Investigation Report

C1/2010M

M/S LINDA (FIN), falling overboard of four containers into the Baltic Sea, south of Gotland, on 6 February 2010

Translation of the original Finnish report

Onnettomuustutkintakeskus
Olycksutredningscentralen
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SUMMARY

Four containers fell into sea from the Finnish flagged M/S LINDA on Saturday morning 6 February 2010. The incident occurred in the Baltic Sea, south of Gotland, while the vessel was on her way from Rotterdam, the Netherlands, to St. Petersburg, Russia.

The LINDA operates in regular traffic between European ports. In addition to the customary cargo, a 40 foot container equipped with a refrigeration unit, so-called reefer container, was loaded on her deck, in the first tier, in Poland, in the port of Gdansk. The reefer container had been taken out of use. The container had been decided to be taken to Helsinki, where it was to be sold so it could be used as something else than a transport unit. Nothing was loaded on the container in the following port, Teesport. In Rotterdam, the port after Teesport, three containers were loaded on the reefer in the second, third and fourth tiers. These containers weighed 25, 23 and 26 tons respectively, making a total of 74 tons.

When the LINDA was sailing from Rotterdam for St. Petersburg, a motorman noticed on Saturday, 6 February 2010 at 8.20 that a stack of containers from the port side of the vessel had fallen into the sea and that remains of a reefer container were hanging on the vessel's side. The motorman informed the Officer of the Watch, who was on the navigating bridge, of his observation. The Officer of the Watch had not noticed the falling of the containers as it was dark. The exact time of the fall, 07.56 vessel’s time, was obtained later from the registration of the vessel's CCTV camera, which was located in the superstructure. According to the LINDA’s log, the vessel position at 08.00 was lat 57°00.6N and long 017°34.2E.

Swedish authorities decided not to lift the containers as their understanding was that the possible environmental damages would be small and restrict to a limited area. Baltic herring is fished in the area, and its stock may decrease temporarily when the dangerous substances at some point dissolve in seawater.

It was found out in the investigation that it was not possible to identify the container, which had been taken out of use and was deteriorated, as there was no marking on it indicating that loading on it was not permitted. The identification of such a container rested only on the identification taking place on the basis of the number of the cargo unit. In Rotterdam three containers were loaded on the deteriorated container even though there was in the instructions information about the fact that nothing could be loaded on the reefer container in question. Information did thus not pass between the different actors. Divergences in the cargo information system do not pass automatically from one system to another, and some information must be conveyed directly between the various parties involved.

In the opinion of the Safety Investigation Authority of Finland, transporting a deteriorated container as cargo on a vessel requires that it is marked clearly enough as taken out of use. In addition to the sides and ends of the container, the markings should also be visible on the top of the container in which case it would be possible for the crane operator, too, to identify the faulty unit. The shipping company, the operator and the vessel have different cargo information systems in use, and the information transfer between them is not flawless. The actors must make sure by other means that information on diverging cargoes or cargoes requiring special attention is passed to all parties.

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GLOSSARY OF ABBREVIATIONS AND ACRONYMS

Abbreviation / acronym	In English	Explanation
AIS	Automatic Identification System	
CSC	Convention for Safe Containers	
hPa	Hectopascal	The unit of pressure, describes the prevailing atmospheric pressure
IICL-5	Institute of International Container Lessors	A corporation of container lessors, which has published a guide defining the condition and the need for repair of a container; the publication is used when inspecting containers
IMDG	International Maritime Dangerous Goods Code	International code dealing with the marine transport of dangerous goods
kn	Knot	
kVA	Kilovoltamps	
kW	Kilowatt	
MS	Motor Ship	
Tdw	Tons Deadweight	
TEU	Twenty-Feet Equivalent Unit	20-feet container
UN	UN (United Nations) number	A four-digit number, on the basis of which the transported dangerous substance can be identified
UTC	Universal Time Coordinated	

FOREWORD

Four containers fell overboard from the Finnish flagged M/S LINDA into the Baltic Sea, south of Gotland, on Saturday morning 6 February 2010 while the vessel was on her way from Rotterdam, the Netherlands, to St Petersburg, Russia. The duty officer of the Safety Investigation Authority of Finland (hereafter referred to as the SIA) received information on what had happened from a Maritime Inspector at 13.50 on the day of the accident. The investigator who was then the duty officer initiated a preliminary investigation of the incident.

On the basis of the preliminary investigation, the SIA decided on 11 February 2010 to appoint an Investigation Group to investigate the accident. SIA investigator, Captain Risto **Repo** was appointed as a team leader per his consent, and Principal Lecturer, Captain Tapani **Salmenhaara** and M.Sc (Tech.) Ville **Grönvall** were appointed as member investigators. The investigation report has been translated into English by M.A., M.Pol.Sc. Minna **Bäckman.**

The SIA investigators visited the vessel on 9 February 2010 after it had arrived from St. Petersburg to Vuosaari in Finland, and interviewed the Master and the Officer on the vessel as well as examined the remains of the container which had been bottommost in the fallen container tier.

The final draft of the investigation report was sent to concerned parties for statements and comments. The statements and comments received within the prescribed time have been taken into consideration in the final report.

The sources used in the investigation are filed at the SIA.

The investigation was finalised on 10 October 2012. The time used in the investigation report is Finnish time (UTC+2).

Figure 1. M/S LINDA *(© Oy Langh Ship Ab)*

1 EVENTS AND INVESTIGATIONS

1.1 The vessel

1.1.1 General information

Figure 2. A layout drawing of the cargo spaces on M/S LINDA. The red rectangle indicates the location of the fallen container stack on the outermost bay on the port side of the vessel. (© Oy Langh Ship Ab)

Name:	M/S LINDA
Flag state:	Finland
Owner:	Oy Langh Ship Ab
Freighter:	Containerships Ltd Oy
Construction place and time:	J.J.Sietas Hamburg, 2007, type 174a
Class:	Germanischer Lloyd +100 A 5 E 4 “Multi purpose vessel” “Equipped for Carriage of Containers” “IW” “NAV-0” “SOLAS II-2, Reg. 19” “G” + MC E4 Aut
Call sign:	OJML
IMO number:	9354325
Ice classification:	1 A Super
Gross tonnage:	9131
Net weight:	4205
Deadweight:	11487 Tdw
Length:	141.20 m
Breadth Loa:	21.55 m
Draught:	8.6 m
Speed:	17.7 kn
Container capacity:	907 TEU
Engines:	Wärtsilä 8L46C, 8400 kW
Generation of electricity:	shaft generator 2150 kVA
Bow thruster:	800 kW

1.1.2 Manning

The vessel had a ten-person crew which consisted of:

- the Master (FIN)
- the Chief Officer (FIN)
- the Officer (EST)
- the Chief Engineer (FIN)
- the First Engineer (EST)
- the Boatswain (FIN)
- the Repairman (EST)
- an Able-bodied Seaman (FIN)
- an Ordinary Seaman (FIN) and
- a Cook (FIN).

In addition to the regular crew, there were three Finnish trainees on the vessel.

1.1.3 Navigating bridge and bridge equipment

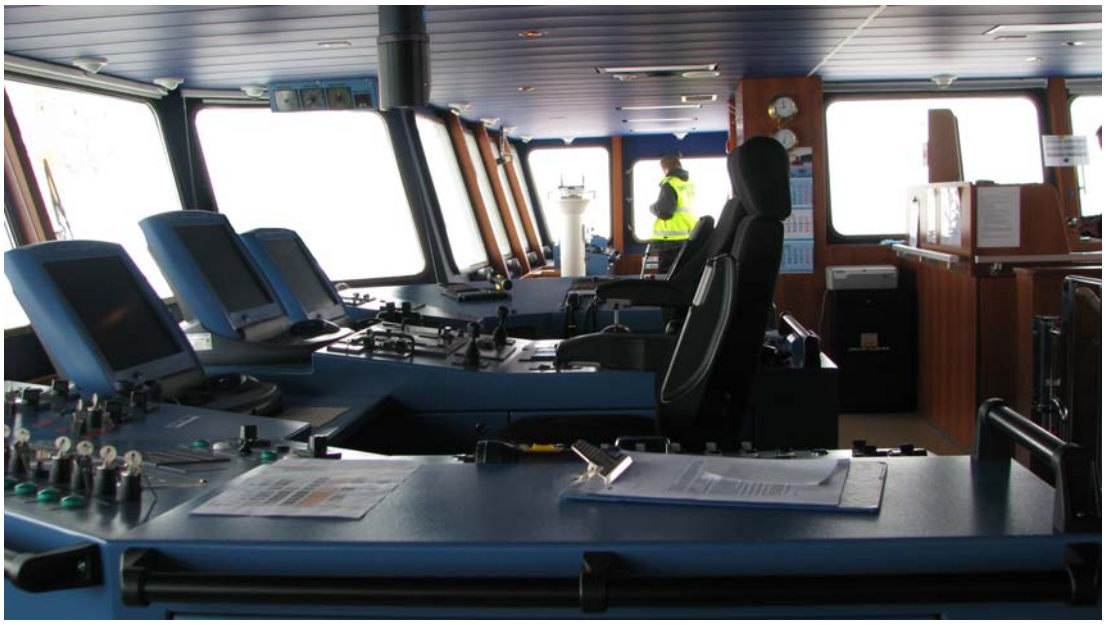

Figure 3. A photograph of the vessel's wheelhouse.

The vessel's navigating bridge is a so-called Optimale Brücke and it is equipped with modern bridge equipment including navigational and communication appliances. The navigating bridge and its equipment did not play any role in the incident.

1.1.4 Engines and the engine room

The main engine of the vessel is a Wärtsilä 8L46C, the effect of which is 8400 kW. The electricity is produced with a shaft generator, the output of which is 2150 kVA. The effect of the bow thruster is 800 kW.

The machinery systems of the vessel did not have an effect in the incident.

1.2 Cargo

1.2.1 General information

The LINDA only transports containers and her container capacity is 907 TEU. The vessel operates in regular traffic between European ports. In the ports of call the cargo units intended for that particular port are discharged first. After this the units which are to be transported to the other ports along the line are loaded. Along the route, some of the cargo units remain onboard if the port of call is not the port of destination. The vessel is thus almost always fully laden. The ports along the LINDA's route in order, starting from Helsinki are Helsinki, Gdansk (Poland), Teesport (Great Britain), Rotterdam (the Netherlands) and St. Petersburg (Russia).

1.2.2 Stowage planning

Measures related to cargo handling are carried out according to a separate, pre-planned operational programme. Containerships uses its own software for the management of cargo units. The programme software covers the entire transport chain and equipment. With this system the company aims at as effective planning as possible and at monitoring the location of their equipment and its condition at the different stages of the transport chain. The programme software used by the shipping company also identifies defect cargo units. Information on a defect cargo unit does no transfer automatically to the vessel's stowage software, but the information transfers to the vessel as separate information.

The LINDA uses her own stowage software. In different ports the units to be loaded and discharged can be moved ashore and back onboard in such a way the vessel's stability and stresses remain within set limits. With the help of the stowage software the vessel can optimise the placing of the transported cargo units on the vessel. In addition to cargo optimising, stowage planning aims at good seaworthiness and fuel economy. The stowage plan itself is an Excel-based spreadsheet report.

1.2.3 Stowage method

Moving the containers from the vessel and to the vessel starts immediately after the vessel has moored to the quay. On the vessel the crew or stevedores unfasten the cargo from its securings before it is moved. The containers are hoisted by the container cranes located on the quay. The units to be loaded have been placed on the loading field in a so-called work queue, from which the crane picks the units onboard the vessel in a pre-planned order. Respectively, the cargo units onboard the vessel are discharged according to the work queue, in the order indicated by the plan. The cargo units to be handled are identified by the number on the container.

In the terminals owned by Containerships the aim is to perform the loading and discharging as efficiently as possible. A figure indicating the capacity of the port's cranes to handle units in an hour is considered to be the efficiency indicator in the handling of containers. Container cranes are exceptionally quick. The containers to be loaded are wait-

ing on the quay under the crane. The crane moves containers in both directions. The aim is that the crane is not empty to either direction.

The vessel's crew takes care of the securing of the cargo. The securing is based on the instructions in the cargo securing manual[1] which the vessel is required to have.

The vessel's cargo securing manual

McGregor Ltd has compiled the vessel's cargo securing manual. It has been approved by the classification society Germanischer Lloyd and the Finnish Maritime Administration in 2007. The cargo securing manual provides comprehensive instructions on how to secure different kinds of cargoes, but it does not give instructions on the placing of cargo units.

1.3 Incident

1.3.1 Weather conditions

According to the ship's log, at 8.00 the wind blew from south with force 4 (5.5–7.9 m/s), the weather was cloudy, the temperature -2° C, the atmospheric pressure was rising and at 8.00 it was 1027 hPa[2].

According to the nearest weather station, Visby, the temperature ashore was -3 °C, wind from southeast approx. 5 m/s at 8.00. It did not rain but it was cloudy.

1.3.2 Voyage and preparations for it

The LINDA arrived from Helsinki to Poland, to the port of Gdansk on Friday night on 29 January 2010. Some of the cargo was discharged in Gdansk, after which containers intended to the following ports were loaded on the vessel. In addition to the actual cargo, a discarded 40' reefer container owned by the Containerships Ltd was loaded on the vessel's deck, in the first tier on the cargo hatch in position number 230882 (Bay 23, Row 08 and Tier 82). The container equipped with a refrigeration unit had been taken out of traffic use eighteen months earlier and it had been on the quay in Gdansk. Now it had been decided that the container would be taken to Helsinki, where it was to be sold to be used as something else than a transport unit. After midnight, before the departure of the vessel and before the reefer container was stowed, the senior operator of the stevedoring company and the Officer of the vessel signed a damage report[3] on the container. The voyage towards the next port, Teesport, started at 05.25 on Saturday 30 January 2010.

The vessel arrived at the Teesport anchorage somewhat after midday on Monday 1 February 2010 and remained there waiting for a free berth. A pilot boarded the vessel at 00.56 the following night, and the vessel moored at the quay on Tuesday night at 01.45.

[1] IMO Cargo Securing Manual (Solas Chapters VI/VII, MSC/Circular.745 - Guidelines for the Preparation of the Cargo Securing Manual)

[2] 1 hPa = 100 Pa, the unit of pressure in the SI system is Pascal, Pa

[3] Containerships Ltd Container Damage Report, Ms Linda, Voyage 6509, Container number SCZU 495261-8: *Left rear side corner dented and a torn hole on left side the container.*

The cargo operations were carried out 02.15–17.45. In the Port of Teesport, 247 TEU units weighing 2979.34 tons in total were loaded on the vessel in accordance with the stowage plan. In addition, there were approx. 140 empty containers on the vessel. The total weight of the vessel's cargo was 3272.44 tons.

In the Port of Teesport nothing was loaded on the discarded reefer container which had been loaded in place number 230882 in Gdansk. The vessel left Teesport for Rotterdam on Tuesday evening at 18.20.

The vessel arrived at Rotterdam Arreste South terminal on Wednesday 3 February 2010 at 11.05, and the load operation was commenced at 11.40. When the containers addressed to Rotterdam had been discharged, 40 20' containers, 4 30' containers, 69 40' containers and 31 45' containers were loaded onboard the vessel. The total weight of these containers was 3379 tons. In Rotterdam three containers were loaded in the second, third and fourth tier on the damaged reefer. These containers weighed 25, 23 and 26 tons respectively, making a total of 74 tons.

The loading in Rotterdam was completed on Thursday 4 February 2010 at 06.20. The voyage towards the next port on the line, St. Petersburg, was started on Thursday at 07.00. Draught in the bow was 8.3 metres and in the aft 8.35 metres. The metacentric height (GM) was 0.62 metres. The value fulfils stability requirements and is normal, and it does not cause exceptional accelerations when the vessel rolls in the sea.

The vessel arrived at the Brunsbüttel lock in the North Sea end of the Kiel Canal on Friday 5 February 2010 at 03.05. When the vessel was in the canal, the condition and securing of the IMDG[4] cargo units were checked and they were found to be in order in all respects. At 10.17 the vessel passed the Holtenau lock and started its voyage to the Baltic Sea.

1.3.3 The incident

On Saturday 6 February 2010, the LINDA had passed the southern point of Öland and continued her voyage towards the Gulf of Finland. The First Officer of the vessel was keeping watch at 04.00–10.00.

A motorman was on his way to the vessel's bow in the morning at 8.20, when he noticed that a stack of containers from the port side of the vessel had fallen into the sea and that remains of the reefer container were hanging on the vessel's side. The motorman informed the OOW who was on the bridge of his observations. The falling overboard of the containers was not noticed on the vessel when it actually happened.

1.3.4 Time and scene of the incident

The exact time for the falling, 07.56 vessel's time, was obtained later from the registration of the vessel's CCTV camera located in the superstructure. According to the LINDA's log, the vessel position at 08.00 was lat 57°00.6N and long 017°34.2E.

[4] International Maritime Dangerous Goods Code, an international guideline to the safe transportation or shipment of dangerous goods or hazardous materials by water on vessels.

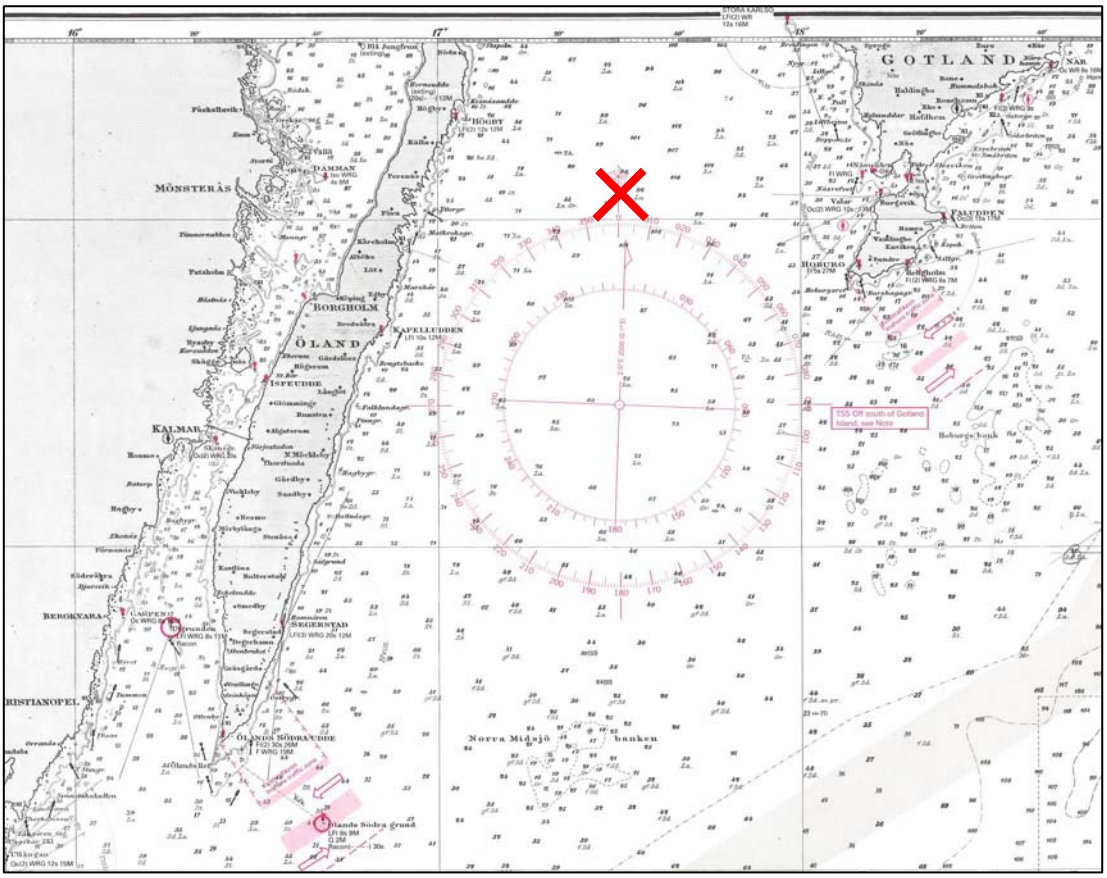

Figure 4. The scene of the incident has been marked in the figure with a red cross. (© Swedish Maritime Administration 2012)

1.3.5 Measures after the incident

When the falling overboard of the cargo had been noticed on the vessel, the OOW informed the Master of the matter and phoned the MRCC Turku. The MRCC Turku informed the Swedish maritime rescue authorities of the incident, and they sent a helicopter unit to investigate the situation.

A helicopter from the Swedish Coast Guard videotaped of the remains of the reefer container at 11.18 UTC, i.e. at 13.18 vessel's time. On the basis of the coordinates in the record, the position of the remains was then lat 57°02.55N and long 17°30.03E. Remains of the reefer container had drifted to the distance of approx. three nautical miles from the presumed place of falling. The other three containers had already sunk.

1.3.6 Damages to the vessel

When falling overboard, the containers damaged the vessel's port side railing at a length of approx. 4 metres (Figure 5). The vessel did not suffer any other damages.

Figure 5. The railing damaged by the fallen container stack on the port side of the vessel.

1.3.7 Damages to cargo

In addition to the containers which fell overboard there were no other damages to the cargo or transport units.

1.3.8 Registration equipment

The vessel has CCTV cameras on the boat deck on both sides of the accommodation spaces. The port side camera recorded the containers in the sea after they had fallen overboard. The containers which contained cargo were attached to each other as one block. For example the roof of the broken reefer was also attached to this block.

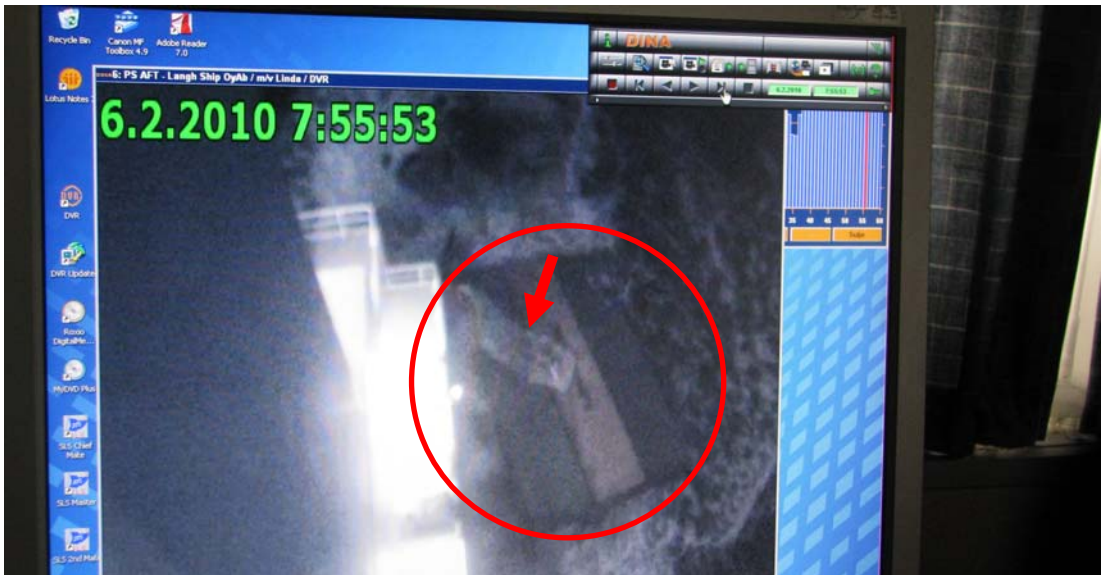

Figure 6. A picture recorded by the vessel's CCTV camera photographed by a camera from a display on the vessel. The block formed by the three containers attached to each other can be seen in the picture (the red circle). The roof of the broken reefer container is on this block (the red arrow). The wall of the reefer container drifts somewhat behind the block.

1.4 Rescue activities

Actual rescue activities were not initialised, because from the vessel's point of view there was nothing else to do than to inform the rescue authorities.

1.4.1 Alerting activities

A notification on the incident was made from the vessel to the MRCC Turku, which transmitted the information to the Swedish authorities.

1.4.2 Search activities

After receiving information on the fallen cargo via the MRCC Turku, the Swedish maritime rescue authorities sent a helicopter to the scene. Both the LINDA and the remains of the broken reefer container in the sea were videotaped from the helicopter. The other containers which had fallen overboard were not to be seen on the surface of the sea.

1.5 Special investigations

1.5.1 Investigations on the vessel and at the scene of the incident

When the LINDA arrived at the Port of Vuosaari in Finland, the SIA investigators initiated an investigation on the incident. The vessel's personnel were interviewed and the remains of the container were photographed. The records of the vessel's CCTV camera were obtained to be used in the investigation.

The reefer container marked with the identification SCZU495261-8 was already used when it was bought by Containerships Ltd. It had been manufactured in 1992 by GE SeaCo. After April 2008, it had been used as a transport unit until it had been unloaded empty from the vessel in Gdansk in Poland on 8 November 2008. After more than a year, on 18 December 2009, the container got the status "Awaiting Sale". On 30 February 2010 the container was loaded on the deck of the LINDA.

1.5.2 Contents of the containers which fell overboard and their effects on marine environment

In addition to the broken reefer container, the three containers which were laden on the reefer container fell into the sea:

CSFU 964448-6, year of manufacture 2005
NEVU 796664-6, year of manufacture 2002
GESU 401119-0, year of manufacture 2002

Of the containers mentioned above, the container CSFU 964448-6 contained the following harmful substances:

UN number 1325, IMDG class 4.11 solid, powdery substance in cardboard boxes 6508 kg, trade name *Trioxan Fluessig*. The substance is flammable, irritates respiratory passages and is possibly dangerous to foetuses. 175g/l (25°C) has been reported as the

water solubility of the substance and its toxicity *to fish*: LC50 4,000mg/l (Leuciscus idus) ide[5] and LC50, 16,350 mg/l (Cyprinodon variegatus) sheepshead minnow[6]. *Invertebrates living in water:* EC50 ›1,000 mg/l, water fleas.

UN number 3082, *(Poly(hexamethylenebiguanide)hydrochlorine)* IMDG class 9 III Marine pollutant, trade name Vantocil TG. 200 plastic containers á 25 kg, 5000 kg in total.

The substance is very toxic to marine organisms and may cause significant damage to marine environment in the long term. The liquid is somewhat denser (1.04) than seawater, and it dissolves in water. The liquid is very toxic to fish, invertebrates and algae.

UN number 3082, *(N-Cocoalkyl-NN-Dimethylamineoxide*) IMDG class 9 liquid, 40 drums, net weight 8000 kg. Trade name Barlox 12. Stabilising emulsion substance which irritates skin and is very dangerous to eyes; also very toxic to marine organisms. The substance dissolves in water.

The information about the substances presented above was available for the authorities soon after the incident. The position where the containers sank is not located in the Swedish territorial waters, but it is, however, in the Exclusive Economic Zone, EEZ of Sweden.

The Swedish authorities[7] decided not to lift the containers as their understanding was that the possible environmental damages would be small and restricted to a limited area. Baltic herring is fished in the area, and its stock may decrease temporarily when the substances at some point dissolve in seawater.

1.6 Rules and regulations guiding the operations

1.6.1 National legislation – Container Act and Container Decree

Container Act

Container Act[8] which came into force 1 January 1999 is applied to containers used in international traffic.

According to section 5 in the act, the owner[9] of the container has the duty to make certain that the container is in safe condition. The inspection of containers is carried out in the way prescribed in the Container Decree[10] if the registered office or principal place of business of the owner of the container is in Finland.

According to section 3 in the Container Act, the structural strength and equipment of a container must be approved before it may be used in international traffic. The approval criteria are prescribed in the Container Decree. A safety sign (a CSC sign) in accordance with the Convention for Safe Containers (CSC) is attached to an approved con-

5 DIN 38412 Part 15, static
6 Fish test acute, static
7 Information obtained from the Swedish Transport Agency, Maritime Department
8 L 23.10.1998/762
9 The owner can transfer his duty to exercise proper case to the lessor of the container or other holder by agreement.
10 A 23.12.1998/1145

tainer, as prescribed in section 4 of the Act. The supervising authority must make sure that the appropriate safety sign is attached to the container.

An inspection body approves a container type or a single container and supervises the tests performed on containers as well as approves upon the owner's suggestion an inspection programme which complies with the Decree. The inspection body is approved by the Finnish Safety and Chemicals Agency (Tukes).

If a safety sign is missing from a container in use or the container has not been inspected in accordance with what has been prescribed or if the container on the account of its structure or condition may cause apparent danger to safety, the supervising authority may by virtue of sections 14 and 15 in the Act immediately forbid the use of the container.

According to section 6[11] in the Container Act, the Customs, the Border Guards, the police authorities and occupational safety and health authorities and the Finnish Transport Safety Agency act as supervising authorities and oversee that the Act and provisions are complied with.

There is no standardised way to mark containers which have been taken out of traffic due to their bad condition.

Container Decree

As the Container Act, the Container Decree also came into force on 1 January 1999. The Decree stipulates more detailed provisions on the execution of the Container Act, i.e. the criteria for the approval and commissioning of a container are specified. The Decree also stipulates what inspections a container must undergo and how often these inspections are carried out.

The approval of a container requires that the container fulfils CSC requirements as to its structural strength and equipment. A safety sign (CSC sign) is attached to the container to indicate that it fulfils the requirements. According to section 8, chapter 3 (Safety Sign) in the Container Decree, the owner of the container must remove the safety sign if the container has been taken out of use or if it has not been kept in a condition required by the CSC.

According to section 11 in Chapter 4 (Inspections), the owner of the container must inspect the container or have it inspected according to the inspection programme approved by the inspection body. The inspections must be carried out with intervals required by the operating conditions of the container. The first inspection must, however, be carried out within five years of the date of manufacture of the container and after this the container must be inspected again with the interval of max. 30 months. Whether the container has such defects which may cause a risk of accident must be examined in connection with the inspections. The condition of the bearing structures and structures essential for safety must be especially ascertained.

[11] From the beginning of year 2010, the duties of the Maritime Administration were transferred to the Finnish Transport Agency and to the Finnish Transport Safety Agency, which began their operation at the turn of the year. Because of this, the section 6 (2) in the Container Act was changed by Amendment 22.12.2009/1296.

1.6.2 Operator's orders

According to the internal practice of Containerships Ltd, other units are not to be loaded on a damaged container.

1.7 International agreements and recommendations

Convention for Safe Containers, CSC

An international convention on safe containers was concluded in Geneva on 2 December 1972. The convention is also known by the name CSC (Convention for Safe Containers) and its primary objective is to assure the safety of the persons involved in the handling and transport of containers by defining generally approved strength requirements on the structure of containers and test methods to be used. The convention came into force in 1977.

The minimum inspection requirements are defined in the CSC. After meeting these requirements the container qualifies for international traffic. The CSC safety signs on containers indicate that the containers are appropriately inspected and fulfil the convention requirements.

There is no internationally standardised way to mark containers which have been taken out of traffic.

Finland became a CSC member state on 1 January 1999, at the same time when the Container Act and Decree came into force.

IICL Guide

The IICL stand for the Institute of International Container Lessors, and it was founded in 1971. The IICL has created the criteria for the seaworthiness of containers. The IICL Guide is the most widely spread guide for the determination of the condition of a container. It defines in what kind of condition containers must be in order to serve flawlessly as transport units in sea carriage.

The objective of the fifth generation guide, the IICL-5, is to act as a supplement to the CSC and national laws and regulations when determining the condition and need for repair of containers.

1.8 Quality systems

The vessel and the shipping company have an enterprise resource planning system which includes a safety management system in accordance with the ISM Code[12].

[12] International Safety Management Code

2 ANALYSIS

2.1 System interfaces

Containership Ltd has one own vessel in traffic and in addition to her, other vessels on charter. The LINDA is in long-term charter in Containership traffic.

According to the investigators' experience and understanding, the mode of operations and operational culture on the chartered vessels are not always exactly similar to those on the "own" vessels. The vessel has two "masters". The culture and practices of the vessel's owner shipping company can be seen in the personnel's mode of operations. In this case, nothing differing from the normal mode of operations of the vessel's crew has come to the investigators knowledge.

When a container reaches the end of its lifespan in the transport chain, a new user is often found to it. The reefer which caused the incident had been taken out of use because of its bad condition as early as in November 2008. In December 2009 the container had been entered into the information system with the reference "Awaiting sale" and a damage report in writing had duly been made on 30 January 2010 when the unit was loaded on the deck of the LINDA. The report was signed by the vessel's Officer and by a senior operator from the stevedoring company.

2.2 Marking and identification of a container which has been taken out of use

There is no internationally standardised way to mark containers which have been taken out of traffic due to their bad condition. Such containers are, however, transported, and the only indicator available is the number of the container. Therefore the identification of the deteriorated containers transported as cargo on vessels is based on the cargo list and the number of the unit. It may be difficult to identify such units when the discharging and loading take place at the same time.

The vessel and the shipping company both had their own systems to manage cargo units. In addition to this, an outside stevedoring company was responsible for cargo operations in such ports where Containerships did not have their own terminal. There were interfaces between the different actors for the transmission of information. Some pieces of information passed automatically and some manually.

In the accident case the discarded container had been loaded on the vessel in Poland to be used in other than transport purposes in Finland. The poor strength of the container with reference to loads was known in the port of loading and the vessel was aware of the inferior condition of the unit. The damage report signed by the shipping company and the vessel's Officer is an indication of this.

The vessel's route ran from Gdansk, Poland, to Teesport, Scotland, and from there further to Rotterdam. Because stowage planning is carried out in ports, the information about the defect container laden in Poland did not reach the persons who planned stowage in Rotterdam, but the information and documentation on the damaged container was only available on the vessel.

Obstacles in the transfer of information from one system to another or from one responsible person to another could be detected between the parties involved in loading and between the interfaces of the different stages of the transport chain. In practice, the damages of the container which had been loaded in Poland were only known in the port of loading, i.e. Gdansk, and by the vessel's Chief Officer. In Rotterdam containers were loaded according to the normal practice. Information about the defect container did not reach the persons who were responsible for cargo handling.

Vessels in container traffic typically have a tight schedule and port calls are of short duration. A figure indicating the capacity of the port's cranes to handle units in an hour is considered to be the efficiency indicator in the handling of containers. The discharging and loading of cargo units are based on a plan and the supervision of the measures is random and carried out by the vessel's personnel. The vessel's deck crew participates in the securing of the cargo unit transported on the deck, but not in the placing of cargo or identification of the units. This is a common practice in container traffic.

The loading of the vessel started in Rotterdam at 11.40 on 3 February 2010 and ended the next morning at 06.20. Information on when the detoriated reefer container was loaded is not available. Because the loading took approx. 18 hours, it can be presumed that the persons responsible for the loading have changed during that time and information on the defect container was not transmitted to the responsible persons[13] in the following work shift(s). The systems are not technically linked to each other and the possible restrictions on the containers to be loaded or their placing are based on the information only the vessel's Officer has.

2.3 Alerting and rescue activities and search for the container

After the falling overboard of the containers had been noticed on the vessel, the Master made a notification on the incident. After receiving information on the fallen cargo via the MRCC Turku, the Swedish maritime rescue authorities sent a helicopter to the scene. Both the LINDA and the remains of the broken reefer container in the sea were videotaped from the helicopter. By then the containers containing dangerous cargo had already sunk. Other marine traffic was also warned of the fallen containers.

The Swedish authorities later localized the position where the containers sank. The position is within the Swedish economic water area but not in the territorial waters of Sweden. The investigation does not take a stand on the leaving of the units on sea bottom in the area in question. It is probable that at least part of the dangerous substances in the containers dissolves in the sea as the time passes.

2.4 Effects of weather on the incident

According to the entries in the ship's log, the weather was normal in the southern part of the Baltic Sea considering the time of the year. The swell of sea was not significant, and the vessel did not roll on high accelerations. The metacentric height (GM), which is

[13] The vessel's deck officers and the foremen of the stevedoring company.

based on stability calculations and which was at the required lower limit[14], is also an indication of this. On basis of weather information and the vessel's stability calculations it can be concluded that the weather did not have a significant effect on the incident.

[14] Min GM 0.15m (SOLAS II-1). The GM value describes the vessel's stability with small heeling angles. A large GM value is an indication of the vessel's good stability, but it also causes strong accelerations when the vessel rolls.

3 CONCLUSIONS

On the basis of the observations, the Investigation Commission has come to the following conclusions:

A container, the structure of which has become weak, must be taken out of traffic. This had been done. A deteriorated container which had been taken out of use was loaded on the vessel to be transported to be used for some other purpose.

It was not possible to identify the container, which had been taken out of use and was deteriorated, as there was no marking on it indicating that loading on it was not permitted. The identification of deteriorated container is currently based only on the identification taking place on the basis of the number of the cargo unit.

In Rotterdam three containers with a total weight of 74 tons were loaded on the deteriorated container even though there was in the instructions information about the fact that nothing was to be loaded on the reefer in question. Information did thus not pass between the different actors. Divergences in the cargo information system do not pass automatically from one system to another, and some information must be conveyed directly between the various parties involved.

4 IMPLEMENTED MEASURES

No safety actions that could prevent this kind of incident from reoccurring were brought to the attention of the investigation.

5 SAFETY RECOMMENDATIONS

Marking of cargo units

Transporting a deteriorated container as cargo on a vessel requires that it is marked clearly enough as taken out of use. In addition to the sides and ends of the container, the markings should *also be visible on the Top of the container* in which case it would be possible also for the Crane operator to identify the deteriorated unit.

Thus the SIA recommends to the General Industrial Federation in Finland, that:

1. *it would act in the international development work for standadization in such way that the ISO Standard 6346: 1995 "Freight containers - Coding, identification and marking" woud be changed in way mentioned above.*

Flow of information

The shipping company, the operator and the vessel have different cargo information systems in use, and the information transfer between them is not flawless. The actors must make sure by other means that information on unusual cargoes or cargoes requiring special attention is passed to all parties.

Helsinki, 10 October 2012

Risto Repo Tapani Salmenhaara Ville Grönvall

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Liikenteen turvallisuusviraston lausunto tutkintaselostuksen lopulliseen luonnokseen C1/2010M "M/S LINDA (FIN), neljän kontin putoaminen mereen Itämerellä Gotlannin eteläpuolella 6.2.2010"

Liikenteen turvallisuusvirasto lausuu tutkintaselostuksen lopullisesta luonnoksesta seuraavaa:

Liikenteen turvallisuusvirasto kannattaa Onnettomuustutkintakeskuksen tekemää turvallisuussuositusta koskien ISO-standardin (konttien koodaus, identifiointi ja merkintä) muutosta siten, että vioittuneet kontit merkittäisiin selkeästi käytöstä poistetuksi, tehden merkintä myös kontin päälle.

Tuomas Routa
Ylijohtaja

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