Preliminary Inquiry No.1 of 2005

Report of Investigation into the Engine Room Fire on Board M.V. “Fleet Trader 1” Causing One Fatality on 24 March 2005

The Hong Kong Special Administrative Region
Marine Department
Marine Accident Investigation Section

Preliminary Inquiry No. 1 of 2005

In accordance with Section 51(1) of the Merchant Shipping Ordinance (Chapter 281), on 29 March 2005, the Director of Marine appointed Mr. KWAN Kan-fat, Surveyor of Ships (Engineer and Ship), to carry out a Preliminary Inquiry into the circumstances attending the casualty.

Purpose of Investigation

This incident is investigated, and published in accordance with the IMO Code for the Investigation of Marine Casualties and Incidents promulgated under IMO Assembly Resolution A.849(20). The purpose of this investigation conducted by the Marine Accident Investigation and Shipping Security Policy Branch (MAISSPB) of Marine Department is to determine the circumstances and the causes of the incident with the aim of improving the safety of life at sea and avoiding similar incident in future.

The conclusions drawn in this report aim to identify the different factors contributing to the incident. They are not intended to apportion blame or liability towards any particular organization or individual except so far as necessary to achieve the said purpose.

The MAISSPB has no involvement in any prosecution or disciplinary action that may be taken by the Marine Department resulting from this incident.

Contents

1 Summary

1.1 At 1150 local time on 24 March 2005, a fire broke out in the engine room of the Hong Kong registered bulk carrier "*Fleet Trader 1*", when en route from Tenerife to Lagos. The fire spread into part of the accommodation around the engine room areas resulting in the death of the Third Engineer. The incident caused substantial damage to the engine room and the accommodation space.

1.2 The investigation revealed that the fire was caused by overflowing fuel oil from the boiler fuel oil tank which came into contact with the main engine hot exhaust gas manifold and ignited.

1.3 Contributing to the cause of the fire was that the filling valve for the boiler fuel oil tank was wrongly opened by the Junior Engineer. This mistake was unfortunately compounded with two major defects on the boiler fuel oil tank system. Firstly, the boiler F.O. return line to the boiler fuel oil tank had been modified leaving behind an opening on the top of the boiler fuel oil tank. Secondly, the overflow line from the boiler fuel oil tank was blocked with rusty debris. As a result, excess fuel oil overflowed out from the opening at the top of the tank to come into contact with the hot exhaust trunk.

2 Sources of Evidences

2.1 The following witnesses of m.v. "*Fleet Trader 1*" were interviewed and their statements were recorded:

i) The Master;

ii) Chief Engineer;

iii) Second Engineer; and

iv) Junior Engineer.

2.2 Ship's records, drawings and plans provided by the Fleet Management Limited.

2.3 Information provided by Nippon Kaiji Kyokai (N.K.K.).

3 Description of the Vessel and the Fuel Oil Transfer System

3.1 Particular of m.v. "*Fleet Trader 1*"

Port of Registry:	Hong Kong
IMO No.:	8126123
Official No.:	HK-0676
Call Sign:	VRWY2
Type of Ship:	Bulk/Lumber Carrier
Year Built:	1981
Name of Builder:	Watanabe Shipbuilding Co., Ltd.
Ship Manager:	Fleet Management Limited
Classification Society:	Nippon Kaiji Kyokai
Length:	142.30 metres
Breadth:	24.00 metres
Moulded Depth:	13.20 metres
Gross Tonnage:	12,909
Main Engine:	MHI Kobe Sulzer 6RLA56
No. of Crew:	20

Fig. 1: "*Fleet Trader 1"* was towed to Lagos after the fire.

3.2 Description of "*Fleet Trader 1"*

3.2.1 "*Fleet Trader 1*" (refer to "the Vessel" hereafter) is a four-hold bulk/lumber carrier built in 1981 by Watanabe Shipbuilding Co., Ltd. in Japan. The vessel is powered by a six-cylinder marine diesel engine, Sulzer 6RLA56, having a common exhaust manifold and one set of turbocharger, capable of developing engine power of 5,917kW.

3.2.2 At the time of the incident, the Vessel was owned by the Fleet Trade Limited and managed by the Fleet Management Limited of Hong Kong under voyage charter of the Transammonia in Switzerland. The Vessel was manned mainly by Indian crewmemebers with a Russian Second Engineer and a Filipino Third Officer.

3.3 The fuel transfer system

3.3.1 Fig. 2 shows a simplified diagram of the fuel oil transfer system on board the Vessel. The Vessel operated on two kinds of fuel, heavy fuel oil and diesel oil. The heavy fuel was delivered from the F.O. double bottom tanks to the F.O. settling tank and boiler F.O. tank by the F.O. transfer pump. The F.O. settling tank was required to be topped up every watch while the boiler F.O. tank was only to be topped up in port. On the other hand, the diesel fuel was delivered from the D.O. double bottom tanks to the incinerator F.O. tank and D.O. settling tank by the D.O. transfer pump. There was a crossover valve fitted between the delivery lines of both pumps to connect the heavy fuel and diesel oil systems.

3.3.2 All the F.O. tanks and D.O. tanks including the boiler F.O. tank were fitted with an overflow pipe, which acted as a protection device to allow excess heavy fuel oil and diesel oil to overflow back to the designated double bottom tanks of the Vessel.

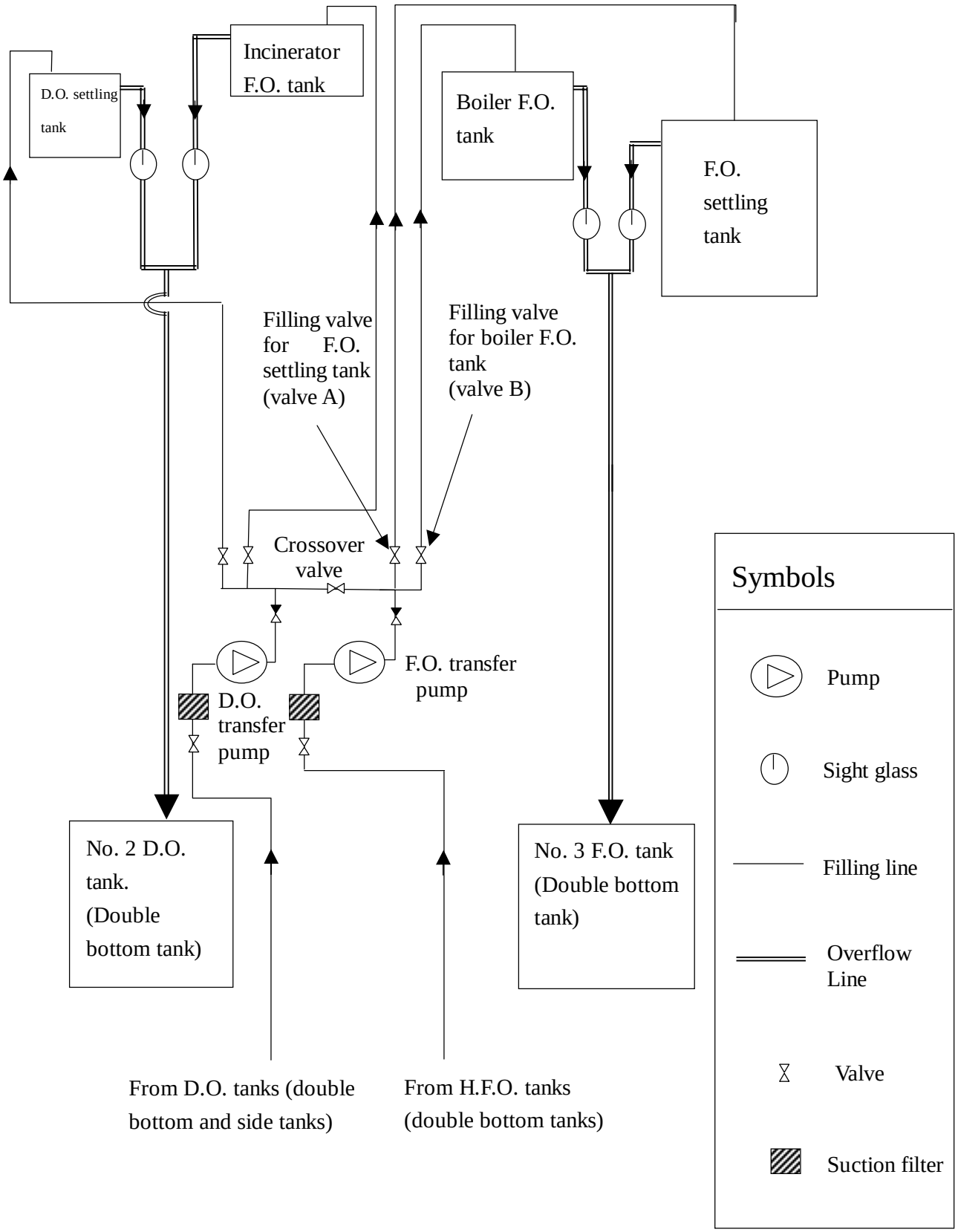

Fig 2: Simplified diagram of fuel oil transfer system

3.3.3 The starter panel (see fig. 3) of the fuel oil transfer pump is located in the engine control room with a selection switch on either manual or automatic mode for starting and stopping of the fuel oil transfer pump.

Fig 3: Starter panel for fuel oil transfer pump.

4. Outline of Events

(All "times" shown in this report is local zone time unless otherwise stated)

4.1 The Vessel upon completion of loading of fertilizer at the port of Muuga, Estonia on 8 March 2005, departed for Tenerife, Las Palmas for taking bunker and replacement of crew. On 19 March 2005, the Vessel arrived at Tenerife. After receiving bunker and changing of crew, the Vessel departed for Lagos on 20 March 2005.

4.2 At about 1000 on 24 March 2005, the Junior Engineer shut off the valve A[1] of the filling line of the fuel oil settling tank for cleaning up the filter of the fuel oil transfer pump. After he had completed the cleaning work, he was supposed to open the valve A back to normal status. However, instead of opening the valve A, he had mistakenly opened the valve B[1], which was adjacent to valve A. The valve B was used for filling up the boiler fuel oil tank, but not for fuel oil settling tank.

Fig. 4: Filling valves for F.O. settling and boiler fuel oil tanks.

4.3 At about 1145, the Third Engineer entered the engine room taking over the engine watch, he met the Junior Engineer in the engine control

[1] For valve A and valve B, please refer figs. 2 and 4 for easy reference.

room. Nearly at the same time, the Junior Engineer started the fuel oil transfer pump in the control room to top up the fuel oil settling tank.

4.4 Shortly after the pump was started, the Junior Engineer saw through the window of the control room that some oil in black colour was dripping onto the turbocharger casing. He tried to inform the Chief Engineer by telephone but the line was busy, so he asked the wiper to go up to seek assistance from the Chief Engineer. Later on the Junior Engineer and the Third Engineer found that the dripped oil was ignited and caught fire. The Junior Engineer immediately stopped the main engine by using the emergency stop in the engine control panel before leaving the engine room. Dense smoke generated from the fire soon filled up the engine room and the accommodation at upper deck level.

4.5 The Second Engineer noted that the main engine was stopped and he rushed down to the engine room. Prior to opening the engine room door, he heard an explosion and afterwards saw dense smoke coming out from the engine room. Realising a fire had broken out in the engine room, he ran up to the bridge to inform the Master of the situation.

4.6 When the Master noted the smoke and fire emitting from both the skylight and the funnel, he raised the fire alarm on the bridge. At about 1200, distress alerts via IMMARSAT, MF/HF and VHF were activated.

4.7 After acknowledging the fire alarm, the crew mustered on the boat decks at both sides of the Vessel immediately. Head count was taken and the Third Engineer was found missing.

4.8 The Chief Engineer closed all fire dampers including the engine room blower flaps, skylight, funnel flaps, accommodation ventilation fire dampers to prevent further spreading of the fire.

4.9 As the fire grew in the engine room, the crewmembers attempted to shut off the fuel oil supply to the engine room machinery from the emergency station in the accommodation on upper deck. However, they could not get access into the emergency station due to the dense smoke in the accommodation areas.

4.10 The fire went out of control as the diesel generators and the fuel oil transfer pump were not able to be stopped. Also the crewmembers could not use any fire hoses to extinguish the fire as the storage areas of fireman outfits and the emergency fire pump were engulfed with dense

smoke. They could only use water buckets to bail up seawater for boundary cooling.

4.11 At about 1410, the container vessel m.v. "*Clara Maersk*" and chemical tanker m.t. "*Etoile Lava*" arrived at the scene to render assistance. The crew of m.v. "*Clara Maersk*" gave two sets of fireman outfits with spare air bottles and some fire hoses to the crewmembers of the Vessel.

4.12 At about 1430, the Junior Engineer and the Fitter managed to enter into the emergency fire station in the accommodation on upper deck with the fireman outfit and successfully stopped the diesel generators and the fuel oil transfer pump. They then proceeded to the steering gear flat to start the emergency fire pump.

4.13 After the emergency fire pump was started, the Chief Engineer and the Fitter entered the steering gear flat to operate the fire fighting foam system to the engine room, the foam was injected to the tank top and various machinery spaces. However, the valve spindle of the distribution foam valve to the boiler space was broken while the valve was being opened. As a result, the injected foam could not reach the boiler space.

4.14 At about 1700, the temperature of the engine room bulkheads were lowered and the smoke inside the accommodation of the upper deck was largely reduced. The Fitter opened the engine room door next to the crew's smoking room and discovered the dead body of the Third Engineer inside the engine room near the entrance door.

4.15 On 25 March 2005, a bulk carrier m.v. "*Spar Neptun*" managed also by Fleet Management Limited arrived at the scene. The body of the Third Engineer and his belongings were transferred from the Vessel to m.v. "*Spar Neptun*" for Tenerife. The body was finally sent to his place of domicile via Tenerife.

4.16 On 28 March 2005, a tug boat m.v. "*Vigilant*" arrived at the scene and started to tow the Vessel. On 1 April 2005, another tug boat m.v. "*Dominant*" joined the towing operation. The Vessel arrived at Lagos on 17 April 2005 and anchored there for further instructions.

5. Analysis of Evidences

5.1 The investigating officer boarded the vessel on 20 April 2005 whilst the Vessel was at anchor in the port of Lagos awaiting discharging cargo (see fig 5). A site inspection was conducted and the witnesses were interviewed for the investigation.

Fig 5: Appearance of the accommodation area of the Vessel after the incident.

5.2 The main engine exhaust trunk

5.2.1. The main engine exhaust trunk ran up from the main engine turbocharger to the auxiliary boiler intake at poop deck level. The exhaust trunk was wrapped by insulation fibers and protected by steel metal cover. Part of the exhaust trunk was located underneath the boiler fuel oil tank.

5.3 The boiler fuel oil tank

5.3.1. The boiler fuel oil tank (See fig. 6) had a capacity of 1.2 m^3. Mounted on the top of the boiler fuel oil tank were the inlet pipe from fuel oil transfer pump and diesel oil transfer pump, inlet pipe from purifiers, float gauge and air vent. There should be a boiler F.O. return pipe fitted to the top of the boiler fuel oil tank. However

the pipe was not in place leaving only the opened flange on top of the boiler fuel oil tank. An overflow pipe was connected to side shell of the tank. Diesel oil was normally used as fuel for the boiler, the tank was said to contain about 600 litres of diesel oil before the incident.

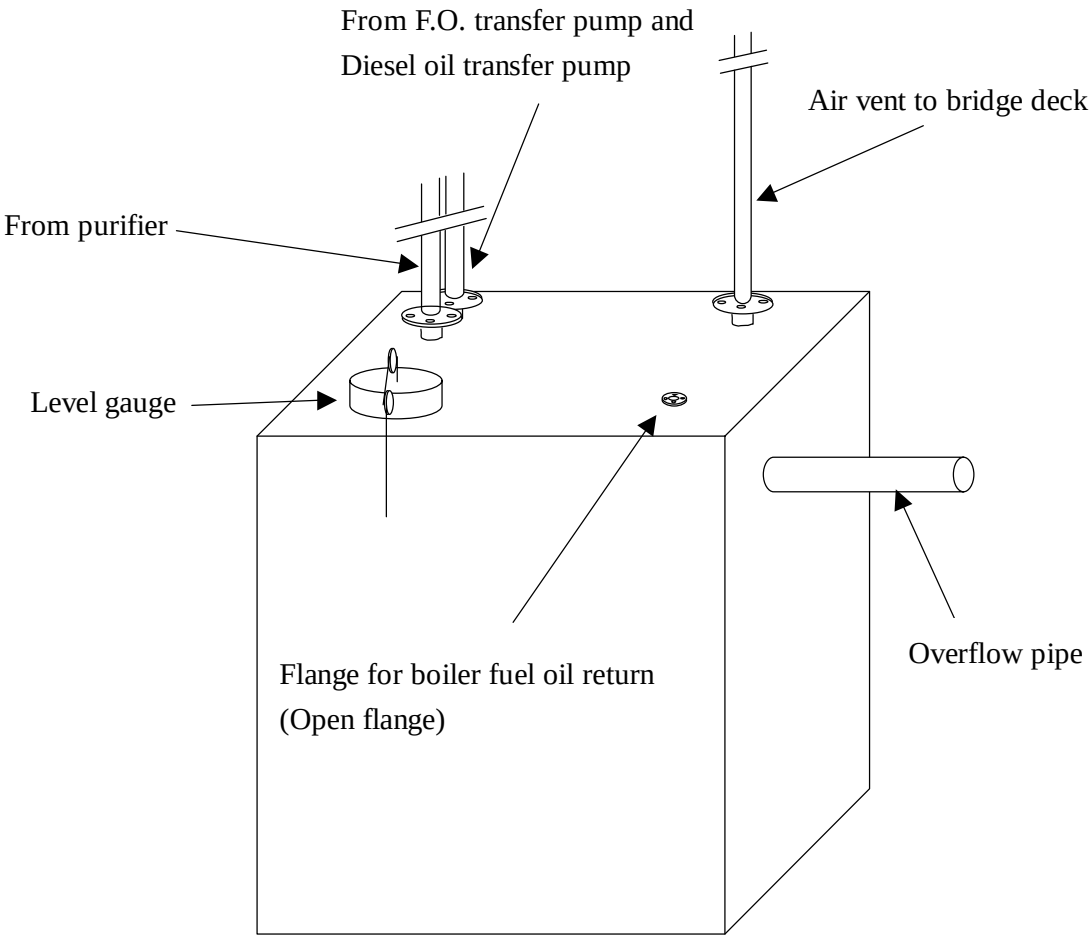

Fig. 6: Sketch of the boiler fuel oil tank

5.4 The filling operation

5.4.1. The fuel oil settling tank could be filled up by either manual or automatic operations. For automatic operation, the fuel oil transfer pump would be started and stopped by means of level switches. The pump would be started when the capacity of the fuel oil

settling tank fell below 5.3m$^{3.}$ The pump would be stopped when the capacity reached 7.2m^3. According to the records from the engine logbook, all the watch-keeping engineers usually used the manual operation for transfer of fuel oil to the fuel oil settling tank. The valve was left open all the time as the watch-keeping engineer could simply switch on the pump to fill up the tank whenever necessary.

5.4.2. The boiler fuel oil tank could only be filled up manually by the fuel oil or the diesel oil transfer pump. As the ship was fitted with economizer, boiler was not required at sea therefore the filling valve of the boiler fuel oil tank was normally shut.

5.4.3. At about 1000 on 24 March 2005, a mistake was made by the Junior Engineer. He opened the wrong valve after cleaning the filter of the fuel oil transfer pump. As a result, the boiler fuel oil tank was filled up instead of the fuel oil settling tank. When the boiler fuel oil tank was full, the fuel oil came out from the opening at top of the boiler fuel oil tank and ran down onto the hot exhaust trunk which ignited the fuel (see fig 7).

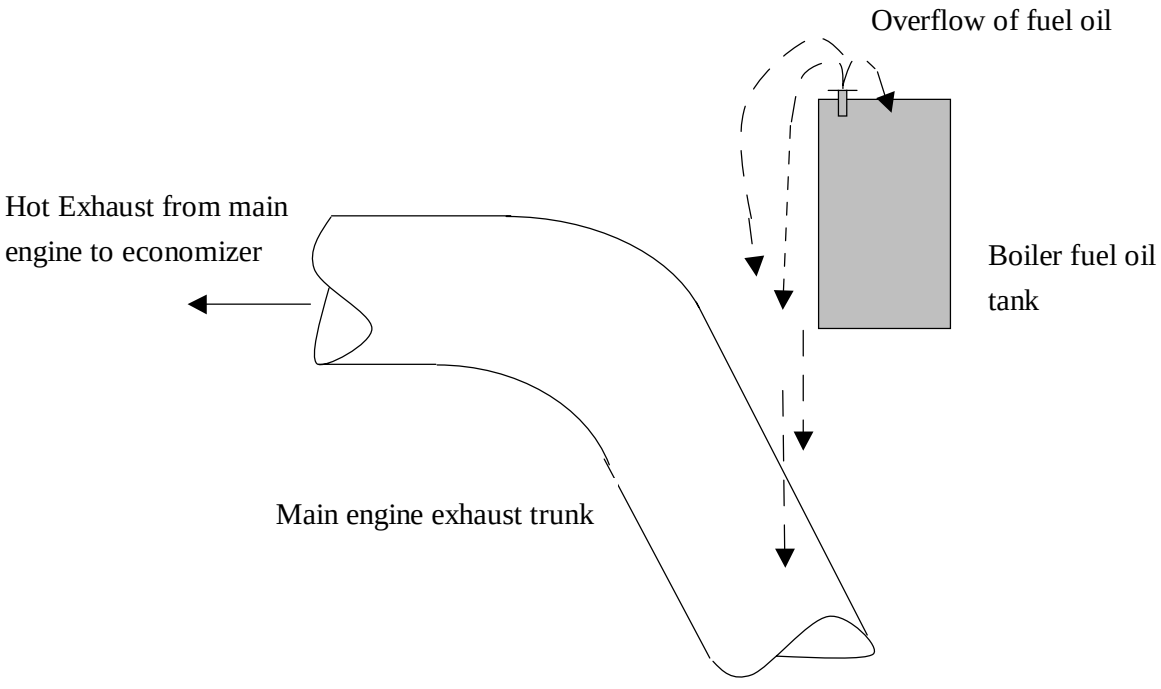

Fig.7: Scene of the incident

5.5 Sign of oil leakage

5.5.1. During inspection, signs of unburned and hardened heavy fuel was found on the top of the boiler fuel oil tank (see fig. 8), main engine exhaust trunk, main engine cylinder platform (see fig. 9) and its turbocharger. The trace indicated that oil leakage originated from the top of the boiler fuel oil tank and dropped down to the main engine cylinder platform.

Fig 8: Sign of fuel oil leakage from the top of the boiler fuel oil

Fig 9: Top of main engine coated with heavy fuel oil.

5.5.2. A fuel oil return line was fitted at the fuel oil burning system of the boiler to allow circulating fuel oil to return back to the boiler fuel oil tank. However, this return line had been modified. The length of the boiler return line at the top of the boiler F.O. tank was removed from the original 15 mm nominal diameter flange and connected to the air pipe of the tank. The ship's engineers did not know the purpose of such modification as it had been done a long time ago. However, the original flange opening was not covered and left open to the atmosphere. (See fig. 10)

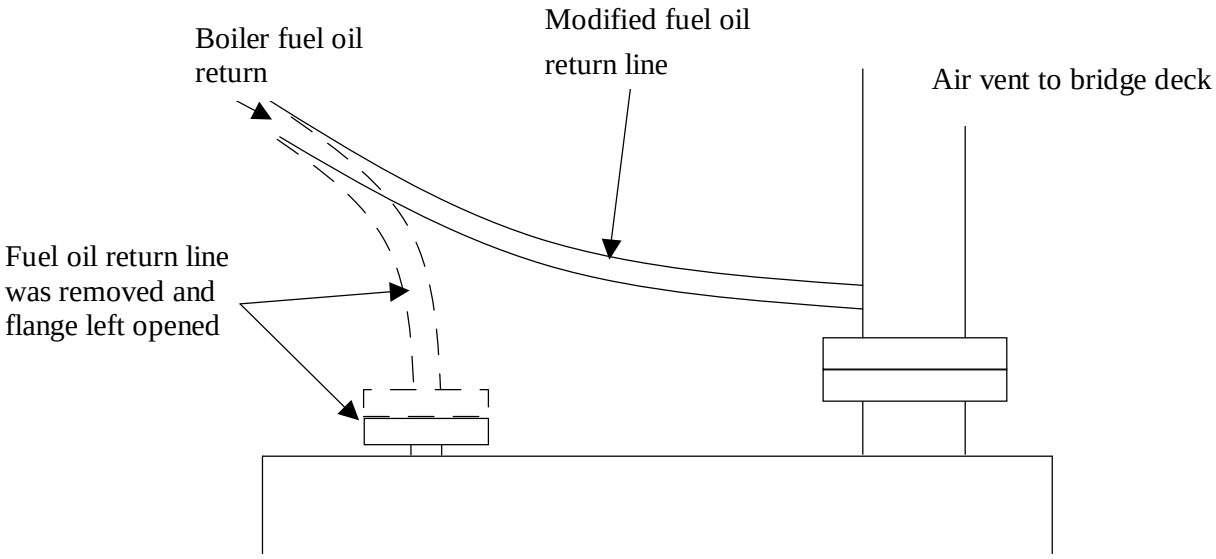

Fig. 10: The modification of boiler fuel oil return line

5.5.3. According to the survey records provided by NKK, the boiler fuel oil tank was last inspected by NKK as part of the CSM (continuous survey of machinery) in December 2002. There were no records to show the modification which left an opening on the top of the boiler fuel oil tank, it appeared that the return line had been modified without the approval of the authorized body.

5.5.4. An overflow line was fitted at the starboard side of the boiler fuel oil tank. The overflow line would allow excess fuel oil to be drained to the No. 3 double bottom fuel oil tank. The overflow line was opened up during the inspection and found blocked with rusty debris at the horizontal section above the purifier space. Under the circumstances, the excess fuel oil would not be able to drain back via the overflow line to the No.3 double bottom fuel oil tank but spilled out from the opened flange at top of the boiler fuel oil tank.

5.6 Damage due to the fire

5.6.1. Engine room

The upper part of the engine room was found badly burnt and darkened by carbon deposits from the level of main engine cylinder platform to the funnel top. Apparently, such damages were caused by the intense heat generated from the fire occurred down in the engine room. (See figs.11 to 14)

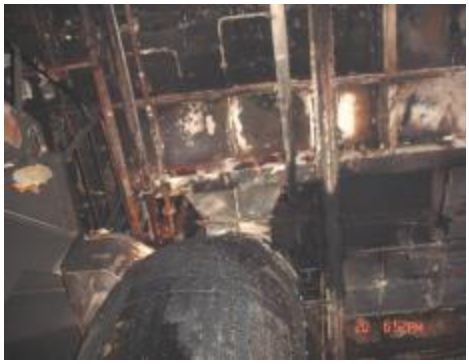

Fig. 11: The top of engine room was badly burnt.

Fig.12: Metal shielding for exhaust M/E exhaust truck deformed and detached.

Fig. 13: Shoes of the Third Engineer was burnt, steel toecap remained on the floor.

Fig.14: Engine room door at poop deck was badly burnt.

5.6.2. Accommodation spaces

The intense heat transmitted through the bulkheads might have ignited the adjacent painted surfaces and the attached furnishings in the accommodation (see figs. 15 & 16). The safety equipment locker containing the fireman outfit and the SCBA sets was damaged by the fire (see figs 17 & 18). As this safety equipment locker was located adjacent to the engine room bulkhead, it is believed that during the outbreak of fire, smoke propagated to the storage space, deterring crewmembers from entering the space to fetch the fire fighting equipment. Furthermore, during the initial stage of the fire, the steering gear room in which another set of fireman outfit and the associated equipment, emergency fire pump and foam fire fighting system were located, had also been covered with smoke, thus the crewmembers were not able to get access to the emergency stations in the steering gear room. It is therefore apparent that after the onset of the fire in the engine room, the fire went out of control as the fire fighting appliances used for fighting the fire were out of reach by the crewmembers due to the presence of smoke.

Fig. 15: The roof of the officer's smoking room .

Fig. 16: The light cover was melted by the intense heat.

Fig. 17: Fireman outfit was damaged by the heat.

Fig. 18: Equipment in the safety locker were damaged.

5.7 Doors to engine room and steering gear flat

5.7.1. There were three fire doors for getting access to the engine room. Two were located at the upper deck level and the other one located at the poop deck level. The fire door located in the accommodation at the port side of the upper deck level was found seriously darkened by the fire and the smoke. According to the Junior Engineer, he had used this door during his escape. Inspection found that the door was equipped with a self closing device (see fig. 19). However, the setting of the self closing device appeared to have not been properly adjusted making the complete closure of the door difficult. Furthermore, a slightly bent padlock ring was found on the door frame which had prevented the door from closing completely (see fig. 20). In the incident, most of the ceiling light covers adjacent to this door were destroyed by the heat of the fire. Evidence therefore suggested that the alleyway of the upper deck had been filled with smoke, probably because the door at the port side of the upper deck had not been properly closed due to the aforementioned defects. Eventually, the vicinity of the emergency stop switch fitted adjacent to the fire door was engulfed with smoke and nobody could get access there to operate the emergency stop switch to deal with the fire. There was no abnormality found on the other two engine room doors.

Fig. 19: The connections of the door self closing device was detached.

Fig. 20: The ring obstructed the closure of the door.

5.7.2. According to the information provided by the crew, the door leading to the steering gear flat had been kept open either by ropes or by drums during the fire (see figs. 21 & 22). The space would thus be filled up with smoke propagating from the engine room. The Second Engineer stated that the steering room door was left open for the sake of convenience. It is apparent that the fire fighting equipment there could not be used in the incident and had caused the fire to become out of control.

Fig. 21: Ropes used for securing the steering gear room door.

Fig. 22: Drum for keep the steering gear room door open.

5.8 Fixed fire extinguishing system

5.8.1. The Vessel was equipped with expansion foam system which was propelled by the emergency fire pump. After additional fire fighting appliances were sent from other vessel, the Chief Engineer attempted to start the foam system to extinguish the fire. However, the valve spindle of a discharge valve leading to the boiler space was broken (fig. 23) during the operation and the foam could not be injected to the boiler space.

5.8.2. During inspection to the spindle, signs of solder welding repair was observed at the parted section of the spindle. It appeared that welding repair had been carried out to the spindle by the ship's crew. As the valve spindle is designed to withstand high torsion during operation, welding should not be considered as a proper repair method for a broken spindle.

5.8.3. According to the survey records of N.K.K., last safety equipment survey was carried out on 2 March 2005. Apparently, the welding repair on the valve spindle was not detected during such survey.

Fig. 23: The valve for the injection of foam liquid to the boiler space was broken during operation.

5.9 Certification and training of Ship's staff

5.9.1. The Master had joined the Vessel for more than three months, he held an UK class 1 deck officer certificate of competency issued on 28 May 2002. He had been working on various types of vessels since 1989.

5.9.2. The Chief Engineer had joined the vessel for about six months, he held an Indian class 1 motor certificate of competency issued on 25 July 2001. Prior to joining the Vessel, he had been working as Second Engineer for about 6 years.

5.9.3. The Third Engineer had joined the vessel on 19 March 2005, i.e. only five days before the incident. He held an Indian class 2 motor certificate of competence issued on 27 January 2005.

5.9.4. The Junior Engineer had joined the vessel since 15 December 2004, he held an UK class 3 motor certificate of competency issued on 8 December 2003, he had about 3 months experience on sea service in the capacity as an engineer officer.

5.9.5. All the ship's officers held valid and appropriate documentation including licenses issued by Hong Kong Marine Department. They had all received familiarization training upon joining the vessel.

5.9.6. Drills and exercises for fire fighting and other emergencies had been carried out regularly. Last fire drill was carried out on 7 March 2005.

6. Conclusions

6.1 An engine room fire occurred on board m.v. "*Fleet Trader 1*" on 24 March 2005 while she was en route from Tenerife to Lagos. The fire resulted in the death of the Third Engineer and serious damage to the Vessel. It was probable that when the Third Engineer tried to escape the fire from the engine room, he was overcome by the heat and dense smoke.

6.2 The investigation revealed that the fire was probably caused by the overflow of heavy fuel oil from the boiler fuel oil tank, which was ignited when coming into contact with the hot main engine exhaust gas manifold.

6.3 Contributing to the cause of the fire was that the filling valve for the boiler fuel oil tank was wrongly opened after the Junior Engineer finished work on the fuel oil transfer system. This mistake was unfortunately compounded with two major defects on the boiler fuel oil tank system. Firstly, the boiler F.O. return line to the boiler fuel oil tank had been modified for some unknown reasons by connecting to the vent pipe leaving behind an opening on the top of the boiler fuel oil tank. Secondly, the overflow line from the boiler fuel oil tank was blocked with rusty debris. As a result, any excess fuel oil could not be drained through the overflow line but flow out from the opening at the top of the tank to come into contact with the hot exhaust trunk.

6.4 The investigation has also identified the following factors that had contributed to the spread of the fire:

i) The engine room door at the upper deck failed to close properly during the fire due to the defective self-closing device and the bent padlock ring, thus allowed the spread of smoke into the accommodation spaces. The smoke further spread into the steering gear room due to its entrance door being kept open. The passage of smoke thus prohibited crewmembers to gain access to the emergency stations in the accommodation space and steering gear room to use the fire fighting equipment to tackle the fire.

ii) When the Chief Engineer went to start the foam system, the spindle to the controlling valve for the boiler space was broken due to improper repair rendering the foam system to the boiler space inoperable.

7. Recommendations

7.1 The causes of this accident have been established in the Preliminary Inquiry. A Marine Court into the accident is not considered necessary.

7.2 A Marine Shipping Information Note (MSIN) should be issued to draw the attentions of all concerned parties to the lessons learnt in the incident.

7.3 A copy of this Report is to be forwarded to the ship owner and ship manager informing them the findings in the investigation and reminding them:

i) No modification of the fuel oil system should be made without prior approval from Flag Administration or Classification Society;

ii) the pipe works should be properly maintained for the intended services;

iii) proper oil transfer procedures should be followed on board;

iv) no doors should be kept open by preventing proper function of the self closing devices; and

v) highly stressed components such as valve spindles of fire fighting system should not be normally repaired by welding. Such components should be replaced by spares.

7.4 A copy of this Report is also to be forwarded to Nippon Kaiji Kyokai informing them the findings of the accident.

8. Submissions

8.1 In the event that the conduct of any person or organization is criticized in a casualty investigation report, it is the policy of the Hong Kong Marine Department that a copy of the draft report is given to that person or organization so that they have the opportunity to rebut the criticism or offer evidence not previously available to the investigating officer.

8.2 The draft report (without recommendations) was forwarded to the followings:

Fleet Management Limited.
The Master of m.v. "***Fleet Trader 1***"
Nippon Kaiji Kyokai

8.3 A submission on the report was received from Fleet Management Limited concerning clarification on the following issues:

i) The rank of the Junior Engineer;

ii) Condition of the boiler fuel oil tank overflow pipe;

iii) Open flange might be plugged;

iv) Name of the vessel for assistance; and

v) Condition of the engine room fire door.

8.4 No submission was received from the Master of m.v. "***Fleet Trader 1***" and the Nippon Kaiji Kyokai.

8.5 Amendments have been made as appropriate.