Report of investigation into the death of an Assistant Electrical Officer inside a ship elevator on board the Hong Kong registered bulk carrier vessel *Taiju* at the Ube Anchorage in Japan on 13.12.2011

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

29 May 2013

Purpose of Investigation

This incident is investigated, and published in accordance with the IMO Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident, Resolution MSC.255(84).

The purpose of this investigation conducted by the Marine Accident Investigation and Shipping Security Policy Branch (MAISSPB) of Marine Department, pursuant to Merchant Shipping Ordinance Chapter 281 section 51, 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 13 December 2011 at about 1440 hrs, while Hong Kong registered bulk carrier vessel *Taiju* was at the Ube Anchorage in Japan, the Assistant Electrical Officer (AEO) on board was killed by the cage of the elevator which moved while he was doing inspection on the cage top alone.

1.2 It is deduced that the AEO was working alone on the cage top. Without seeking for help, he might have changed-over the MANUAL/AUTO switch to AUTO hoping someone would press the call buttons so that the elevator moves at normal speed, either going up or down, for him to detect for any abnormal noise.

1.3 At the time of the accident, the AEO was at the front side of the cage and he lost balance and fell into the gap between the cage and the bulkhead. He was dragged up until the cage finally stopped in between A-deck and B-deck.

1.4 The investigation into the accident revealed that the main contributing factors to the accident is the non-compliance of the Company's *Safety Measures* by the engineer officers and the AEO and such document was prepared without sufficiently appraising the associated risks.

2. Description of the Vessel

2.1 Particulars of M.V. *Taiju*

Flag	:	Hong Kong
IMO No.	:	9148611
Official No.	:	HK- 0347
Call Sign:	:	VRVK5
Classification Society	:	Lloyd's Register
Type of Ship	:	Bulk Carrier
Keel Laid	:	07 November 1996
Built At	:	NKK Corporation, TSU Works, TSU, Japan
Ship Owner	:	Triumph Sea Limited, Hong Kong
DOC Company	:	Bernhard Schulte Shipmanagement India Pvt. Ltd.
Length	:	289.00 metres
Breadth	:	45.00 metres
Depth	:	24.10 metres
Gross Tonnage	:	87,422
Net Tonnage	:	57,703
Deadweight	:	57,775 MT
Main Engine	:	one set of Mitsui- Man B&W 6S70MC Mark-5
Engine Power	:	14,710 kW
No. of Crew	:	24

Fig. 1 M.V. *Taiju*

2.2 Particulars of the elevator

Manufacturer	:	Schindler Elevator K.K.
Type	:	Single Wrap Traction Geared Type
Standard	:	LR
Capacity	:	6 persons / 500 kg
Speed	:	30m/min
Stage	:	7 stops
Power supply	:	3-phase, AC 440V, 60Hz
Cage	:	1200 (W) x 1000 (D) x 2000 (H)
Home landing deck	:	D Deck

3. Sources of Evidence

(a) The statements of the Master, Officers and crew of *Taiju*; and

(b) Information provided by the Ship Management of *Taiju*.

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4. Outline of Events

(All time shown in this report is local time)

4.1 Taiju (the *vessel)* departed Tubarao, Brazil on 21 October 2011 after finished loading of iron ore. She arrived at Sekisaki pilot station in Japan at about 1220 hrs on 7 December 2011 and anchored at the Oita Anchorage at 1505 hrs on the same day. On 11 December 2011 at about 0325 hrs, the *vessel* left Oita Anchorage and berthed at about 0640 hrs. Discharge of cargo started at 0800 hrs.

4.2 The relieving Chief Engineer and the Third Officer boarded the *vessel* at Oita. At 1625 hrs on 12 December 2011, the *vessel* departed after finishing cargo. She arrived at Ube Anchorage at 2100 hrs on the same date.

4.3 Routine inspections and maintenance of shipboard equipment had been scheduled while the vessel was at the anchorage. On 13 December 2011 at about 0800 hrs, at a 'tool box' meeting held in the engine control room, the Assistant Electrical Officer (AEO) told the Second Engineer that he wanted to check the cause of abnormal noise from the ship elevator with the assistance of the Fourth Engineer. The Second Engineer told him to take all precautions and follow the procedures.

4.4 Meanwhile, the Chief Officer informed the engine room that the port and starboard lifeboats would be lowered into the water for testing as part of the shipboard routine inspection. The Second Engineer instructed the AEO and the Fourth Engineer to attend.

4.5 After the 'tool box' meeting, the AEO and the Fourth Engineer checked the emergency lighting system inside the engine room and it was finished by 1000 hrs. Then, they proceeded to the starboard lifeboat station to take part in the launching. Before noon, the launching test of starboard lifeboat was completed and the boat was retrieved and secured. The launching of the port lifeboat would be in the afternoon after the lunch break.

4.6 After the lunch break at about 1305 hrs, the AEO and the Fourth Engineer reported to the Second Engineer that they would start inspecting the elevator. The Second Engineer told him to take all precautions and follow the procedures again. At about 1310 hrs, they hanged red colour hand-written warning tags "Elevator Under Maintenance" on every elevator landing door handle of each floor (Fig 2).

4.7 At about 1315 hrs with the cage parked in the A-deck, the AEO used the emergency key (Fig 3) to open the landing door on B-deck. He asked the Fourth Engineer to go on top of the cage to change over the AUTO-MANUAL selector switch on the control panel mounted on the cage top from 'AUTO' to 'MANUAL' position (Fig 4).

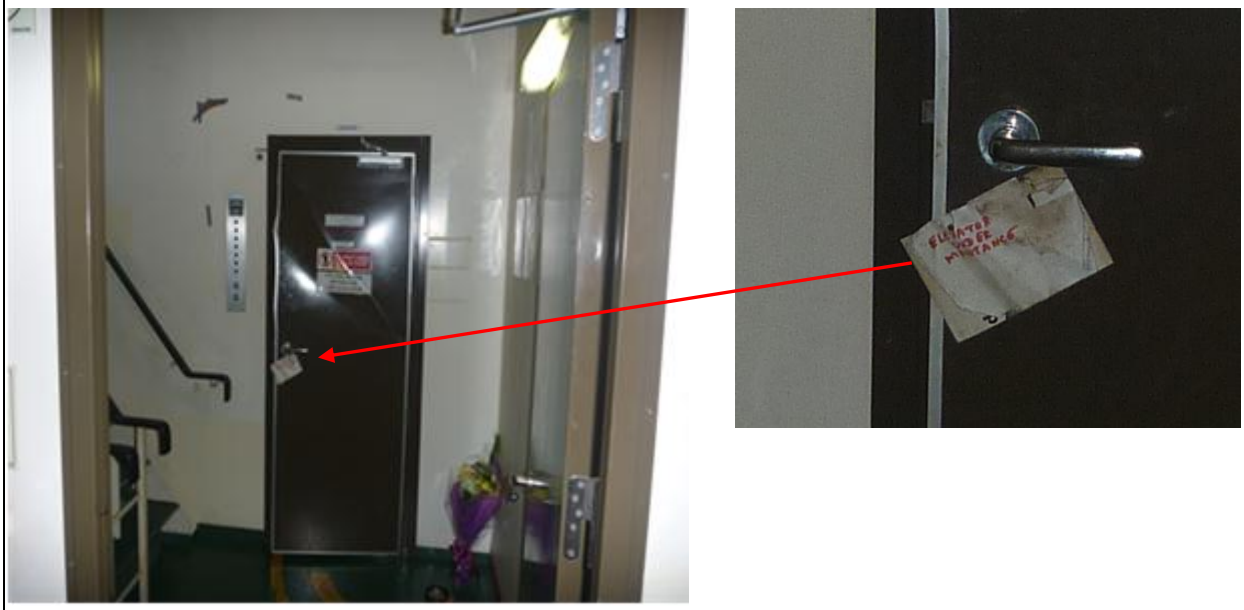


Fig 2- warning sign hanged on the handle of landing door

Fig. 3 – Position for inserting the emergency key to open the landing door

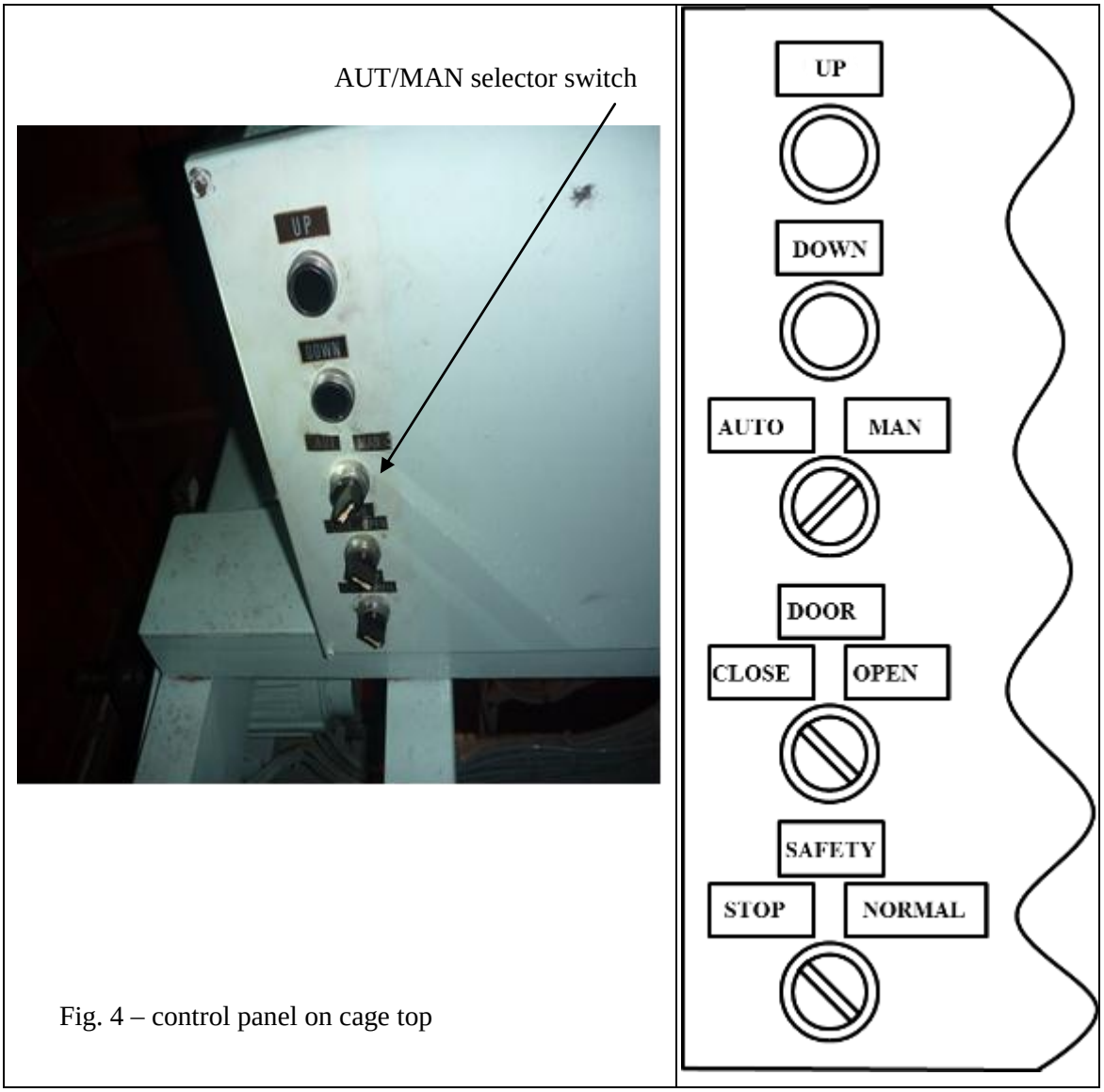


Fig. 4 – control panel on cage top

4.8 After that, the AEO landed on the cage top and controlled the movements of the cage by pressing either the "UP" or "DOWN" button switches on the control panel to detect for any noise during running. The Fourth Engineer was also on the cage top staying behind the AEO. At about 1325 hrs, they came out of the elevator without any findings.

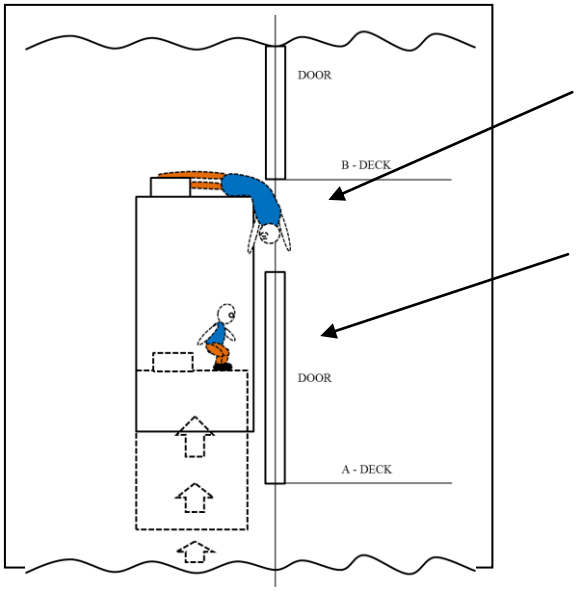
4.9 They proceeded to the port lifeboat station and arrived there at about 1330 hrs. At 1420 hrs, the port lifeboat was retrieved back to the embarkation deck after launching. The Second Officer left the port lifeboat embarkation deck and went to his cabin to change the uniform before returning back the bridge to relief the Master who had been there overseeing the launching of the lifeboats.

4.10 At 1430 hrs, the port lifeboat was secured in position. The Fourth Engineer told the

AEO and the Chief Officer that he was going to use fresh water to flush the starboard lifeboat engine. After that, he would conduct lifeboat engine operation familiarization training with the Third Officer.

4.11 At about 1440 hrs, when the Second Officer just arrived at the bridge, he and the Master heard a loud screaming. The Master asked the Second Officer to go down and find out what happened. The Second Officer went down the stairs inside the crew accommodation and he met the ship Superintendent who was going up the stairs from A-deck to B-deck after attending the launching test of the port lifeboat. The Superintendent told the Second Officer that he heard screaming from inside the elevator. They also found the elevator door's emergency key placed on the first step of the stairs by the side of B-deck landing door.

4.12 The Superintendent and the Second Officer used the emergency key to open the B-deck landing door. They saw the cage stopped in between A-deck and B-deck. The lower part of the AEO's body and his legs were lying on top of the cage, while the upper part of his body (head and chest) was upside down and stuck in the gap between the cage, the separation between the two decks and the top of the A-deck landing door frame (Fig. 5). They tried to open the A-deck landing door but unsuccessful.



4.13 The Superintendent asked the Second Officer to call for assistance from other crewmembers. The Second Officer then made a public address to ask all crew members to come to A-deck for the rescue. Afterwards, he went up to the bridge to report the accident to the Master and took over the watch from him.

4.14 At about 1445, the Fourth Engineer came rushing to the engine room workshop and informed the Second Engineer that the AEO was stuck inside the elevator. The Second Engineer ran to A-deck of the elevator and found other crew members were trying to open the A-deck landing door. He went up to the B-deck of the elevator and found that the Chief Officer was on the cage top trying to communicate with the AEO. Immediately, the Second Engineer asked the Third Engineer to go to the elevator machinery room to switch off the electrical power for the machine.

4.15 The A-deck landing door was jammed and could not be opened by the emergency key. The crew tried hard by force and at last it broke open. When the Master arrived at the A-deck of the elevator, the A-deck landing door had already been forced opened by the crew. They found that the AEO's head was down and it was very difficult to pull him out of the cage.

4.16 The Second Engineer decided to lower the cage manually by releasing the brake on the electrical motor. He and the Third Engineer went to the elevator machinery room to lower the cage by hand while keeping close communication with the Chief Officer who was on cage top taking care of the casualty.

4.17 At about 1450 hrs, the AEO was pulled out of the cage and transferred to ship hospital. Throughout the operation, the crew tried to communicate with the AEO but got no response. The Master informed the Designate Person Ashore (DPA) of the accident.

4.18 From 1500 hrs to 1530 hrs, the Master was in contact with Moji Coastguard, exchanging information about the accident and requesting for the immediate evacuation of the casualty. At the same time, the Second Officer came from the bridge and arrived at the ship hospital to check the vital sign of AEO. The pulse was found too feeble to none and the respiration was absent. Applying Cardiopulmonary resuscitation (CPR) was not possible due to internal breeding, injury to his chest and nasal canal blockage.

4.19 At 1554 hrs, the UBE Coastguard arrived at the vessel with two Moji Coastguard officers boarded the *vessel* for investigation. The AEO was transferred to hospital ashore by the coast guard vessel. At 1700 hrs, the Master of the vessel was informed by the ship agents that the AEO had been certified dead at 1648 hrs.

5. Analysis of Evidence

Qualification and experience of Officers

5.1 The Master of the vessel has had 12 years of seagoing experience, five years of which were in the capacity of a ship master. He took over as a Master of *Taiju* for three months before the accident. He held a Certificate of Competency as Master issued by the United Kingdom on 16 July 1999 valid until 02 April 2014, and a Class 1 Licence (Deck Officer) issued by the Hong Kong Marine Department.

5.2 The Chief Engineer has had 40 years of seagoing experience, 13 years of which were in the capacity of a chief engineer. He took over as a Chief Engineer of *Taiju* just one day before the accident. He held a Certificate of Competency as First Class Engineer issued by The Russian Federation on 02 October 2006 valid until 03 September 2016, and a Class 1 Licence (Marine Engineer Officer) issued by the Hong Kong Marine Department.

5.3 The Fourth Engineer has had seven months of seagoing experience. He held a Certificate of Competency as Marine Engineer Officer Class IV issued by the Government of India on 05 April 2011 valid until 21 February 2016. He joined *Taiju* as a Fourth Engineer Officer on 27 November 2011.

5.4 The AEO held a "Continuous Discharge Certificate cum Seafarer's Identity Document" (CDC) for the rank of Electrical / Electronic Officer issued by the Government of India on 14 September 2009 valid until 13 September 2019. He started working on board an ocean-going vessel as a Trainee Electrical Officer on 30 November 2009 and signed off on 14 August 2010. After that, he worked on board his second vessel, which was a Hong Kong registered ship, also as a Trainee Electrical Officer in the period from 15 November 2010 to 9 May 2011. He signed on his third vessel i.e. *Taiju*, as an Electrical Officer on 25 June 2011.

Safety measures during elevator maintenance work

5.5 The company instruction on "Safety Measures During Elevator Maintenance Work" (*Safety Measures*) stipulates that : -

(a) the crew be provided with detailed and adequate information regarding the machinery when an inspection or maintenance work is planned and ensure they fully understand the procedures to be followed;

(b) to hold a prior meeting for the purpose of (i) informing the Bridge and all crewmembers clearly of the unavailability of an elevator during maintenance; (ii) confirming the need to wear necessary protectors; (iii) establishing communication channels during the work; checking inspection / maintenance procedures; and (iv)

clarifying communication channels in the case of emergency;

(c) make sure that the maintenance team comprises of plural members;

(d) make and prepare a checklist for not only the inspection checkpoints, but also for the changeover procedures of "AUTO/MANUAL" operations before and after an inspection;

(e) announce and post a notice of "UNDER MAINTENANCE – DO NOT USE" on every elevator entrance;

(f) cancel the "HOME LANDING" function beforehand; and

(g) *when accessing the operation panel for maintenance on the cage top, the sequence of steps must be followed : (i) push the "EMERGENCY STOP" switch; (ii) go up to the cage top from the inside of the cage through the "EMERGENCY ESCAPE DOOR" ; (iii) turn the "AUTO-MANUAL" changeover switch to "MANUAL"; (iv) cancel the "EMERGENCY STOP" switch.*

5.6 The AEO informed the Second Engineer during the 'tool box' meeting held in the morning on 13 December 2011 that he wanted to check the cause of the abnormal noise from the ship elevator with the assistance of the Fourth Engineer. The Second Engineer told him to take all precautions and follow the procedures. There seemed to be no such item of work planned beforehand. The Second Engineer's verbal safety reminders, same also given to the AEO later on in the afternoon, deemed not fulfilling the company instruction in sub-paragraph 5.5(a), (b) and (d) above.

5.7 When the AEO and the Fourth Engineer started the inspection of the elevator after lunch break, they hanged a piece of paper written in red letter "Elevator Under Maintenance" warning tags instead of the *"UNDER MAINTENANCE – DO NOT USE"* on the handle of elevator door landing door on each floor without making or arranging to make the announcement as required in sub-paragraph 5.5(e) above.

5.8 The elevator was parked in A-deck and they landed on the cage top from B-deck instead of following the procedure as required in sub-paragraph 5.5(g) above. Besides, there is no evident that the "HOME LANDING" function was cancelled beforehand as required in sub-paragraph 5.5(f) above.

5.9 Apart from the requirement of hanging the warning tags on elevator door's handle on each floor during inspection or maintenance of elevator, there was no clear instruction in the Safety Measures as to blocking and/or preventing any call buttons on every deck from being inadvertently pressed by crewmember despite the latter requirement has been

specified in the Marine Elevator Handling Guidelines[1] used on board. The warning tags at call buttons on every floor were properly placed after the accident as shown in figure 6.

Fig.6 – Warning tag *"UNDER MAINTENANCE – DO NOT USE"*

5.10 Also there was no clear instruction as to having at least one person on standby outside the elevator since there was at one time both the AEO and the Fourth Engineer were on top of the cage during checking.

5.11 The AEO and the Fourth Engineer were assigned to work together in different jobs throughout the day on 13 December 2011, including checking of the emergency lighting system inside the engine room, inspecting the ship elevator and attending the launching of the port and starboard lifeboats, which just came up during the 'tool box' meeting in that morning. After they had finished their duties in the launching of the port lifeboat in the afternoon, the Fourth Engineer told the AEO that he was going to stay behind on the boat deck to flush the starboard lifeboat engine with fresh water and then conduct lifeboat engine operation familiarization training with the new Third Officer. It could be due to the Fourth Engineer's sudden change of work schedule that rendered the AEO, who wanted to finish the work early and decided to inspect the elevator alone without the Fourth Engineer, neglecting the risk and bypassing the company instruction as required in sub paragraph 5.5(c) above.

[1] Created in March 2006 by the Engineering Group, Marine Management Division, Mitsui O.S.K Lines, Ltd.

Working condition of the elevator

5.12 In accordance with the elevator maintenance record, the yearly, half-yearly and quarterly inspections of the elevator had been carried out by the AEO on 20 August 2011, 29 October 2011 and 02 November 2011 respectively. The most recent monthly inspection of the elevator prior to the accident was also carried out by the AEO on 05 November 2011. All were found in satisfactory condition.

5.13 On 13 December 2011, from about 1300 hrs to 1325 hrs, the AEO and the Fourth Engineer were operating the elevator on cage top to check for any abnormal noise.

5.14 It is therefore believed that the elevator had been maintained properly and the cause of the accident is not attributed to failure of the machine.

Working hours

5.15 The *Vessel's* machinery space was certified as Unmanned Machinery Space. Engine room crew worked at daytime and no engine room watch-keeping duty was required. The *Vessel* arrived at Ube Anchorage at 2100 on 12 December 2011. The day work started at 0800 on 13 December 2011 and accident happened at about 1440. The AEO should have sufficient rest and not suffered from fatigue at work.

Weather and sea condition

5.16 At the time of the accident, it was light air, calm sea, cloudy sky and good visibility, according to the Deck Log Book. The Master of the vessel mentioned that there was no movement of his vessel due to wave motions at the time of the accident. The accident to the AEO inside the elevator was not likely caused by wave motions.

The elevator moved when the AEO was doing inspection on the cage top

5.17 At the time of the accident, there were no witnesses as the deceased AEO was working alone inside the elevator shaft. He died afterwards and was unable to give any information about the accident.

5.18 The Superintendent and the Second Officer, who were first arrived at the scene and opened the B-deck landing door, witnessed the bodily posture of the AEO and that the cage was stopped in between the A-deck and B-deck (refer paragraph 4.12). The elevator door's emergency key was placed on the first step of the stairway by the side of B-deck elevator door.

5.19 The operating panel on top of the cage is used to control the elevator during maintenance and inspection. There are two push buttons (UP and DOWN) and three selector switches (MANUAL/AUTO; DOOR - Close/Open; SAFETY - Stop/Normal) on the control panel.

5.20 According to the manufacturer instruction and the Company's Safety Measures for carrying out maintenance and inspection of the elevator on top of the cage, the AEO should get to the cage top through the emergency exit in the ceiling of the cage. When on top of the cage, the emergency exit should be closed and then change-over the "MANUAL/AUTO" switch from "AUTO" to "MANUAL". Therefore, the cage will not respond to any calls from floors and no automatic operation will be resulted. With the cage door and all landing doors closed, the cage can be moved by pressing either the UP or DOWN button. Such movement of the cage will be slow and inching. It will stop immediately once the push buttons are released.

5.21 It is probable that the AEO landed on the cage top from B-deck after opening the B-deck landing door with the emergency key while the cage was parked in A-deck as the key was found placed on the first step of the stairway by the side of B-deck landing door. He should have changed over the "MANUAL/AUTO" switch to "MANUAL" as he had required the Fourth Engineer to do so earlier. After that, the B-deck landing door was closed automatically by the door self-closing device. The "DOOR" and "SAFETY" switches should remain unchanged and they are respectively in the Close and Normal positions.

5.22 The positions of the switches on the control panel upon inspection by flag State investigator few days after the accident were "MANUAL/AUTO" in "MANUAL" position; "DOOR" in Close position and "SAFETY" in Stop position (Figure 4). The setting of these switches should have been changed by the engineers on board and/or the elevator technician, who attended the elevator, after the accident.

5.23 In view of the seriousness of the injury sustained by the AEO, the cage must have been moved in the upward direction at such a high speed that rendered him lost balance and then being dragged inside the gap. It would not have happened as such had the AEO operated the cage using the "UP" and "DOWN" button as the cage would move slowly and stop immediately once the button was released.

5.24 It is therefore deduced that the most probable positions of the switches on the control panel at the time of the accident were: "MANUAL/AUTO" at AUTO position; "DOOR" at Close position; "SAFETY" switch at Normal position. As such, any calls at floors above B-deck would cause the elevator to move up automatically at a speed of 30 meters per minute, which is the nominal speed of the machine.

5.25 At the time of the accident at about 1440 hrs, the launching of the port lifeboat had just been completed and the crew members were returning back inside the accommodation. It was possible that someone may have inadvertently pressed the call button since the "Elevator Under Maintenance" warning tag was only hanged on elevator landing door's

handle and the call button could still able to be pushed.

5.26 The AEO had previous experience working on the cage top and had been cautious to ensure that the "MANUAL/AUTO" switch be changed over to MANUAL. But, in this incident, he was working alone inspecting and controlling the cage, it would be difficult for him to detect the abnormal noise when the elevator moves slowly by pressing the "UP" and "DOWN" button. Without seeking for help, the AEO might have changed-over the MANUAL/AUTO switch to AUTO hoping someone would press the call buttons so that the elevator moves at normal speed, either going up or down, for him to detect for any abnormal noise.

5.27 Figure 7 illustrate the working environment on cage top. It is also probable that, at the time of the accident, the AEO was at the front side of the cage and he lost balance and fell into the gap between the cage and the bulkhead. He was dragged by the upward movement of the cage and it was finally stopped when the door switch of A-deck landing door was deformed rendering the electrical protection circuit to open and stop the movement of the cage. It cannot be determined how far the cage had ascended until it was completely stopped.

View from outside into cage top

View from above to the cage top

Front view of the control panel

View showing the gap between the cage and bulkhead

Fig. 7 – working environment on cage top

6 Conclusions

6.1. The Hong Kong registered bulk carrier vessel *Taiju* was anchored at the Ube Anchorage in Japan on 13 December 2011. In the morning on that day, the Assistant Electrical Officer (AEO) and the Fourth Engineer were assigned by the Second Engineer to attend the launching test of the starboard and port lifeboats and to check the cause of abnormal noise in the ship elevator.

6.2. After launching of the starboard lifeboat completed in the morning, the AEO and the Fourth Engineer went for lunch. After the lunch break finished at 1300 hrs, they started to check the elevator until the work was suspended at 1325 hrs without any finding. They proceeded to the port lifeboat station and arrived at about 1330 hrs.

6.3. At 1430 hrs, the port lifeboat launching was completed and it was secured in position. The Fourth Engineer told the AEO that he was going to use fresh water to flush the starboard lifeboat engine first. After that, he would conduct lifeboat engine operation familiarization training with the Third Officer.

6.4. At about 1440 hrs, the Master and the Second Officer at the bridge heard a loud screaming. It was found that the screaming came from the elevator. The Second Officer and the ship Superintendent opened the B-deck landing door and found the AEO stuck in the gap between the cage and the bulkhead, and the cage stopped in between A-deck and B-deck.

6.5. Announcement was made calling for assistance and the rescue operation by the crew launched immediately. After the A-deck landing door was broke open, the cage was lowered manually by releasing the brake of the motor inside the machinery room. At 1450 hrs, the AEO was rescued from the cage by the crew and was transferred to the hospital ashore by coastguard vessel for treatment. He was certified dead at 1648 hrs on 13 December 2011.

6.6. It is deduced that the AEO was working alone on the cage top. Without seeking for help, he might have changed-over the MANUAL/AUTO switch to AUTO hoping someone would press the call buttons so that the elevator moves at normal speed, either going up or down, for him to detect for any abnormal noise.

6.7. At the time of the accident, the AEO was at the front side of the cage and he lost balance and fell into the gap between the cage and the bulkhead. He was dragged up until the cage finally stopped in between A-deck and B-deck.

6.8. The investigation into the accident revealed that the main contributing factors to the accident is the *Safety Measures* (paragraph 5.5) issued by the company were not strictly followed by engineer officers and the AEO (paragraph 5.6, 5.7 and 5.10) and it was prepared without sufficiently appraising the associated risks (paragraph 5.8 and 5.9).

7 Recommendations

7.1. A copy of the report of investigation is to be sent to

(a) the owners / management company of the *vessel*;

(b) the Shipping Division (Mercantile Marine Office and Ship Safety Branch) of Hong Kong Marine Department; and

(c) the Directorate General of Shipping, Ministry of Shipping, Government of India.

7.2. The owners / management company of the *vessel* should : -

(a) issue circulars to inform all personnel ashore responsible for ship safety, and all masters, officers and crew on board ships the findings of this accident investigation;

(b) review the *Safety Measures* (paragraph 5.5) taking into consideration of the findings of this accident investigation; and

(c) ensure that all masters, officers and crew on board ships would strictly follow the *Safety Measures*, as amended, when performing any kinds of work to ship elevator.

7.3. A Merchant Shipping Information Note should be issued to promulgate the lessons learnt from this accident.

8 Submissions

8.1 In the event that the conduct of any person or organization is commented in an accident investigation report, it is the policy of the Hong Kong Marine Department to send a copy of the relevant parts of the draft report to that persons or organization for their comments.

8.2 The draft report of investigation into this accident is also provided to the substantial interesting State for their comment.

8.3 The draft report in its entirety has been sent to the following persons, organization and administration for comments : -

a) the owners / management company of the *vessel*;

b) the Shipping Division (Mercantile Marine Office and Ship Safety Branch) of Hong Kong Marine Department; and

c) the Directorate General of Shipping, Ministry of Shipping, Government of India.

8.4 Submission was received from the owners / management company of the *vessel* and the report has been revised accordingly