



Report on the investigation into the fire in the engine room  
of  
FERNANDA, IMO No. 7806025  
off the coast of Iceland  
on  
30 October 2013

Commonwealth of Dominica  
Maritime Administration

Office of the Deputy Maritime Administrator  
for Maritime Affairs

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Pursuant to the IMO Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code) Resolution MSC.255(84) the Dominica Maritime Administration, Office of Maritime Affairs has investigated this casualty.

This investigation has been conducted under the authority contained in Section 47 (1) of the Dominica Maritime Regulations 2002 (CDP 102)

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## **GLOSSARY OF ABBREVIATIONS AND ACRONYMS**

Bosun	Deck crew foreman
DP	Designated Person is the link between the ship and company senior management
EPIRB	Electronic Position Indicating Radio Beacon
GT	Gross Tonnage
ISM	International Safety Management
kW	Kilowatt – The measure of power output for shipboard machinery
LOA	Length over All
VDR	Voyage Data Recorder – Maritime version of the airline industry “black box”
VHF	Very High Frequency (radio)
SART	Search and Rescue Transponder
UMS	Unattended Machinery Space



## SYNOPSIS

At approximately 1250 hours (UTC) on 30 October 2013 the Dominica registered refrigerated ro-ro cargo ship FERNANDA suffered a fire in the engine room while off the coast of Iceland.

Both engineering watch keepers were absent from the engine room at the time of the outbreak, the Second Engineer had gone to an engine store on the upper deck to select fuel valves to be re-conditioned and the engineering watch rating was working in the electrical store also on the upper deck. During this time, a fire broke out in the engine room which was initially detected by the second officer via the fire detection panel's visual and audible alarms located on the navigation bridge. The Master arrived shortly thereafter to the bridge upon hearing the alarms. Efforts were made to enter the machinery spaces to determine the location of the fire but they were unsuccessful due to the presence of heavy smoke. Flames were seen on the starboard side of the engine room. The main engine stopped resulting in a blackout as electrical power was being supplied by the shaft generator.

All of the crew were accounted for, the engine room openings were closed and the Master instructed the Chief and Second Engineers to activate the halon fixed fire-fighting system, which initially appeared to suppress the fire. However it soon became apparent to the Master that the fire was gaining ground and he contacted the ship's agent in Iceland and the managers DP in Estonia to brief them on the situation. The ship's agent in turn notified the Icelandic Coastguard who broadcast a MAYDAY RELAY although no MADAY call was made by the ship. The decision by the Icelandic Coastguard to broadcast a MAYDAY RELAY was made following an evaluation using sound professional judgement to facilitate the safety of life at sea in an expedited manner. Consideration was given for the type and degree of the emergency, the locale of the emergency and prevailing weather conditions, and previous experiences conducting search and rescue operations consistent with similar circumstances.

The crew mustered initially on the navigation bridge and later on the boatdeck. Two inflatable liferafts were launched on the port side and one was prepared for launching on the starboard side.

The wind was estimated by the Master to be about 20/25 metres per second, Beaufort force 7/9 with a heavy sea and swell. FERNANDA was approximately 6 miles offshore and was rolling heavily.

The Icelandic Coastguard called the ship requesting information and the Master advised that the situation on board was deteriorating rapidly. It was agreed that a helicopter would be dispatched to airlift the crew from the vessel. It was airborne at 1351 hours. At 1436 hours the evacuation of the crew commenced from the open deck forward of the bridge. All eleven crew members were successfully airlifted from the vessel at approximately 1456 hours. They were landed ashore at Reykjavik, Iceland at 1532 hours.

The Icelandic Coastguard tasked a lifeboat from the Vestmannaeyjar Islands, a tug, and their salvage ship THOR to attend the vessel. Fire-fighting efforts continued overnight until 0230 hours on 31 October 2013 when it was determined that the fire was contained although not fully extinguished.

At 1200 hours on 31 October a number of firefighters from the Icelandic Coastguard boarded the vessel to prepare for towing it to Hafnarfjordur where the vessel was eventually berthed at 0830 hours on 01 November 2013.

While at Hafnarfjordur, as firefighters from Reykjavik were preparing to board, it was decided to open the stern ramp to ventilate the cargo spaces which were smoke logged. This decision was also made in order to facilitate access so that foam could be used to extinguish the fire in the remaining hot spots. The action of opening the stern ramp allowed fresh air to enter the cargo compartments of the vessel and the fire flashed again generating large volumes of smoke. A decision was quickly taken to tow the vessel out to sea to allow the fire to burn out. The stern ramp was in the open position and was subsequently lost to the sea.

The fire continued to burn mainly in the cargo compartments. Heat seeking cameras on THOR confirmed that there were very high temperatures in the lower tween deck and cargo hold. Sea water was directed on to those areas to cool them.

At 0900 hours on 06 November FERNANDA was towed into Grundartangi Port, Iceland where she berthed starboard side to the quay. Fernanda was identified to have a distinct starboard list. An inspection of the entire vessel was undertaken by the Icelandic Police Service.

On 09 November 2013 an inspection of the vessel was conducted by the Flag State Investigator in the company of fire-fighting and investigating officials from Iceland.

On 13 November 2013 the vessel was sold to a metal re-cycling company in Iceland for demolition and de-contamination.

Sea water and all hazardous waste on board was removed and taken to a disposal facility. The remaining fuel oil and sludge was removed and re-cycled.

There were no injuries or fatalities among the crew, the firefighters or the Icelandic Coastguard.

## SECTION I – FACTUAL INFORMATION

### 1.1 PARTICULARS OF FERNANDA

#### Vessel details

Registered Owner	:	Scot Solutions Ltd., Trust Company Complex, Ajeltake Island, Majuro, Marshall Islands
Managers	:	Norfos Shipping Ltd. Parnu mnt. 82 -M5, 10131 Tallinn, Estonia
Port of Registry	:	Portsmouth
Flag	:	Dominica
IMO No.	:	7806025
Type	:	Ro-Ro Refrigerated Cargo Ship
Built	:	1982 at Astilleros de Huelva S.A., Spain
Classification Society	:	Bureau Veritas
Length Overall	:	74.70 metres
Gross Tonnage	:	2576
Engine Power / Type	:	2394 hp/ MAN B&W Alfa Diesel
Service Speed	:	11 knots
Fuel Oil on board	:	66 tonnes (Marine Diesel Oil)
	:	19 tonnes (Gas Oil)
Lube Oil on board	:	2535 litres

#### Incident details

Time and date	:	1250 hours on 30 October 2013
Location	:	Offshore Iceland
Persons on board	:	11
Injuries/Fatalities	:	None
Damage	:	Constructive total loss



FERNANDA arriving at Hafnarfjordur, Iceland showing extensive damage on aft part

## **1.2 Description of vessel and cargo**

FERNANDA is a ro-ro refrigerated cargo ship with two ramps, one on the stern and one on the starboard quarter. Cargo spaces are on three decks, upper tween deck, lower tween deck and cargo hold. Cargo was loaded on pallets and stowed using fork lifts of which the vessel carried three, two diesel driven and one electrically driven. At the time of the casualty she was on a ballast voyage from Tyboron, Denmark to Sandgerdi, Iceland to load a full cargo of frozen fish.

## **1.3 Vessel Certification**

FERNANDA was fully certificated for a vessel of her class and type engaged in worldwide trading. At the time of the casualty all of her certificates were valid and current.

Certificates were issued by Bureau Veritas, as the Recognised Organisation (RO) on behalf of the Commonwealth of Dominica Maritime Administration. The International Safety Management Certificate was issued by the Russian Maritime Register of Shipping as the Recognised Organisation (RO) on behalf of the Commonwealth of Dominica Maritime Administration. Being a vessel of less than 3000 gt, FERNANDA was not equipped with a Voyage Data Recorder (VDR).

## **1.4 SAFETY MANAGEMENT SYSTEM ( SMS)**

### **Certification**

Norfos Shipping Limited (NSL) which manages 5 vessels developed a Safety Management System for FERNANDA to meet the requirements of the International Safety Management Code (ISM Code). NSL holds a Document of Compliance (DOC) issued by the Russian Maritime Register of Shipping (RMRS) acting as a Recognised Organisation on behalf of the Government of the Commonwealth of Dominica. The DOC was issued on 09 April 2010 with validity until 04 April 2015 and is subject to annual verification by the RMRS.

RMRS, acting on behalf of the Government of the Commonwealth of Dominica, also issued a Safety Management Certificate (SMC) to FERNANDA. The SMC was issued on 09 April 2010 with validity until 19 April 2015 and is subject to verification by the RMRS between the second and third anniversary of its issue date and to an annual verification by the Company through an internal audit.

The Designated Person (DP) for FERNANDA, who is the link between the ship and the NSL Senior Management is the company's Fleet Manager. The SMS is written in the Russian language which was the working language on board.

## **1.5 PERSONNEL CERTIFICATION**

The vessel was manned in accordance with the requirements of the Safe Manning Certificate issued by the Dominica Maritime Administration on 28 May 2013. The vessel was not certified for Unattended Machinery Space operation.

### **1.5.1 Deck Officers**

There were two navigational watch-keeping officers on board in addition to the Master who kept the 0800 to 1200 and 2000 to 2400 watches. The Chief Mate kept the 0400 to 0800 and 1600 to 2000 watches and the Second Mate kept the 0000 to 0400 and 1200 to 1600 watches. In addition there were three navigational watch ratings on board.

The Master holds a certificate of competency as Master without limitations issued by the Government of the Russian Federation that is valid until 08 February 2016. He also attended a course in Advanced Fire Fighting in Astrakhan, Russian Federation in March 2011. He had joined the ship 10 months previously but had served on board vessels managed by Norfos Shipping Ltd. for more than 16 months.

The Chief Mate holds a certificate of competency as Chief Mate without limitations issued by the Government of the Russian Federation that is valid until 26 April 2017. He attended a course in Advanced Fire Fighting in Murmansk, Russian Federation in March 2012. He had joined the ship 2 months previously but had served on board vessels managed by Norfos Shipping Ltd. for more than 10 months.

The Second Mate holds a certificate of competency as Officer in charge of a Navigational Watch without limitations issued by the Government of the Russian Federation that is valid until 24 January 2016. He attended a course in Advanced Fire Fighting in Rostov-on-Don, Russian Federation in March 2012. He had joined the ship one week previously but had served on board vessels managed by Norfos Shipping Ltd. for more than 12 months.

All of the deck officers on FERNANDA held appropriate endorsements of their certificates of competency issued by the Commonwealth of Dominica Maritime Administration.

### **1.5.2 Engineering Officers**

There were two engineering watch-keeping officers together with two engineering watch ratings on board. The Chief Engineer kept the 0600 to 1200 and 1800 to 2400 watches and the Second Engineer kept the 0000 to 0600 and 1200 to 1800 watches.

The Chief Engineer holds a certificate of competency as Chief Engineer limited to ships powered by main propulsion machinery of less than 3000 kW issued by the Government of the Republic of Estonia that is valid until 31 December 2016. He had joined the ship 2 months previously but had served on board the ship previously for more than 10 months.

The Second Engineer holds a certificate of competency as Chief Engineer limited to ships powered by main propulsion machinery of less than 3000 kW issued by the Government of the Republic of Estonia that is valid until 07 May 2015. He had joined the ship one week previously but had served on board the ship previously for more than 8 months.

All of the engineering officers on FERNANDA held appropriate endorsements of their certificates of competency issued by the Commonwealth of Dominica Maritime Administration.

### **1.6 NARRATIVE (All times are UTC)**

FERNANDA was nearing the end of her voyage to Sandgerdi, Iceland and the Second Officer was on watch on the navigation bridge.

The Second Engineer and one rating were on watch in the machinery space. At the beginning of his watch, the Second Engineer recorded the machinery parameters in the log book indicating that everything was per normal operations. He then carried out a maintenance procedure on the lube oil purifier. When the task was completed he found the purifier did not start correctly. He went to the messroom to consult with the Chief Engineer who advised him regarding the resolution of the problem.

The Chief Engineer who had been on watch from 0600 – 1200 hours, returned to the machinery space to check the operation of the purifier. He then instructed the Second Engineer to prepare some fuel injectors for the main engine. The Chief Engineer then retired to his cabin for some rest.

The Second Engineer went to the engine room store which is located on the after end of the upper deck close to the machinery space entrance. He tidied up the store room and selected the injectors to be maintained as per the Chief Engineer's instruction.

The engineering watch rating that was on watch with the Second Engineer was working in the Electrician's Store also on the upper deck while the Second Engineer was retrieving the injectors from the engine room store.

The Master was in his cabin attending to administrative matters. At about 1250 hours he heard the alarm from the fire detection panel and immediately went to the navigation bridge. The machinery space and steering room fire detector was illuminated. He tried to reset the detector but could not do so.

The Bosun was on the bridge so the Master instructed him to proceed immediately to the engine room to assess the situation. The Bosun quickly returned and reported heavy smoke in the starboard side of the engine room.

As the Second Engineer returned to the engine room he met the Bosun who said the steering room was on fire. The Second Engineer had not heard the fire alarm. He opened the door to the engine room and noted heavy smoke. At that moment the main engine stopped and there was an electrical power blackout and the emergency lighting came on. He then went to the door on the other side of the engine room and noted that the smoke was not as heavy but the space could not be entered without breathing apparatus.

The Master made an announcement on the public address calling the crew to their fire stations.

The Bosun, together with a deck rating, donned breathing apparatus in order to enter the machinery space to get a better assessment of the conditions inside. They entered from the crew accommodation and immediately saw flames on the starboard side. They returned to the bridge and reported a large fire in the machinery space. The Master ordered the Second Mate to sound the general alarm.

The Second Engineer then went on deck to assist with closing the fire dampers and machinery space ventilation openings and eventually returned to the bridge.

The Master quickly made the decision to utilise the halon fixed fire-fighting system. Once the machinery spaces had been secured and all crew members accounted for he instructed the Chief and Second Engineers to release the halon.

At approximately 1310 hours the Master contacted the Ship Managers in Tallinn, Estonia as well as the ship's agent in Reykjavik, Iceland to brief them on the situation. The ship's agent contacted the Icelandic Coastguard to brief them on the situation as well. The Coastguard in turn contacted the ship and requested information and broadcast a MAYDAY RELAY requesting all vessels in the vicinity to stand by FERNANDA. No MAYDAY message was broadcasted by the ship.

It quickly became clear to the Master that while the halon initially appeared to contain the fire a serious situation was developing in the engine room. The Master advised the Coastguard that the situation on board was deteriorating rapidly and he requested that the crew be evacuated.

By this time, the crew were all on the bridge donning immersion suits and lifejackets. The Master ordered them to prepare the liferafts and two were launched from the port side.

FERNANDA was 6 miles offshore and was rolling heavily in a heavy sea and swell. At 1320 hours the Icelandic Coastguard advised that a rescue helicopter was en route to the ship. The Coastguard also tasked the lifeboat from the Vestmannaeyjar Islands as well as a local tug to proceed to the aid of FERNANDA.

The Master donned an EEBD and went to his cabin to retrieve the crew's official documents which he brought to the bridge.

On his return the bridge was smoke filled and he went first to the bridge wing and then to the open deck where the crew was mustered having launched the two liferafts.

The Second Officer activated the EPIRB, collected the SARTS and the hand held VHF radios from the bridge and brought them to the muster area where the crew awaited the arrival of the rescue helicopter.

One helicopter arrived at 1436 hours and commenced evacuating the crew. The entire crew was evacuated together with the box of official documents at 1456 hours. As the first helicopter departed from the scene a second one arrived. The crew was taken to the Red Cross Station in Reykjavik where they changed their clothes and had a meal before being taken to a hotel.

## **1.7 WEATHER CONDITIONS**

The weather conditions recorded by the Icelandic Coastguard were:

Wind	:	SSE 40/50 knots
Sea	:	Very rough
Wave Height	:	4.2 metres
Swell	:	Heavy
Visibility	:	Good

## **1.8 EVENTS FOLLOWING THE RESCUE**

### **Icelandic Coastguard takes control of FERNANDA**

The Icelandic Coastguard, in accordance with Icelandic Law No. 33/2004, took over control of the vessel soon after the crew was evacuated. Fire-fighting efforts continued throughout the night and at approximately 0230 hours on 31 October 2013 it was determined that the fire had largely died down. There was some residual smoke emanating from the vessel but the temperatures on board had reduced

significantly as determined by the coastguards heat seeking cameras on board THOR. However, due to the rough sea conditions no personnel had been placed on board.

At approximately 1200 hours coastguard personnel were airlifted to FERNANDA to connect a towline between it and the coastguard vessel THOR. Towing to Hafnarfjordhur commenced late in the afternoon of 31 October 2013. FERNANDA was berthed alongside at about 0830 hours on 01 November.

When berthing at Hafnarfjordur the ship landed heavily against the quay which resulted in a marked increase in the smoke coming from the cargo area through the access to the cargo spaces located on the port side aft end of the upper deck. The fire appeared to flash again in the cargo spaces but the smoke died down after approximately 10 to 15 minutes.

The fire appeared to be largely extinguished on arrival of the vessel to Hafnarfjordur, though the extent of the damaged areas could not be ascertained. Firefighters from Reykjavik were preparing their equipment to go on board to extinguish any remaining fire and cool down any hotspots.

Later that morning it was decided to open the stern door to clear smoke from the cargo spaces and to facilitate access to attack the remaining fire with foam. As there was no electrical or hydraulic power available on board it was decided to cut the lifting wires for the stern ramp and allow it to open under gravity. The ingress of air into the cargo spaces caused the fire to flash to a much greater extent than previously which generated large volumes of smoke. The volume of smoke was so great that it was decided that it was necessary to take the vessel back to sea to minimise smoke pollution of the surrounding area and to allow the fire to burn out. The stern door could not be recovered and so it remained in the open position until it was eventually lost to the sea. With the stern door and accesses to the cargo spaces open there was a free flow of air into those spaces resulting in the fire consuming everything flammable in its path.

The crew of THOR directed sea water on to the hull of the vessel to cool it. Eventually on 06 November 2013 with the fire having burnt out and the vessel cooled down FERNANDA was towed into Grundartangi Port where she berthed starboard side to the quay with a 7 degree starboard list.

## **1.9 INSPECTION OF FERNANDA**

On 09 November 2013 an inspection of the vessel was conducted by the Flag State Investigator in company with three firemen with the purpose of identifying the ignition point of the fire and to determine the progress of the fire throughout the entire vessel.

Initially a general inspection of the machinery spaces, cargo spaces, crew accommodation, main deck and forward store followed by the boat deck and navigating bridge was conducted. The vessel was almost completely burnt out with the exception of the steering room and forecastle store. The vessel was partially flooded in the engine room and in the cargo hold. The water in the engine room

extended over the entire compartment. It extended above the floor plates and reached the centreline in the forward part and beyond the centre line in the aft part of the compartment. The water therefore limited the inspection of the machinery space on the starboard side.

A more detailed inspection of the machinery space was then conducted and, as far as could be determined, the fire started in the main switchboard located in the aft part of the main engine room. It quickly spread upwards through open accesses to the funnels. The Chief Engineer reported seeing smoke coming from the top of the starboard funnel when the fire alarm sounded. The fire then seems to have spread to the crew accommodation and navigating bridge and later to the upper tween deck cargo compartment.

The HALON fixed fire-fighting system appears to have been satisfactorily released in the machinery space. Most fire dampers on board were closed by the crew before the release, however there was one fire damper on the aft end of each funnel that was not closed. In addition, there was a hinged access door into the refrigerating plant at the aft end of the cargo hold which was found tied back. This area was not directly affected by the fire but would have provided an air supply to the engine room at the lowest level thereby aiding the development of the fire and reducing the effectiveness of the Halon.

The cargo hold and the ventilation trunks at the forward end of the upper tween deck were found to be corroded so that, although their fire dampers were closed, they may not have been entirely effective. Smoke could be seen emanating from them when the vessel arrived in Havnarfjordur. It should be noted that the fire dampers and trunks were under extreme heat and fire for a prolonged period of time which may have aided the deteriorated condition of the trunks and dampers noted during the post casualty inspection.

The remote closures of the service tanks (in total there were four in the machinery space) were not activated by the crew due to difficulty of access. However, during the inspection the service tank valves appeared to be closed and it seems that little of the contents of the service tanks in the machinery spaces contributed to the fire. In excess of 80 tonnes of oil was recovered from the vessel.

## **1.10 CREW TRAINING AND ON BOARD DRILLS**

Fire Drills were conducted on board at monthly intervals in accordance with an annual drills programme provided by NSL, the most recent being on 26 October 2013, or 4 days before the out-break of the fire.

## **1.11 FIRE DETECTION SYSTEM**

The vessel was equipped with a "Malling type 813" fire detection system with three detector loops comprising 15 smoke detector heads in the engine room, steering room and funnels. In addition there were three detector loops comprising 43 heat detector heads in the crew accommodation and wheelhouse.

The company Malling no longer exists but support for this product is now provided by Deckma GmbH, Germany.

The system was checked at annual surveys by the Surveyor and weekly since then by the ship's crew.

### **1.12 FIXED FIRE-FIGHTING SYSTEM**

The vessel was equipped with a fixed fire-fighting system in the engine room comprised of 4 x 50 kg and 5 x 35 kg cylinders of HALON 1301 installed during the construction of the vessel in 1982. The system was last serviced in accordance with the International Code for Fire Safety Systems (FSS Code) and MSC.1/Circ.1318 in Riga, Latvia on 20 June 2012 by a company certified by the Maritime Administration of Latvia

### **1.13 EMERGENCY FIRE PUMP**

SOLAS requires that in a ship of 1000 gt and upwards, if a fire in any one compartment could put all fire pumps out of action there must be an alternative means of providing water for fire-fighting purposes. FERNANDA, being a vessel of more than 2000 gt, was obliged to be equipped with a fixed emergency fire pump that is independently driven. A diesel driven fire pump was provided on the starboard side of the steering gear room located on the third deck immediately abaft the engine room. There was no direct access from the engine room to the steering gear room.

Access to the steering gear room was from the port funnel casing on the second deck through a fire door and thence through a hatch from which a vertical ladder extended downwards to the forward end of the steering gear room.

The Second Engineer stated that he opened the door to the engine room (the funnel casing on the upper deck) and there was heavy black smoke. He went to the port side and found it also smoke logged such that a breathing apparatus would have been needed to make an entry. Accordingly the emergency fire pump was not accessible due to heavy smoke.

### **1.14 SWITCHBOARD**

The main switchboard which was as fitted during the building of the ship is located on a raised platform at the aft end of the main engine. It is of closed front type, and comprises 7 panels numbered from port to starboard extending over a length of approximately 4 metres. The operating systems are 440V, 3 Ph, 60 Hz. and it is supplied from 3 diesel generators and one shaft generator. The switchboard is open backed and access is open from both sides.

The switchboard was extensively damaged in the fire although it was not possible to identify the cause of the fire. The manufacturers name is not known and following the

fire no manufacturers manual exists. Maintenance of the switchboard consisted of cleaning and checking connection tightening and was last carried out in April 2013.



**Switchboard on FERNANDA**

## **SECTION 2 - ANALYSIS**

### **2.1 OBJECTIVE**

The purpose of the analysis is to determine the cause(s) of the casualty with a view to making recommendations aimed at preventing similar casualties in the future.

### **2.2 SAFETY MANAGEMENT SYSTEM (SMS)**

The Shipboard Emergency Situations Manual (SM- 02) developed by NSL was partially reviewed, in particular Section 8 which deals with “Fire Protection of the Vessel.” Although there were clearly measures in place for the prevention and detection of fires in the machinery spaces, it would be advisable that NSL conduct a thorough review of the relevant portions of their SMS specific to fire detection and prevention to ensure that they remain ship specific and adequate in all fire situations. It would be beneficial for NSL to conduct a fundamental review of this manual to ensure it complies with Section 8 of the ISM Code. Although adequate measures were in place for communication with coastal States and authorities, a review of the procedures for communicating emergencies on board should be conducted to ensure prompt and adequate notification to all interested parties.

The SMS external Audit Reports submitted by RMRS were reviewed for the current cycle of Safety Management Certification. In the report of the renewal audit conducted on 09 April 2010 two major non-conformances were recorded. A major non-conformance would normally result in the withdrawal of the ISM certification for the vessel. However in this case the major non-conformances were subsequently downgraded to non-conformances following immediate action by NSL to address the issues involved. RMRS required an additional shipboard internal SMS audit to be conducted within one month, the results of which were required to be submitted to the RMRS Head Office. Since that time, a new DPA has been appointed and all non-conformities have been closed out.

During the subsequent SMC Intermediate audit conducted by RMRS in April 2013 it was noted that the most recent technical audit conducted by the Company was not conducted within the specified period of 12 months and that the Masters’ reviews of the SMS are not efficient.

Collectively these findings raise concerns about NSL’s commitment to safety management. However, during a Safety Management Certificate renewal audit and Flag State Inspection on board another ship managed by NSL there were 5 observations noted, no non-conformities and no deficiencies which are all positive indications of improved Safety Management and awareness.

### **2.3 FIRE DETECTION**

The vessel was equipped with a Malling Type 813 Fire Detection System. All documentation on board was destroyed in the fire and no duplicate copy of the fire detection system manual was held in the manager’s office.

The system was checked for operational efficiency during statutory surveys, the most recent being in April 2013. Thereafter it was said to have been checked weekly by the ship's crew. The system did give warning of the fire to the display panel on the navigation bridge which alerted the Master to the fire.

#### **2.4 FIXED FIRE-FIGHTING SYSTEM**

The HALON 1301 fixed fire-fighting system appears to have functioned correctly when activated by the Chief and Second Engineers. It was adversely affected by the chimney effect of the open fire dampers in the funnels and the ingress of air to the engine room through the open accesses from the cargo spaces.

#### **2.5 EMERGENCY FIRE PUMP**

The diesel driven emergency fire pump was the sole provider of water for fire-fighting purposes when the main power failed. The Second Engineer stated that he could not reach it in the steering gear room because of heavy smoke.

During the post fire inspection of the vessel at Grundartangi it became clear that the steering gear room could not be entered safely without a breathing apparatus as there was no means of ventilating the space. Two of the firemen in attendance during the inspection agreed to don breathing apparatus. However it was found that they were unable to get through the opening due to its limited size. It became necessary to remove the compressed air bottle harness while remaining on air through the mask in order to gain entry into the space. The compressed air bottle was then passed down so that the harness could be donned again.

Although there were demonstrated difficulties on entering the space after donning fire-fighting equipment, these difficulties are not relevant to the detection, prevention or extinguishment of the fire on board the vessel as the crew did not engaged in fire-fighting activities in this location.

#### **2.6 RAPID DEVELOPMENT OF FIRE**

The fire developed rapidly giving cause for concern to the Master. There were significant variances between the times recorded by the Coastguard and those given by the ship's crew when interviewed, which in the circumstances is understandable. Accordingly, the times given by the Coastguard for the various events have been used where appropriate, otherwise the times have been adjusted to the best possible fit.

It is believed that the fire originated in the electrical switchboard located across the after end of the engine room. No proximate cause could be determined. The fire burned intensely in the switchboard area being fed by air drawn in by the chimney effect of the open funnel fire dampers. The Halon fixed fire-fighting system was activated and the Master believed that it did initially suppress the fire to some extent. However the effectiveness of the Halon was adversely affected by the flow of air through the engine room and the fire continued to grow spreading into the funnel spaces and igniting the oil in the cargo crane hydraulic header tank in the starboard

funnel. Flames were visible at the top of the starboard funnel as the crew prepared to launch the liferafts.

The fire then spread by conduction into the crew accommodation on the upper deck and thence upwards to the crew accommodation on the boat deck and later to the bridge deck, probably after the crew was evacuated. There was considerable smoke in the Master's cabin when he went to retrieve the crew documentation. The fire is then thought to have spread by conduction downwards from the crew accommodation on the upper deck to the upper tween deck entrance where the diesel driven fork lift truck was stowed and secured by chains. It seems that when the diesel driven fork lift caught fire there was an explosion in its fuel tank as the overhead guard bracket was detached from the fork lift truck and was lying still attached by its chain on the deck beside the truck. It appears that the fire was confined to the upper tween deck cargo compartment prior to the arrival of the vessel in Havnarfjordhur on 01 November 2013. There was little or no evidence of smoke emanating from the forward cargo ventilation trunks, but smoke could be seen emanating from the cargo hold access ladder on the port side of the upper deck aft.

The stern door was opened in Havnarfjordhur and the fire immediately flashed and eventually extended to all of the cargo spaces. The cargo compartments burned intensely generating such heat that the upper deck was badly distorted as were the pillars in the upper tween deck. The fire spread by conduction back into the forward starboard side of the engine room from the cargo hold, heating the oil in the service tanks such that their vapours were ignited on deck and they burned for a considerable period of time.

## **2.7 EVACUATION OF CREW**

The rescue of the crew of FERNANDA was conducted in a professional and competent manner by the Icelandic Coastguard in difficult weather conditions.

The Dominica Maritime Administration, Office of Maritime Affairs wishes to record its appreciation for the actions of the Coastguard.

## **2.8 ASSESSMENT OF EVIDENCE IN ENGINE ROOM**

### **2.8.1 Fire Dampers**

Two fire dampers, one on each funnel on the aft side were not closed. It is likely they had a significant effect on the spread of the fire from the switchboard upwards into the funnel casings. Flames were visible from the top of the starboard funnel when the liferafts were being prepared.

The open fire dampers were noted on FERNANDA's arrival in Hafnardsfordhur. The dampers are hinged on the upper side and are maintained in the open position by two bars on each damper attached to the funnels on their lower sides. The only method of closing such dampers is by climbing a series of unprotected rungs attached to the aft end of each funnel to release the bars, close and secure the dampers.

Accessing these fire dampers would have been hazardous at any time as the rungs are not of the same size and are not in one straight line. Given the rapidity of the development of the fire it is likely the rungs and the funnel would quickly have been at a high temperature and in the prevailing sea conditions which, according to the Master caused the vessel to roll heavily, it would have been foolhardy even to attempt to close them. To further complicate matters, on the starboard funnel a cooling fan for the hydraulic oil supply to the aft mooring winches had been fitted between the ladder rungs. ( *See photograph on page 23*)

SOLAS does not contain regulations covering the means of closure of fire dampers except that “ *Means shall be provided ..... for closing .....annular spaces around funnels and other openings to such spaces. And that such means shall be capable of being operated from outside such spaces in the event of fire.*” The methodology for closing these two significant fire dampers was not practicable however is can be considered within regulatory requirements.

### **2.8.2 Remote closure of engine room fuel oil tank valves**

FERNANDA had three fuel oil service tanks and one lube oil service tank in the engine room, each fitted with a valve close to the outlet point of the piping from the tank. The purpose of such valves is to minimise the volume of oil which would be released into a machinery space fire if the oil pipes were to be damaged by fire. Such valves are fitted with a means of remote closure, generally either pneumatic/hydraulic or on older ships by means of a pull wire operated from a location outside of the machinery spaces.

The operating position for the valves on FERNANDA was on the main deck on the starboard side. However the valves were not operated by the crew on this occasion as the control station was said to be impossible to access due to heavy smoke.

During the post fire inspection on board, it appeared that the outlet valves to these tanks were closed. Since that inspection more than 80 tonnes of fuel oil has been recovered from the vessel which indicates that at most 5 tonnes of fuel oil was consumed by the fire.



Fire Dampers on funnels – note the hydraulic oil cooling fan on the starboard funnel

### 2.8.3 Housekeeping

Good housekeeping is an important aspect of effective on-board management of risks, ensuring the crew's wellbeing and safety. During the post-fire inspection of the machinery spaces some examples of poor housekeeping were noted. Oils, oily rags, rubber boots and other garbage were found lying around the machinery spaces. A hose was fitted to the drain from the save-all around the oil purifiers to divert its contents into the engine room bilges.

While it may be a matter of convenience, the random oils, rags and rubber boots present both fire and health hazards. Measures should be taken to ensure that all such materials are kept in a safe, approved stowage away from the machinery spaces and that garbage such as oily rags, rubber boots and gloves, etc. are removed to the garbage stowage area on a daily basis.

Housekeeping issues have been a feature on FERNANDA for a number of years as evidenced by the reports from Port State Control (PSC) and Flag State Inspections (FSI). On 07 May 2012 the Report of a PSC More Detailed Inspection at Sangerdi, Iceland in which only two deficiencies were recorded cited *"Too much Lube and Fuel oil on the tank top in Engine room (Bilge) to be cleaned and pumped ashore"*, which deficiency was to be rectified before departure.

In an FSI on 19 May 2013 the Dominica Inspector noted the following: “*Multiple cooling water and oil leakages noticed on various parts of the port and starboard side auxiliary diesel generators,*” which deficiency was to be rectified within three months.

Housekeeping failures should be detected by the on-board management team, by those conducting internal SMS audits, during statutory and Class surveys and audits, and during Flag State Inspections.

Housekeeping failures were evident in other areas such as the entrances to the lower tween deck and the cargo hold. Many gas cylinders were stowed in these spaces, their contents could not be verified. In addition there were tyres for the forklifts and other garbage. In the air conditioning room there were many cylinders of R-22 gas, electrical motors, cloth materials on the deck and a gasoline can storing fuel for the rescue boat’s outboard engine.



Oil drums, boots and other rubbish in Forward Port Engine room. ( Note open entrance to refrigeration machinery space top right)



Two drums and a parcel of oily rags

#### **2.8.4 Engine Room Bilges**

Oily water from the engine room bilges amounting to one tonne was discharged ashore in Tyboron, Denmark during the vessel's last call there. There is a provision in the port dues for Tyboron whereby two tonnes of oily water may be discharged to shore facilities free of charge.

#### **2.9 PORT STATE CONTROL INSPECTIONS (PSC)**

The most recent PSC inspection was conducted in Loedingen, Norway on 02 April 2013 and there were no recorded deficiencies.

The previous PSC inspection was conducted in Sangerdi, Iceland on 07 May 2012 recording two deficiencies which have been commented upon in paragraph 2.8.3.

#### **2.10 FLAG STATE INSPECTIONS (FSI)**

A Flag State Inspection was conducted at Thyboron, Denmark on 19 May 2013. The findings have been commented upon in 2.8.3. Confirmation was received from the Managers by 23 July 2013 that the deficiency had been rectified. The auxiliary engine in question was not in operation when the fire was detected.

## **2.11 CREW TRAINING AND DRILLS**

Both the Master and Chief Mate had attended Advanced Fire Fighting Courses conducted in accordance with the requirements of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended (STCW Convention). Fire drills were conducted on board at monthly intervals in accordance with the Drills Schedule in the SMS.

However, as all of the ships records perished in the fire the scenarios for the various drills are not known. The planning, conduct and critical assessment of drills is an essential management tool in ensuring that crews can respond adequately and safely to an emergency situation on board. In this case not all of the fire dampers and engine room accesses were closed before the Halon system was activated.

The Annual Drills Schedule only showed that a Fire Drill is to be conducted monthly without giving the Master any guidance with respect to nature of the drills to be conducted and the training elements to be achieved.

Drills on cargo ships are frequently conducted without any specific purpose. The crew muster and go through the motions in order to complete the “drill” as quickly as possible. The emergency fire pump may be operated with two fire hoses connected and BA sets may be donned. Once this has been successfully accomplished it is time to prepare the lifeboat for lowering. Depending on the weather, the lifeboat may be lowered to embarkation deck, the lifeboat engine started and the lifeboat recovered to its stowed position. At this point it is “mission accomplished” and the important log book entry can be made.

However, the drill described above had no specific purpose. To improve the crew’s abilities to respond to an emergency situation it is necessary to rehearse it in a drill. For example, the drill might merely be a rehearsal for closing down all engine room fire dampers and accesses, to determine how long such an exercise might take, to learn how many engine room dampers and accesses there are on board and how many seafarers are needed to participate in this activity to accomplish it in a reasonable period of time. To achieve this aim the drill should be planned in advance utilising all of the crew. It should be executed and timed and on completion it should be reviewed to determine if it could be improved. The checklist in the Emergency Procedures Manual should be reviewed to confirm it accurately lists the tasks which have to be performed and it should be revised as necessary. Such a rehearsal on board FERNANDA might have resulted in the difficulties in closing the fire dampers at the top of both funnels being recognised and the arrangements modified so that they could be closed from deck level. It might also have prompted the Master to send out a MAYDAY message.

## **2.12 FATIGUE, DRUGS AND ALCOHOL**

There is no evidence that fatigue, drugs or alcohol played any part in this incident.

## **SECTION 3 – CONCLUSIONS**

### **3.1 SAFETY ISSUES CONTRIBUTING TO THE FIRE**

#### **3.1.1 Fire dampers and open engine room accesses**

Two fire dampers, one at the upper extremity of each funnel, and one access to the refrigeration machinery space on the tank top level were left open when the engine room was being closed down in preparation for the operation of the HALON fixed fire-fighting system. This is thought to have contributed to the development of the fire in the early stages of the event by allowing air to be drawn into the engine room. This also reduced the effectiveness of the HALON fixed fire-fighting system when it was operated. Two other accesses from the cargo spaces to the companionway from the crew accommodation are thought to have contributed to the spread of fire to the cargo spaces.

#### **3.1.2 Housekeeping**

Housekeeping issues resulting in oil drums, oily rags and other garbage in the engine room may have contributed to the development of the fire based on the history of housekeeping issues during inspections as well as evidence observed in areas of the engine room unaffected by fire during the post fire inspection.

It should be noted that maintenance work was underway at the time of outbreak of the fire and general housekeeping may have been affected by the items being used during this maintenance. It should also be noted that the general housekeeping found on board the vessel was following a number of days of ongoing fire as well as heavy seas. It is not thought that housekeeping conditions on board the vessel were the cause of the fire or the result of the total loss of the vessel.

#### **3.1.3 Location of the emergency fire pump**

The location of the emergency fire pump in the steering gear room rendered it unusable due to the presence of heavy smoke in the access to the steering gear room. The access hatch was too small to enter the space wearing breathing apparatus however no attempt to enter the space was made with breathing apparatus donned.

## **SECTION 4 – ACTION TAKEN**

### **4.1 DOMINICA MARITIME ADMINISTRATION (DMA)**

The DMA has issued a Safety Circular publicising the details of this fire and highlighting the need to maintain high housekeeping standards in machinery spaces, particularly in the engine room. Statutory drills should be planned to achieve specific objectives such as closing down all accesses to the engine room or removing a casualty from the engine room and at the conclusion of the drill its progress should be reviewed to highlight what went well and identify what could have been improved.

## **SECTION 5 - RECOMMENDATIONS**

**5.1** **Dominica Maritime Administration** is recommended to issue a Safety Circular:

- publicising the details of this fire, highlighting the need to maintain high housekeeping standards in machinery spaces, particularly in the engine room;
- recommending that statutory drills are planned to achieve specific objectives such as closing down all accesses to the engine room or removing a casualty from the engine room; and
- recommending that at the conclusion of each drill its progress should be reviewed to highlight what went well and identify what could have been improved.

**5.2** **Norfos Shipping Limited** is recommended to:

- inspect each Dominica registered ship under its management to ensure that housekeeping standards are satisfactory, particularly in the engine rooms;
- review the SMS to ensure it fulfils all of the requirements of the ISM Code;
- provide comprehensive guidance to Masters on the conduct of realistic training drills with specific objectives; and
- issue guidance on the maintenance of a register of gas cylinders on board and their control.

## **SECTION 6 - COMMENTS ON THE DRAFT REPORT**

**6.1** The draft report was sent to the following persons/organizations for their comments:

The Master, FERNANDA;  
The Chief Engineer, FERNANDA;  
The Fleet Manager, Norfos Shipping Ltd. Talinn, Estonia;  
The Operations Director, Icelandic Coastguard; and  
The Icelandic Maritime Casualty Investigation Service.

**6.2** Submissions were received from Norfos Shipping Ltd. and the Icelandic Coast Guard and, where considered appropriate, they have been incorporated into the report.



