



Report of investigation

into the fatal incident

on board

m.v. *"Tai Ping"*

in the position 20° 09.5' N, 59° 03.9' E

on 22 July 2005



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 22 July 2005, while the bulk carrier m.v. "*Tai Ping*" was navigating near the coast of Oman. An able seaman was found lying unconsciously on top of the canopy of the port side lifeboat when carried out a cleaning work with an electric high-pressure water jet cleaning machine. The Able Seaman showed no sign of life after hours of uninterrupted CPR by a crewmember. He was later certified dead by the Master at the scene.
- 1.2 The exact cause of the incident could not be established. However, in order to safeguard users from electric shock, it is a good safety practice to maintain the electric high-pressure water jet cleaning machine in a good working condition for the intended purposes.

2. Descriptions of *the Vessel*

2.1 Particulars of m.v. "*Tai Ping*"

Port of Registry:	Hong Kong
IMO No.:	9086784
Official No.:	HK-0747
Call Sign:	VRXG8
Type of Ship:	Bulk Carrier
Year Built:	1996
Name of Builder:	Guangzhou Shipyard International Co. Ltd.
Management Company:	Fenwick Shipping Services Ltd.
Classification Society:	Lloyds Register of Shipping
Length:	160.17 metres
Breadth:	26.00metres
Moulded Depth:	13.30 metres
Gross Tonnage:	16,041
Main Engine:	MAN-B&W 5L50MC x 1Set

"Tai Ping" (hereinafter referred as *the Vessel*), is a 5-hold bulk carrier built in 1996 by Guangzhou Shipyard International Co. Ltd. in China. *The Vessel* was owned by Rightlink Shipping Ltd. and managed by Fenwick Shipping Services Ltd.



Fig. 1: Photo of m.v. "*Tai Ping*"

3 Sources of Evidences

3.1 Detailed incident report from the Master of *the Vessel*.

3.2 Notification of death form from Royal Oman Police.

3.2 Ship's records, drawings and plans provided by the Fenwick Shipping Services Ltd.

4. **Outline of Events**

- 4.1 At about 0830 on 22 July 2005, while the *Vessel* was about 30 nautical miles South East Coast of Oman, a team of crewmembers were assigned to carry out deck cleaning work.
- 4.2 An Able Seaman (AB) was assigned to clean the boat deck area while the other crewmembers were working on the main deck. The AB used an electric high-pressure water jet cleaning machine to remove the hard cement traces adhering on the port lifeboat and the boat deck areas.
- 4.3 At about 1153, the Bosun called the AB for lunch break. He found that the AB was lying unconsciously on top of the port lifeboat, holding the jet gun of the high-pressure water jet cleaning machine with the water hose wrapped around his body. (See fig. 2)
- 4.4 The Bosun immediately informed other crewmembers for assistance. One of the crewmembers switched off the power supply of the high-pressure water jet cleaning machine.
- 4.5 The crewmembers immediately provided temporary medical aid to the AB. When the AB was found no signs of pulse or breathing, the Deck Cadet gave cardiopulmonary resuscitation (CPR) to him. However, the AB showed no sign of life after hours of uninterrupted CPR. He was later certified dead by the Master at the scene.
- 4.6 The Master of *the Vessel* sought assistance from nearby coastal Search and Rescue stations. At about 1425, the Master was instructed to divert *the Vessel* to Oman. At 1849, *the Vessel* arrived Masirah Island where the Oman's Coast Guard removed the body of the AB from *the Vessel*.

SCENE OF INCIDENT

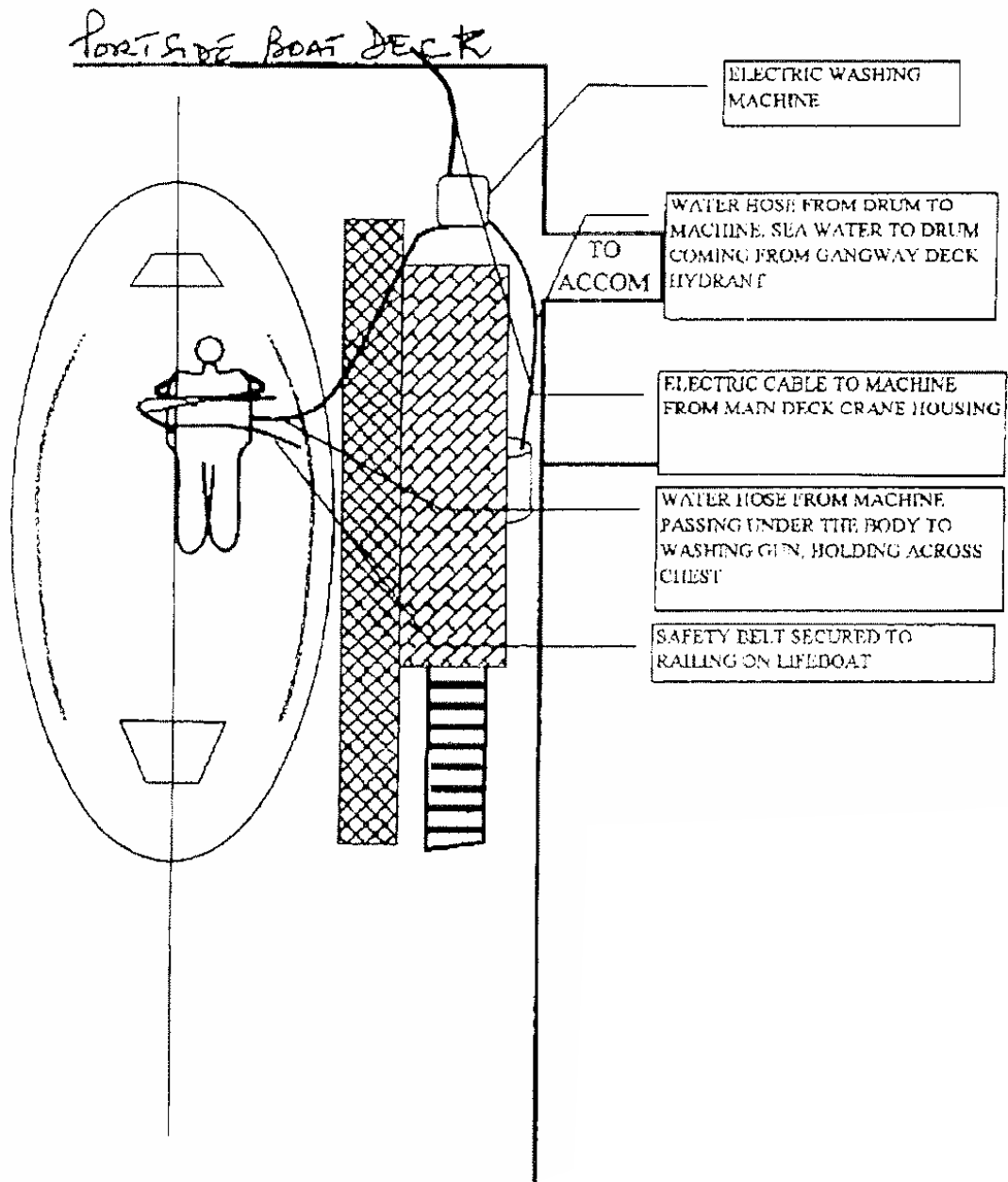


Fig. 2: Sketch showing the scene of the incident

5. Findings and Analysis

Working experience and physical condition of the AB

- 5.1 The AB joined *the Vessel* on 12 March 2005, he was medically fit for serving on board. Before his service on *the Vessel* he had worked as an able seaman on various ships since 1997. There was no detailed medical history or information showing that the AB had suffered from any kind of heart disease prior to the incident.
- 5.2 On the day of the accident, the Chief Officer was working with the AB. At 1140, the AB was last seen by the Chief Officer cleaning the lifeboat and its surrounding areas without any sign of sickness. At 1153, the Bosun discovered that the AB lying unconsciously on top of the port lifeboat. Apparently, the AB lost his consciousness just a few minutes before the Bosun discovered the AB between 1140 and 1153.

The post-mortem examination

- 5.3 The AB was a male Chinese national at the age of thirty-seven (37). Post-mortem examination of the body was conducted by the Royal Oman Police on 22 August 2005, the cause of death was certified as heart failure. There was no information whether the death was related to electric shock or health problems.

The hazard on the high-pressure water jet cleaning machine

- 5.4 The high-pressure water jet cleaning machine was placed on the boat deck underneath the portside lifeboat, water would fall onto the machine and make it wet. During the cleaning operation, the port lifeboat area could be filled up with fine water droplets and the casing of the cleaning machine and its associated equipment, i.e. the hose and the jet gun would be covered by a film of water. Unless the machine has been well maintained and weatherproof, water might go inside the machine and affect the electrical insulation. Since the AB was holding the jet gun and the hose in a surrounding saturated with water droplets, he might be subjected to electric shock if the insulation of the machine dropped to a dangerous value.

The particulars of the high-pressure water jet cleaning machine

- 5.5 The AB was using a high-pressure water jet cleaning machine for cleaning work, the particulars of the equipment are as follows:

Maker/model: Alto, Unitor HPC 54
Voltage: 440 V / 220 V; 3 phase.
Power: 3kW



Fig. 3 The high-pressure water jet cleaning machine

Insulation test on the equipment was conducted by the Electrical Officer at 1600 on 22 July 2005 (four hours after the incident). The test results were as follows:

Item	Relay	Motor	Power Switch	Power Switch	Plastic Body
Insulation Resistance (MΩ)	8	10	3	1	0.5

According to the test result, the insulation resistance of the plastic casing of the high-pressure water jet cleaning machine was rather low and was considered unsafe to operate. Apparently, there were surface deposits of dirt or film of moisture on the plastic casing of the machine. A rough calculation on the leakage current passing through the AB is made based on the following data:

- a. Insulation resistance of the machine and hose during operation in wet condition : $0.25 \text{ M}\Omega$ ¹
- b. Body resistance including foot contact insulated with rubber footwear in wet condition : $20 \text{ k}\Omega$

¹ An estimated value based on the figure given by the ship's staff.

Therefore, the leakage current passing through the AB is

$$: \frac{440V}{\sqrt{3 \times (250+20) \text{ k}\Omega}}$$

$$= 0.94 \text{ mA (say 1 mA)}$$

Based on the table of "The effect on electric shock of one second's duration" (see following table), the leakage current of 1 mA can only cause some tingling sensation to a healthy person.

Current level (mA)	Probable effect on human body
1	Perception level. Slight tingling sensation.
5	Slight shock felt; not painful but disturbing. Average individual can let go. However, strong involuntary reactions to shocks in this range may lead to injuries.
6-30	Painful shock, muscular control is lost. This is called the freezing current or "let-go" range.
50-150	Extreme pain, respiratory arrest, severe muscular contractions. Individual cannot let go. Death is possible.
1,000-4,300	Ventricular fibrillation (the rhythmic pumping action of the heart ceases.) Muscular contraction and nerve damage occur. Death is most likely.
10,000	Cardiac arrest, severe burns and probable death.

5.6 The high-pressure jet cleaning machine was maintained by the Electrical Officer. It was stated that the machine was in good working order before the accident.

5.7 In order to assess the values of the insulation resistance of the high-pressure water jet cleaning machine, insulation resistance tests were performed on the machine after it had been cleaned and run for four hours. The test results were as follows:

Item	Relay	Motor	Power Switch	Power Switch	Plastic Body
Insulation Resistance (MΩ)	1000	1000	500	1000	300

It was noted that the insulation resistance of the machine was back to normal after it had been cleaned and dried. (See test report in the appendix)

6. Conclusions

- 6.1 On 22 July 2005, while the *Vessel* was on her voyage near the coast of Oman. An Able Seaman was found lying unconsciously on top of the canopy of the port side lifeboat. The Able Seaman was certified dead by the Master at the scene.
- 6.2 At the time of the accident, the deceased was operating a high-pressure water jet cleaning machine which was placed underneath the portside lifeboat. Water could have got into the machine and damaged its insulation. Insulation test of the machine was conducted and found that the insulation resistance was low and considered unsafe to operate.
- 6.3 The exact cause of the incident could not be established. The findings could not prove that the deceased was killed by electric shock, however, in order to safeguard the users from electric shock, it is a good safety practice to maintain the electric high-pressure water jet cleaning machine in a good working condition for the intended purposes.

7. Recommendations

- 7.1 A copy of this report should be sent to the concerned parties such as the Master and the Operator of *the Vessel*, advising them the findings of the of this incident and urging them to ensure the following safety precautions in order to reduce the risk of electric shock to personnel:
- a. Electrical equipment should be maintained in good working order for the intended purposes. The insulation resistance should be tested regularly or before use; and*
 - b. Safe operation procedures should be established for the use of electrical equipment, especially for those electrical equipment working under humid environment.*

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. Fenwick Shipping Services Ltd.
 - b. The Master of *the Vessel*.
- 8.3 Submissions were received from Fenwick Shipping Services Ltd. The draft report was amended as appropriate according to the submissions. No submission was received from the Master of *the Vessel*.

M.V. TAI PING
05TH.AUGUST.2005
AT SEA TO SFAX., TUNISIA

REPORT ON HIGH PRESSURE ELECTRICAL WASHING EQUIPMENT

Chief Engineer and Electrical Officer explains that status of electrical equipment insulation fluctuate due to the:

1. Cleaning status of the equipment's electrical, mechanical and body parts.
2. Surrounding environments i.e. weather conditions (wet or dry).
3. Storage after use.

Table-1 indicates the readings of 21-July-2005 were taken after cleaning of motor and readings after the incident were taken at about 16:00hrs local time on the 22-July-2005.

After the incident the machine was stored in safe place within the accommodation for almost 14 days and upon instructions from owners to carry out further test this machine was taken out from the safe place in store. The running test was carried on the starboard side boat deck.

Table-2 indicate the readings before, after cleaning and after 4 hours use in similar condition as of 22-July-2005

Table-1

ITEM	ON THE 21-JULY-2005	ON THE 22-JULY-2005
RELAY	25M OHM	8M OHM
MOTOT	25M OHM	10M OHM
SELECT SWITCH	25M OHM	3M OHM
POWER SWITCH	25M OHM	1M OHM
PLASTIC BODY	25M OHM	.5M OHM

Table-2

ITEM	BEFORE CLEANING ON 4-AUG-05	AFTER CLEANING ON 04-AUG-05	AFTER DRYING OVER NIGHT AND RUNNING WITH SEA WATER FOR ABT 4HR 05-AUG-05
RELAY	300M OHM	300M OHM	1000M OHM
MOTOT	300M OHM	300M OHM	1000M OHM
SELECT SWITCH	300M OHM	300M OHM	500M OHM
POWER SWITCH	3M OHM	300M OHM	1000M OHM
PLASTIC BODY	5M OHM	300M OHM	300M OHM

PARTICULAR OF EQUIPMENT AS FROM NAME PLATE:

ALTO, UNITOR HPC 54
301001393
LWA 92 Db – 2004068406/11/04
NT 0530
Q-15.8 P-200/20 P MAX -250/25
I MAX 60 440/220/3 60Hz 3KW 11, 2A
MADE IN EUROPE

As to the probable causes of low reading of the machine after the unfortunate incident of the 22-July-2005, the machine was wet when reading were taken after the incident.

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NI : 9280
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CALL SIGN: VRXG8

Report prepared by: Master, Chief Officer, Chief
Engineer and Electrical Officer of m.v. "Tai Ping"