



Report of Investigation

into the engine room fire on board

the Hong Kong registered ship

m.v. "Maritime Alliance"

at Huarun Dadong Dockyard,

Chongmingdao, Shanghai

on 1 February 2007



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



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.

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1. Summary

- 1.1 On 1 February 2007, an engine room fire occurred to the Hong Kong registered ship "*Maritime Alliance*" while she was mooring in Huarun Dadong Dockyard, Chongmingdao, Shanghai for repair. The Service Engineer died and the Third Engineer injured in the incident. At time of the incident, they were both working individually at the bottom deck of the engine room.
- 1.2 Investigation revealed that while several workers from the Dockyard were carrying out a gas-cutting work, hot molten metal oxide and sparks generated during a gas-cutting process came into contact with and ignited the diesel oil collected in the drip tray of the fuel booster pumps situated underneath. The heat of the fire melted the flange gaskets of the pipelines of the fuel tanks. As a result, more fuel oil spilled out from the damaged flange gaskets which intensified the fire.
- 1.3 The investigation has also identified the following contributory factors:
 - Hot work was done without adequate precautionary measures taken;
 - Fuel oil was allowed to remain unattended in the drip tray; and
 - Hot work permit had not been issued as per agreement between the Dockyard and the Master of "*Maritime Alliance*".

2. Description of the Vessel

a) Particulars of *the Vessel*

Name of the Vessel	:	<i>" Maritime Alliance "</i>
Port of Registry	:	Hong Kong
IMO No.	:	8202525
Official No.	:	HK- 0509
Call Sign	:	VRWE2
Classification Society	:	American Bureau of Shipping
Type of Ship	:	Bulk Carrier
Year of Built	:	30 August 1984 (Keel laid date)
Built At	:	Oshima Shipbuilding Co. Ltd.
Ship Manager	:	V Ships (Asia) MSI Pte. Ltd.
Length	:	178.01 metres
Breadth	:	28.40 metres
Depth	:	15.60 metres
Gross Tonnage	:	22,359
Net Tonnage	:	12,455
Engine Power	:	8,355 kW



Fig. 1: M.V. *" Maritime Alliance "*

- b) "*Maritime Alliance*" (hereinafter referred as *the Vessel*), a five-hold bulk carrier built by Oshima Shipbuilding Co. Ltd, Japan in 1987. She is powered by a seven-cylinder marine diesel engine, Sulzer 7RTA58, capable of developing engine power of 8,355 kW. *The Vessel* was owned by Alliance Navigation Company Limited, Hong Kong and managed by V Ships (Asia) MSI Pte. Limited, Singapore.
- c) Accommodation and machinery space are located at the aft of *the Vessel*. Fixed CO₂ fire fighting installation is equipped for extinguishing engine room fire.
- d) At the time of the accident, *the Vessel* was moored alongside a floating dock at Huarun Dadong Dockyard Co., Ltd. Chongmingdao, Shanghai for repair.

3. Sources of Evidence

- a) The Master and crewmembers of “*Maritime Alliance*”
- b) The management company of “*Maritime Alliance*”
- c) Ship’s records, drawings and plans.

4. Outline of Events

- 4.1 *The Vessel* arrived at the Huarun Dadong Dockyard Company Limited (hereinafter referred as *the Dockyard*), Chongmingdao, Shanghai on 14 January 2007 for dry docking. Dry docking repair items were completed and *the Vessel* left the drydock on 31 January. After undocking, *the Vessel* berthed alongside a floating dock to continue other repair work.
- 4.2 On 1 February, a group of three to four workers from *the Dockyard* went on board *the Vessel* to the engine room to replace sewage tank steel pipelines.
- 4.3 Some bolts and nuts on the flanges of a steel pipe were seized and were unable to be dismantled by hand tools. At about 0900, the workers made use of a gas-cutting torch to cut away the bolts so that the pipe could be replaced.
- 4.4 While cutting off the bolts on the flanges of the steel pipe, hot molten metal oxide scattered onto the drip tray of the fuel oil booster pumps underneath the position of the hot work. The oil in the drip tray was ignited and caught fire. Dense smoke generated from the fire soon filled up the vicinity. The workers did not raise a fire alarm and nobody knew when they left the engine room after the fire.
- 4.5 The Electrician and the Oiler were in the engine control room. They tried to extinguish the fire with the engine room portable fire extinguishers. However, dense smoke was quickly filling up the engine room.
- 4.6 The two crew escaped from the engine room and raised the fire alarm. The Master immediately sought help from *the Dockyard* and local authorities. After acknowledging the fire alarm, all crew were mustered on deck. A Service Engineer from an engineering service company and a Third Engineer however were found missing.
- 4.7 Rescue operation was carried out but due to the dense smoke, the ship staff fire fighting team was not able to enter the engine room. Fire fighting party from *the Dockyard* soon arrived on scene and joined the rescue operation.
- 4.8 At 0921, the Third Engineer managed to escape from the engine room on his own. He suffered burn injury and immediately sent to a hospital after first aid treatment. However, the Service Engineer was still unaccounted for.
- 4.9 At 1130, the shore fire brigade discovered the Service Engineer in the engine control room. He was sent to hospital but was certified dead on arrival.
- 4.10 The fire was extinguished at 1230.

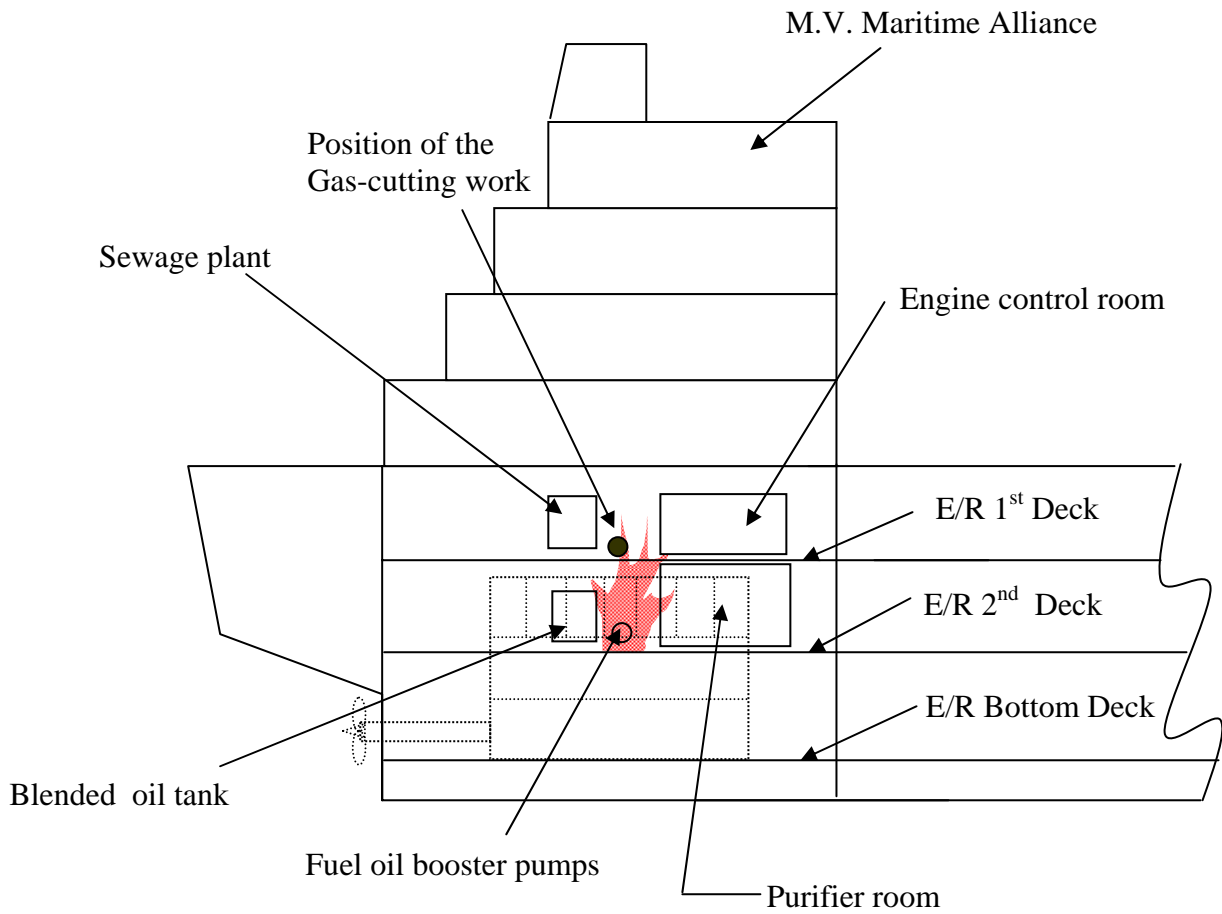


Figure 2: Location of the seat of the fire

5. Analysis of Evidence

Personnel working inside the engine room

- 5.1 At time of the accident, the Third Engineer, the Fitter, the Electrician, the Oiler, the Service Engineer and the *Dockyard's* workers were working in the engine room. Their location in the engine room was as follows:

Personnel	Work	Location
The Third Engineer	Carrying out tail shaft oil pipes work	E/R bottom deck aft
The Fitter	Fabrication of plugs for condenser	E/R workshop
The Electrician	Magnetizing No.3 Generator	Engine control room
The Oiler	Conducting watch keeping	Engine control room
The Service Engineer	Servicing the main engine control system	E/R bottom deck
The <i>Dockyard's</i> workers	Replacing pipelines on sewage treatment plant	Sewage treatment plant on 1 st deck

- 5.2 The Service Engineer died and the Third Engineer suffered injuries in the incident. Both of them were working at the bottom deck of the engine room at the time of the incident. It would take them a long time to escape from bottom deck to the access doors which located at and above the main deck level. The other persons were working at the 1st deck of the engine room near the access doors. They managed to escape from the engine room without injury. The Third Engineer somehow managed to find his way out whilst the Service Engineer who might not familiar with the engine room layout was trapped in the control room.

Escape route

- 5.3 The engine room of *the Vessel* did not equip with emergency escape trunk as it was not a SOLAS requirement for ship built before 1st September 1984. Two open stairways were fitted at both sides of *the Vessel*. Access to engine room could be via the two stairways

from a total of six engine room entrances. Four entrances were located at accommodation spaces while the other two were respectively located at steering gear room and at the funnel on navigation bridge deck. Dense smoke was generated immediately after the fire had broken out. Personnel inside the engine room would be difficult to find their way out of the engine room.

Damages due to fire

- 5.4 Figure 3 shows the extent of damages found in various locations in the engine room. Heavy soot was found covered from the upper levels. Extensive damages were found in those areas above the blended oil tank, the fuel oil booster pumps and their surroundings. A number of plastic covers for lightings at the engine room upper level above the blended oil tank were melted.
- 5.5 The 1st deck of the engine room was also coated with smoke stain. Severe heat damage was found in way of sewage treatment plant on the port side. The after bulkhead of the control room was buckled. All electric cables entering the control room from the aft and inboard sides were heat affected. The interior fittings of the control room such as ceilings and light covers were also damaged by the intense heat of the fire.
- 5.6 The 2nd deck of the engine room was covered with heavy smoke stain. The port side area was suffered with heat damage, particularly at the aft end of the purifier room, auxiliary engines booster pumps area and blended oil tank. All areas above the blended oil tank and booster pumps were severely heat affected with electrical wiring burned and electrical fittings destroyed. The aft wall of the purifier room buckled. The side shell plating adjacent to the blended oil tank was found distorted. It appeared that the seat of the fire was located around the blended oil tank.
- 5.7 The bottom level of the engine room was covered with minor smoke stain, no apparent heat damage was found.

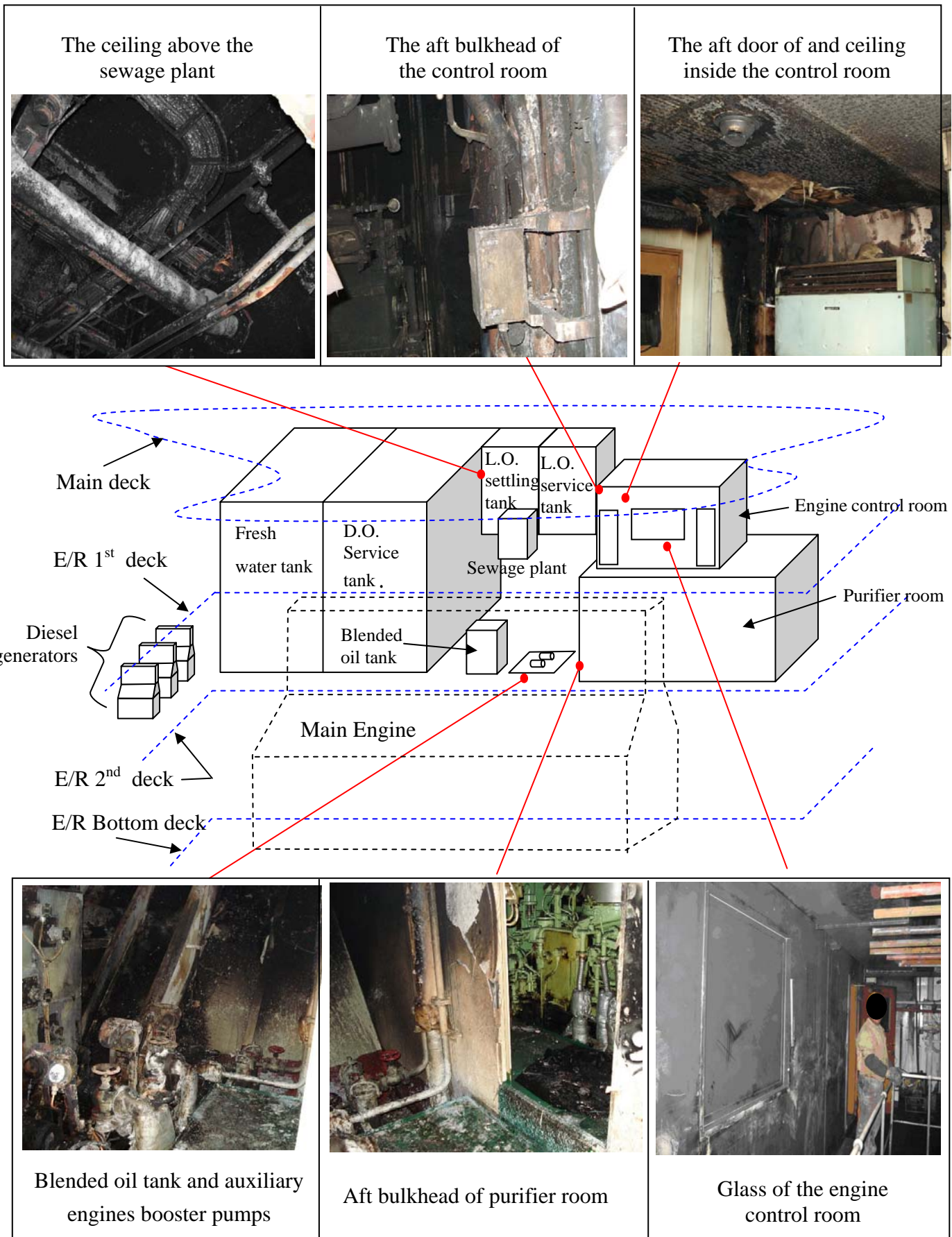


Figure 3: The fire damages

Agreement on Fire-fighting & Environment Protection in Ship Repair

- 5.8 An “Agreement on Fire-fighting & Environment Protection in Ship Repair” had been made and signed between *the Dockyard* and the Master of *the Vessel*. Both *the Dockyard* and the Master should have taken precautions against fire prior to and during a hot work. An “Approval of Hot Work” (Hot Work Permit) should be signed by the representatives of *the Dockyard* and *the Vessel* prior to the gas-cutting work. In addition, the *Dockyard* should also require to assign a safety officer or a watchman to carry out a fire watch for the hot work. However, no approved “Hot Work Permit” had been issued for the gas-cutting work, it appeared that these safety procedures had not been followed properly.

Fire origin

- 5.9 At the outbreak of the fire, hot work was being carried out by three to four workers from *the Dockyard* at the engine room 1st deck adjacent to the sewage treatment plant. They used an oxy-acetylene cutting torch to cut off the bolts on a flange of a sewage treatment plant pipe (see figures 4 and 5). Hot molten metal and sparks could fall down to 2nd deck and bottom deck of the engine room.



Figure 4: The gas-cutting torch



Figure 5: The cut away bolts

- 5.10 The drip tray of the booster pumps for the diesel generators was located a few metres below the position of the gas-cutting work. The gas-cutting work generated hot molten metal and sparks that ignited the fuel oil collected in the tray and consequently caused the fire.

The fuel

- 5.11 *The Vessel* is equipped with three diesel generator engines that can run on either blended or diesel fuel. At the time of the accident, the boiler was not in service and no heating steam was provided. Blended oil system was not in use at the time of the accident as it would require heating steam from the boiler. The diesel generators therefore had been running on

diesel oil for several days. As the booster pumps were most of the time running on viscous blended oil, oil might have leaked from the glands to the tray when the pumps were running on less viscous diesel oil. It was reasonable to believe that certain quantity of diesel oil might have collected in the drip tray if left unattended. Routine inspection on oil leakage and cleanliness on the drip trays were utmost important for prevention of fire. Whenever leakage of oil was discovered, corrective measures should be taken.



Figure 6: Sign of oil spillage from the blended oil tank.

6. Conclusions

- 6.1 On 1 February 2007, an engine room fire occurred to the Hong Kong registered ship "*Maritime Alliance*" while she was mooring in Huarun Dadong Dockyard, Chongmingdao, Shanghai for repair. The Service Engineer died and the Third Engineer injured in the incident. At time of the incident, they were both working individually at the bottom deck of the engine room.
- 6.2 Investigation revealed that while several workers from the Dockyard were carrying out a gas-cutting work, hot molten metal oxide and sparks generated during a gas-cutting process came into contact with and ignited the diesel oil collected in the drip tray of the fuel booster pumps situated underneath. The heat of the fire melted the flange gaskets of the pipelines of the fuel tanks. As a result, more fuel oil spilled out from the damaged flange gaskets which intensified the fire.
- 6.3 The investigation has also identified the following contributory factors:
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 - Hot work permit had not been issued as per agreement between the Dockyard and the Master of "*Maritime Alliance*".

7. Recommendations

- 7.1 A copy of this report should be sent to the Master and the management company of *the Vessel* advising them the findings of this accident and urging them to observe the following safety practices in order to prevent recurrence of similar accident:
- Precautionary measures against fire should be taken before any hot work is carried out;
 - Source of fuel oil leakage should be rectified immediately; and
 - Safety requirements stipulated in the ship repair agreement should be strictly followed.
- 7.2 A copy of this report should be sent to *the Dockyard* advising them the findings of this incident;
- 7.3 A Merchant Shipping Information Note should be issued to draw the attention of all concerned parties to the lessons learnt in this accident in particular fire prevention on ship repair.

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 final draft report was sent to the following parties:
 - a. V Ships (Asia) MSI Pte. Ltd.
 - b. The Master of *the Vessel*
 - c. Huarun Dadong Dockyard
- 8.3 No submission was received from them.