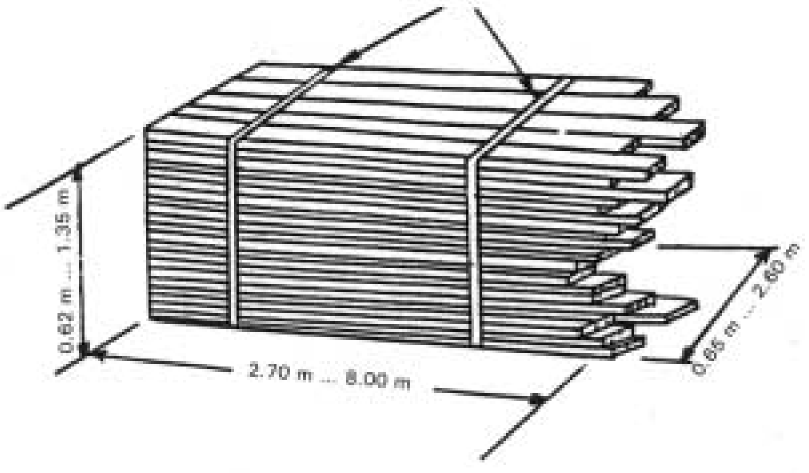


Figure 8

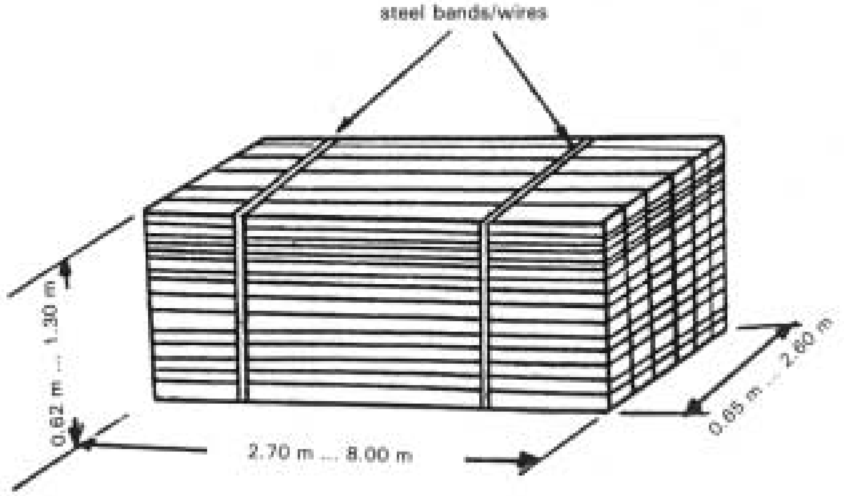


Figure 9

2.4 Cants are usually bundled by banding, but the irregularities caused by varying thicknesses and curved sides make compact bundling very difficult to achieve. Because of these factors, considerable broken stowage is encountered as well. The tendency is for the packages to assume a rounded cross-section within the bands due to the curved sides of the individual pieces (see figure 10).

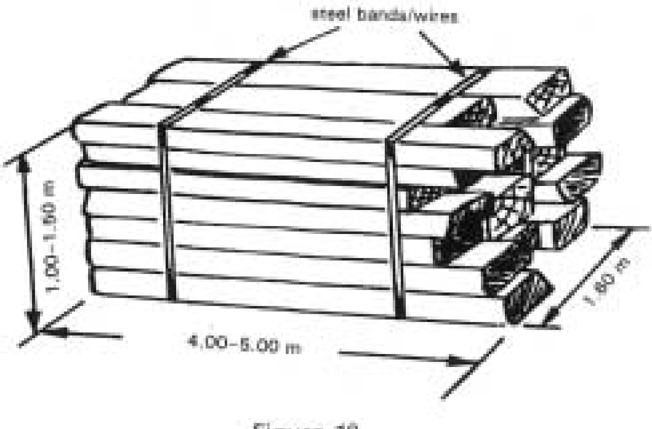


Figure 10

2.5 A solid stow of packaged timber is not always possible as the packages of timber have different measurements, may be partially soft bundles, and gaps may exist between the packages. It is essential, however, that the upper tier and outboard packages be stowed as compactly as possible and the upper tiers chocked as necessary.

2.6 The methods used to stow cargoes of loose timber for transport cannot always be applied to the transport of packaged timber as:

- **.1** packaged timber cannot be stowed to give a compactness as tight as that achieved with loose timber, and lashings may therefore be less effective;
- **.2** packaged timber cannot be stowed between the uprights as densely and with so few gaps as loose timber. The uprights may consequently have to sustain greater loads when packaged timber is being carried and may absorb the forces generated by the cargo when it is moving.

2.7 Before commencing to load on the deck or hatches, a firm and level stowage surface should be prepared. Dunnage, where used, should be of rough lumber and should be placed in the direction which will spread the load across the ship's underdeck structure and assist in draining.

2.8 Due to the system of athwartship lashing, the stowage of packages should generally be in the fore-and-aft direction; the wings of the upper two tiers should always be in the fore-and-aft direction. It is advisable to have one or more non-adjacent tiers stowed athwartships when above the level of the hatches in order to produce a binding effect within the cargo. Also, athwartship packages should be carried above the hatches to interlock the load. If packages with great differences in length are to be loaded, the longest packages should be stowed fore and aft outboard. Short packages should be confined to the inner portions of the stowage. Only packages flush at both ends can be stowed athwartships (see figures 11, 12 and 13).

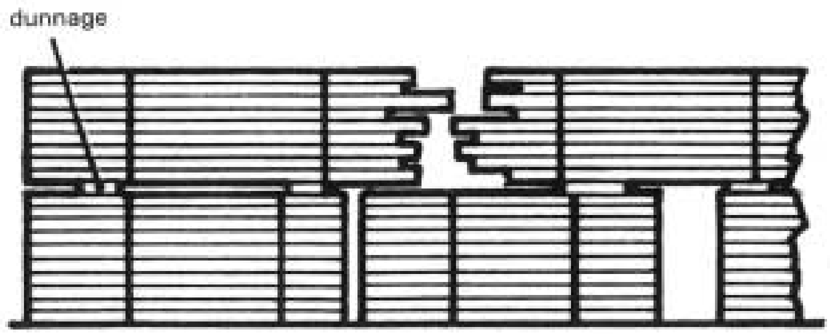


Figure 11

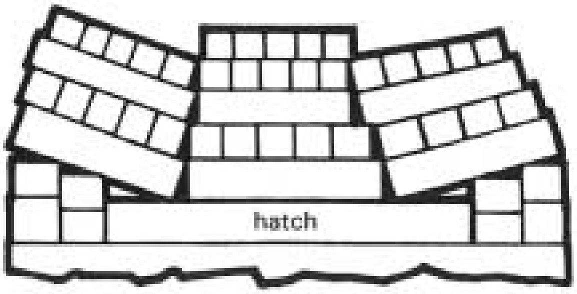


Figure 12

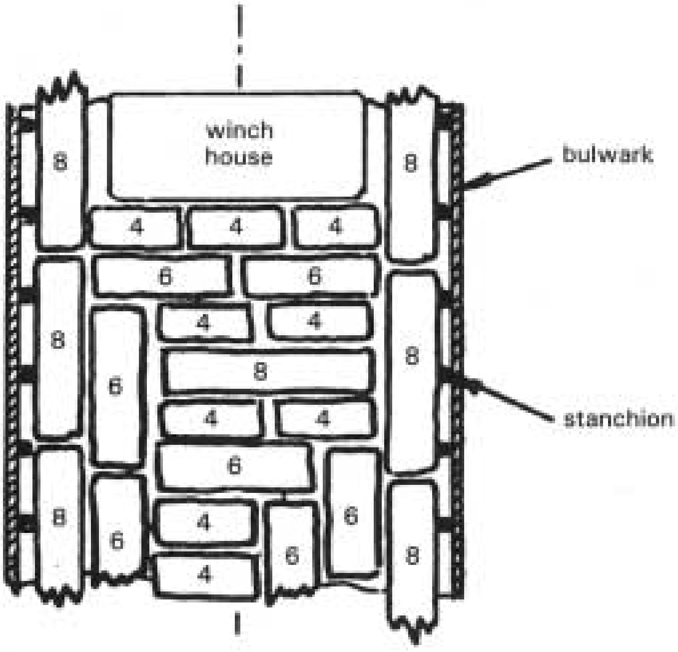


Figure 13

2.9 The timber should be loaded to produce a compact stow with a surface as level as practicable. Throughout the loading, a level and firm stowage surface should be prepared on each working tier. Rough dunnage, if used, should be spread over at least three adjacent packages to produce a binding effect within the stow, particularly in the wings.

2.10 Any gaps occurring around packages in which the cargo may work at sea, such as in the vicinity of hatch coamings and deck obstructions, should be filled with loose timber, efficiently chocked off or effectively bridged over. For this purpose a supply of timber chocking material should be made available to the ship.

2.11 Packages at the outboard edges of the stow should be positioned so that they do not extend over the padeyes and obstruct the vertical load of the athwartship lashings. The end of each deck stow should be flush in order to minimize overhangs to resist the influence of green seas and to avoid the ingress of water.

2.12 Large heavy boards and squares of timber, when loaded on deck in combination with packages, should preferably be stowed separately. When placed in upper tiers, heavy pieces of timber tend to work loose at sea and cause some breaking of packages. In the event that boards and squares are stowed on top of packages they should be efficiently restrained from movement.

2.13 When the final tier is loaded on a large number of tiers, it may be stepped in from the outer edge of the stow about 0.5–0.8 m (a half package).

3 LOGS

3.1 If logs are loaded on deck together with packaged timber, the two types of timber should not be intermixed.

3.2 Logs should generally be stowed in a fore-and-aft direction to give a slightly crowned top surface such that each log is adequately restrained from movement when the system of securing is in place and set up taut.

3.3 In order to achieve a compact stow, the butt of each log or sling of logs should not be in the same athwartship plane as those adjacent to it.

3.4 In order to achieve a more secure stowage of logs when stowed on deck, a continuous wire (hog wire) should be utilized at each hatch meeting the specifications of chapter 4 of this Code. Such hog wire should be installed in the following manner:

.1 At approximately three quarters of the height of the uprights, the hog wire should be rove through a padeye attached to the uprights at this level so as to run transversely, connecting the respective port and starboard uprights. The hog lashing wire should not be too tight when laid so that it becomes taut when overstowed with other logs.

.2 A second hog wire may be applied in a similar manner if the height of the hatch cover is less than 2 m. Such second hog wire should be installed approximately 1 m above the hatch covers.

.3 The aim of having the hog wires applied in this manner is to assist in obtaining as even a tension as possible throughout, thus producing an inboard pull on the respective uprights.

4 PULP WOOD AND PIT-PROPS

4.1 When these items are stowed in the manner described below, good compaction of the deck cargo can be obtained.

.1 In the deck area clear of the line of hatches, the cargo should be stowed in the athwartship direction, canted inboard by some cargo laid fore and aft in the scuppers.

.2 At the centre of the stow, along the line of hatches, the cargo should be laid in the fore-and-aft direction when the wing cargo has reached hatch height.

.3 At the completion of loading, the cargo should have a level surface with a slight crown towards the centre.

4.2 To prevent the cargo from being washed out from below its lashings, it is recommended that nets or tarpaulins be used as follows:

.1 the ends of each continuous section of deck cargo, if not stowed flush with the superstructure bulkhead, may be fitted with a net or tarpaulin stretched and secured over the athwartship vertical surface;

.2 over the forward end of each continuous section of deck cargo and in the waist of the ship the top surface may be fitted with a net or tarpaulin stretched and secured across the breadth of the cargo and brought down the outboard vertical sides to securing points at deck level.

Appendix D

Text of regulation 44 of the International Convention on Load Lines, 1966*

Regulation 44
Stowage

General

(1) Openings in the weather deck over which cargo is stowed shall be securely closed and battened down. The ventilators shall be efficiently protected.

(2) Timber deck cargo shall extend over at least the entire available length which is the total length of the well or wells between superstructures. Where there is no limiting superstructure at the after end, the timber shall extend at least to the after end of the aftermost hatchway. The timber shall be stowed as solidly as possible to at least the standard height of the superstructure.

(3) On a cargo ship within a seasonal winter zone in winter, the height of the deck cargo above the weather deck shall not exceed one third of the extreme breadth of the ship.

(4) The timber deck cargo shall be compactly stowed, lashed and secured. It shall not interfere in any way with the navigation and necessary work of the ship.

Uprights

(5) Uprights, when required by the nature of the timber, shall be of adequate strength considering the breadth of the ship; the spacing shall be suitable for the length and character of timber carried, but shall not exceed 3 m (9.8 ft.). Strong angles or metal sockets or equally efficient means shall be provided for securing the uprights.

Lashings

(6) Timber deck cargo shall be efficiently secured throughout its length by independent overall lashings spaced not more than 3 m (9.8 ft.) apart. Eye plates for these lashings shall be efficiently attached to the sheer strake or to the deck stringer plate at intervals of not more than 3 m (9.8 ft.). The distance from an end bulkhead

* This text remains in force until the entry into force of the Protocol of 1988 relating to the International Convention on Load Lines, 1966 (see note below on page 43).

of a superstructure to the first eye plate shall be not more than 2 m (6.6 ft.). Eye plates and lashings shall be provided 0.6 m ($23^1/_2$ in) and 1.5 m (4.9 ft.) from the ends of timber deck cargoes where there is no bulkhead.

(7) Lashings shall be not less than 19 mm ($^3/_4$ in) close link chain or flexible wire rope of equivalent strength, fitted with sliphooks and turnbuckles, which shall be accessible at all times. Wire rope lashings shall have a short length of long link chain to permit the length of lashings to be regulated.

(8) When timber is in lengths less than 3.6 m (11.8 ft.) the spacing of the lashings shall be reduced or other suitable provisions made to suit the length of timber.

(9) All fittings required for securing the lashings shall be of strength corresponding to the strength of the lashings.

Stability

(10) Provision shall be made for a safe margin of stability at all stages of the voyage, regard being given to additions of weight, such as those due to absorption of water and icing and to losses of weight such as those due to consumption of fuel and stores.

Protection of crew, access to machinery spaces, etc.

(11) In addition to the requirements of regulation 25(5) of this annex, guardrails or lifelines spaced not more than 330 mm (13 in) apart vertically shall be provided on each side of the deck cargo to a height of at least 1 m ($39^1/_2$ in) above the cargo.

Steering arrangements

(12) Steering arrangements shall be effectively protected from damage by cargo and, as far as practicable, shall be accessible. Efficient provision shall be made for steering in the event of a breakdown in the main steering arrangements.

Note: Upon the entry into force of the Protocol of 1988 relating to the International Convention on Load Lines, 1966,* the text of regulation 44 will be replaced by the following:

Regulation 44
Stowage

General

(1) Openings in the weather deck over which cargo is stowed shall be securely closed and battened down.

The ventilators and air pipes shall be efficiently protected.

(2) Timber deck cargoes shall extend over at least the entire available length which is the total length of the well or wells between superstructures.

Where there is no limiting superstructure at the after end, the timber shall extend at least to the after end of the aftermost hatchway.

The timber deck cargo shall extend athwartships as close as possible to the ship's side, due allowance being made for obstructions such as guardrails, bulwark stays, uprights, pilot access, etc., provided any gap thus created at the side of the ship shall not exceed a mean of 4% of the breadth. The timber shall be stowed as solidly as possible to at least the standard height of the superstructure other than any raised quarterdeck.

(3) On a ship within a seasonal winter zone in winter, the height of the deck cargo above the weather deck shall not exceed one third of the extreme breadth of the ship.

(4) The timber deck cargo shall be compactly stowed, lashed and secured. It shall not interfere in any way with the navigation and necessary work of the ship.

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* Article V of the Protocol (entry into force) states, in part, as follows:

"1 The present Protocol shall enter into force twelve months after the date on which both the following conditions have been met:

(a) not less than fifteen States, the combined merchant fleets of which constitute not less than fifty per cent of the gross tonnage of the world's merchant shipping, have expressed their consent to be bound by it in accordance with article IV, and

(b) the conditions for the entry into force of the Protocol of 1988 relating to the International Convention for the Safety of Life at Sea, 1974, have been met,

provided that the present Protocol shall not enter into force before 1 February 1992."

Uprights

(5) Uprights, when required by the nature of the timber, shall be of adequate strength considering the breadth of the ship; the strength of the uprights shall not exceed the strength of the bulkwark and the spacing shall be suitable for the length and character of timber carried, but shall not exceed 3 m. Strong angles or metal sockets or equally efficient means shall be provided for securing the uprights.

Lashings

(6) Timber deck cargo shall be effectively secured throughout its length by a lashing system acceptable to the Administration for the character of the timber carried.

Stability

(7) Provision shall be made for a safe margin of stability at all stages of the voyage, regard being given to additions of weight, such as those arising from absorption of water or icing, if applicable, and to losses of weight such as those arising from consumption of fuel and stores.

ANNEX B

INOK N.V. Shipboard Emergency Plan detailing actions to be taken on receipt of a storm warning

Procedure: Actions in the Event of a Storm Warning

1. APPLICATION

This procedure applies to ship's crews and shore personnel responsible for the safety of shipping and the prevention of pollution.
It establishes the list of actions to be taken by a ship's crew in the event of a storm warning.
The fact that the list of actions has been carried out in no way prevents the captain from making any decision, should he consider it to be more effective in the conditions prevailing.

2. STANDARD DOCUMENTS

The procedure is based on the following documents:

- - International Code for the Safety of Shipping and the Prevention of Pollution;
- - Regulations for the Handling of Emergencies;
- - Regulations governing Procedures;
- - Instructions for Combating Ships' Instability NBZhS;
- - Instructions to Ships' Navigators (NShSM-86);
- -Guidelines for Bridge Procedures (Recommendations of the International Shipping Institute);

3. POWERS AND RESPONSIBILITIES

The ship's captain is responsible for organising and taking adequate measures to ensure survival in an emergency situation.
The captain has full powers to take whatever decision is necessary to save the ship, passengers and crew, safeguard the cargo and prevent pollution of the environment. The responsibilities of various members of a ship's crew in carrying out necessary actions in a given situation are listed at section 4 of these procedures.

4. ACTIONS BY MEMBERS OF THE SHIP'S CREW

Storm conditions at sea, or sailing in areas where ice is likely to be encountered, can be the cause of emergency situations such as: icing up and capsizing of an insufficiently stable ship, severe drifting in areas dangerous to shipping, damage to the ship's bottom, propeller or rudder system from severe pitching when in ballast etc.
When at sea in heavy weather conditions, the following measures should generally be taken:

SUBJECT: Actions in the Event of a Storm Warning

Actions to be taken	Responsibility
In worsening weather conditions or on receipt of a storm warning:	
- Inform the engineer on watch, crew (passengers) that a storm is coming.	Officer of the Watch
- Check all movable objects are secure, and if not take the necessary action to secure them.	First Mate
- Stop all ship's work on the open deck.	Chief Engineer First Mate
- Obtain information on the most favourable shipping route	First Mate
- Carry out additional checks on serviceability of power supply units.	Engineer on Watch
- Assess the level of danger, and if need be change speed and course to avoid the eye of the storm.	Captain
- Switch on navigation lights irrespective of the time of day	Officer of the Watch
- Inform the owner company of the ship's position and time, and of the storm conditions	Captain
Actions to be taken	**Crew Member Responsible**
- Make an entry in the ship's log describing the conditions	Officer of the Watch
- Revert to manual steering	Officer of the Watch
- When the ship is unstable, difficulty in steering makes it impossible to steer into the waves	Officer of the Watch
- If in the circumstances a turn has to be made, warn the crew, contact the ship owners and give them a situation report, and make contact with the nearest ships in the area	Captain
In ice conditions	
- Inform the captain and engineer on watch of the ice situation	Officer of the Watch
- Close all watertight doors	Officer of the Watch
- Take precautionary measures in the engine room	Engineer on Watch

- Select a suitable speed	Captain
- Check the radio broadcasts of ice warnings	Officer of the Watch Radio Officer
- Transmit navigation warnings to nearby ships and shore stations	Captain
Actions to be taken	**Responsible Crew Member**
In ice conditions:	
- Call all hands to general quarters	Officer of the Watch
- Establish a watch list for ice clearance and clear ice away, initially from the highest points of the ship's superstructure and any side that may be listing	First Mate
- Select a course and speed that will reduce spray and the flow of water over the deck to a minimum	Captain
- Take steps to restabilise the ship	First Mate
- Check the hull is watertight	First Mate
- When necessary, request assistance from other ships	First Mate

5. ACCOUNTABLE DOCUMENTS AND RECORD KEEPING

The following accountable documents are to be kept for record purposes:

- - Reports to shore-based state authorities;
- - Reports to nearest shipping;
- - Reports to ship owners;
- - Reports to port authorities;
- - Reports to other organisations with an interest in the ship
- - Report concerning non-standard procedures (in accordance with the Procedure entitled – "Non-standard actions: Checks and corrective actions")
- - Ship's logs.
- Accountable documents are to be retained for not less than 10 years.

6. OTHER TYPES OF DOCUMENT

- - Emergency watch rosters;
- - Emergency file;

- - Instructions for Ships' Navigators (NShSM-86);
- - Accident Investigation Procedures PRAS-90;
- - Guidelines for Bridge Procedures (Recommendations of the International Shipping Institute);
- - Non-Standard Procedure Report Form (Procedure – "Non-Standard Actions: Checks and Corrective Actions");
- Initial Report Form (Section 3 of Ship's Plan).

ANNEX C

INOK N.V. Checklist 15 – Preparation for sea with a deck cargo of lumber

ЧЕК-ЛИСТ 15: ПОДГОТОВКА К ВЫХОДУ В МОРЕ С ГРУЗОМ ПИЛОМАТЕРИАЛОВ НА ПАЛУБЕ

CHECK LIST 15: PREPARATION FOR SEA WITH A DECK CARGO OF LUMBER

1 ***Проведены ли следующие мероприятия ?***
Have the following been actioned?

- ***Судно загружено в соответствии с лесной грузовой маркой*** ☐
  Vessel loaded to the Timber Load Line
- ***Палубный груз погружен и раскреплен в соответствии с «наставлением по креплению груза»*** ☐
  Deck cargo loaded and secured in accordance with "Cargo Securing Manual"
- ***Балластные танки заполнены согласно «Информации об остойчивости»*** ☐
  Ballast tanks filled in accordance with instructions in "Stability Information"
- ***Произведен расчет остойчивости*** ☐
  Stability calculations completed
- ***Воздушные трубы танков проверены и зачехлены*** ☐
  Ballast tank air ventilator pipes checked and covered
- ***Обеспечен безопасный проход из района надстройки на бак*** ☐
  Safety passage way created from the superstructure to the forecastle
- ***Предусмотрена возможность аварийной отдачи крепления палубного груза*** ☐
  Provision made for the emergency release of deck cargo fastenings

2 ***Внесена ли соответствующая запись в судовой журнал ?*** ☐
Appropriate entry made in ship's log?