





Report of Investigation into the Fatal Accident on board a Container Ship *"HEUNG-A SINGAPORE"* at North West Lamma Anchorage on 23 March 2014



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

29 April 2015

Purpose of Investigation

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

The purpose of this investigation conducted by the Marine Accident Investigation and Shipping Security Policy Branch (MAISSPB) of Marine Department, in pursuant to the Merchant Shipping Ordinance Cap. 281, the Merchant Shipping (Safety) Ordinance (Cap. 369), the Shipping and Port Control Ordinance (Cap. 313), or the Merchant Shipping (Local Vessels) Ordinance (Cap. 548), as appropriate, 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 incidents in the 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.

Table of Contents

Page

1.	Summary	1
2.	Description of theVessels	2
3.	Sources of Evidence	. 4
4.	Outline of Events	5
5.	Analysis	8
6.	Conclusion	14
7.	Recommendations	15
8.	Submission	15

1. Summary

- At about 0130 on 23 March 2014, a dumb steel lighter "FLOATA 97" (*the DSL*), carried
 67 containers of different sizes, was towed from the Stonecutters Island Public Cargo
 Working Area to the North West Lamma Anchorage for loading containers.
- 1. 2 At about 0300, the derrick lighter was moored alongside the container ship "HEUNG-A SINGPORE (*the Vessel*) at the North West Lamma Anchorage. The port side of *the DSL* was secured to the starboard side of *the Vessel*. Cargo works was started shortly after *the DSL* was secured to *the Vessel*.
- The cargo hold of *the DSL* had almost fully stowed with highly stacked containers at both the forward and aft leaving only the mid-section was vacated to receive containers. However, the unevenly distributed containers to one side caused *the DSL* to list to port.
- 1. 4 At about 0345, a container in cargo hold bay no.15 of the *Vessel* was being lifted up by the derrick crane of *the DSL*, the *DSL* then listed further to port resulting in the collapse of containers. Four containers fell onto the deck of *the Vessel* and ten containers fell into the sea.
- 1. 5 At the material time, an able-bodied seaman was working on deck the starboard side of *the Vessel*, he was unfortunately hit and crushed to death by the falling containers.
- 1. 6 The investigation into the accident revealed that the main contributing factors were:
 - i. The containers inside the cargo hold of *the DSL* were not evenly distributed to prevent unduly listing of *the DSL*;
 - ii. The containers inside the cargo hold of *the DSL* were not properly stowed and secured; and
 - i i i. No risk assessment had been conducted prior to the commencement of cargo works.

2. Description of the Vessels

2.1 Particulars of Ocean Going Container Ship "HEUNG-A SINGAPORE"

Port of Registry		Panama		
IMO No.	:	9131060		
Call Sign	:	3ERC6		
Type of Ship		Container Ship		
Shipbuilder	:	HANJIN HEAVY INDUSTRY CO. LTD.		
Year of Built	:	1996		
Name of Ship's Owner	:	GSH2 CONTAINER CARRIER I AS		
Name of Ship's Operator	:	HEUNG-A SHIPPING CO. LTD. SEOUL, KOREA.		
Length	:	140 metres		
Breadth	:	20.5 metres		
Gross Tonnage	:	8,276		
Net Tonnage	:	3,805		
Engine Power	:	6,656 kW		
Main Engine Type	:	Hyundai MAN B&W 5L50MC		
No. of Crew	:	18		



Fig. 1 Ocean Going Container Ship "HEUNG-A SINGAPORE"

2.2 Particulars of Derrick Lighter "FLOATA 97"

Certificate of Ownership No.	:	B21773 V
Type of Ship	:	Dumb Steel Lighter
Year of Built	:	1995
Name of Ship's Owner	:	EASTREND DEVELOPMENT LTD.
Length	:	49.98 metres
Breadth	:	23.30 metres
Gross Tonnage	:	2,720.68
Net Tonnage	:	1,904.48
No. of Person Permitted to Carry	:	6



Fig. 2 Dumb Steel Lighter "FLOATA 97"

3. Sources of Evidence

- 3.1 Statements of the Master and the Second Officer of the Ocean Going Container Ship "HEUNG-A SINGAPORE"
- Statements of the Derrick Operator and two Slingers of the Dumb Steel Lighter "FLOATA 97"
- 3.3 Statement of the Assistant Manager of the Company for operation of the derrick lighter.
- 3.4 Weather Report
- 3.5 Autopsy Report

4. **Outline of Events**

All times are local (UTC + 8)

- 4.1 On 19 March 2014 at about 1100, the Panama registered ocean going container ship "HEUNG-A SINGAPORE" (*the Vessel*) departed from Ulsan, Korea.
- 4. 2 On 22 March 2014 at about 2000, *the Vessel* arrived at Hong Kong and anchored in the North West Lamma Anchorage (*NWLA*) for handling of containers.
- 4. 3 On 23 March 2014 about 0130, a dumb steel lighter "Floata 97" (*the DSL*) was towed from the Stonecutters Island Public Cargo Working Area (*PCWA*) to the *NWLA*. *The DSL* carried 18 twenty-foot (20') and 49 forty-foot (40') fully loaded containers on the passage.
- 4. 4 At about 0300, *the DSL* moored her port side to the starboard side of *the Vessel* at the *NWLA* in position about 22°15.01N 114°06.02E. Shortly afterward, *the DSL* started discharging containers from *the Vessel* into the middle part of her cargo hold as both the forward and the aft of the cargo hold had been loaded with containers (Fig. 3, before loading).
- 4. 5 Containers were loaded into the cargo hold of *the DSL* and stowed on the port side (Fig. 3, after loading).
- 4. 6 At about 0345, a 20' container was lifted up from cargo hold container bay no.15 near the midship of *the Vessel* approximately 2 feet high by the Crane Operator, who was the Person-in-Charge of Works (*PIC*) of *the DSL*. He then halted the lifting for a while to decide the position where the container should be placed in the cargo hold of *the DSL*. When the container was being lifted further up again, *the DSL* listed to her port side and caused almost all the top tier 40' containers at her aft fell onto the cargo hold container bay no. 19 of the Vessel.
- 4. 7 At the material time, an able-bodied seaman (the *victim*) was working on top of a hatch cover at cargo hold container bay no.19, starboard side of *the Vessel*. He was unfortunately crushed by the falling containers. (See Fig. 4)
- 4. 8 At about 0420, the Master of *the Vessel* was informed of the accident. He immediately sounded the general alarm and informed the port authority for assistance. As *the victim* was pressed underneath by two fully-loaded containers, no one was able to offer assistance to him but waited for shore rescue team.



Notes: TEU stands for twenty-foot equivalent unit (20' container) FEU stands for forty-foot equivalent unit (40' container)

Figure 3.: Left hand side showing the mooring arrangement of *the Vessel* and *the DSL*; Right hand side showing the stowage of containers before and after the containers loaded from the *Vessel*.



Fig. 4: *The victim* was crushed under the collapsed containers (Shown by red arrow)

- 4.9 At about 0510, officers from the Police Force, Fire Service Department and Marine Department arrived at the scene. A first aid team from Fire Service Department boarded *the Vessel* to rescue the *victim*.
- 4.10 At about 0623, the containers pressing on *the victim* were removed. He was unconscious and certified dead on board. The body of *the victim* was sent ashore and taken to a hospital at about 0653.

5. Analysis

5.1 General Information of the Master and Crew Members of *the Vessel* and *the DSL*

- 5.1.1 The Master had about 14 years of experience in the capacity of shipmaster. He had been serving as the Master of *the Vessel* for about 2 months. He held a valid national certificate of competency with certificate of recognition issued by the Maritime Authority, Republic of Panama. When the accident occurred, he was in his cabin and did not witness the happenings.
- 5. 1. 2 The Second Officer (2/O) had about 2.5 years of experience at sea. She held a valid national certificate of competency with certificate of recognition issued by the Maritime Authority, Republic of Panama. She had joined *the Vessel* about 9 months and she was promoted to second officer 4 months before the accident.
- 5. 1. 3 The *victim* had served on board *the Vessel* for about 5.5 months as an able bodied seaman. At the time of the accident, he was on duty checking the containers in the cargo hold container bay no.19.
- 5. 1. 4 The Crane Operator of *the DSL*, who was also the *PIC*, had about 25 years of experience in crane operations on board derrick lighters. He held certificates of shipboard cargo handling basic safety training course and shipboard crane operator safety training course valid until 22 May 2014 and 17 Sep 2016 respectively. He also held a works supervisor safety training course certificate in shipboard cargo handling which was issued on 23 Nov 1999.
- 5. 1. 5 The Deputy Crane Operator, who acted as a lighterman on board *the DSL* at the time of the accident, had at least 10 years of experience working on board derrick lighters. He had been employed by the *PIC* since 1 March 2014. He held the certificates of shipboard crane operator training course and shipboard cargo handling basic safety training course valid until 8 Sep 2014 and 21 Aug 2015 respectively. He claimed that at the material time he was at a position not able to witness the accident happened.
- 5. 1. 6 The Slinger had over 10 years of experience working for dumb steel lighters. He had been employed by the *PIC* as a slinger on board *the DSL* for 14 months before the accident. His certificate of shipboard cargo handling basic safety training course was valid until 27 May 2014. He witnessed that *the DSL* had listed to her port side toward *the Vessel* before the accident took place.

5.2 The Lifting Appliance and Lift Gear of *the DSL*

5. 2. 1 *The DSL* was equipped with a derrick crane. There were records on the Register of Lifting Appliances and Lifting Gear showing that the annual thorough examination of the derrick

and its lifting gears of the derrick crane were certified by a competent examiner on 10 August 2013. The last periodic inspection of the lifting gear was done on 1 March 2014 by *the PIC* who acted as a competent person.

5.3 Damage to *the Vessel, the DSL* and Containers

- 5. 3. 1 The four collapsed containers hit the hatch cover and guard rails at cargo hold container bay no.19 of *the Vessel*. There was no apparent damage on the hatch cover, apart from some paint scratches on the hull and deck. The guard rails were seriously damaged by the impact of the falling containers.
- 5. 3. 2 The damage of *the DSL* was minor with small paint scratches at the port side hatchway. A mooring rope which secured between *the Vessel* and *the DSL* was parted. Twist locks and stacking cones for securing the collapsed containers were damaged. The twist-locks and stacking cones were not able to hold the containers from collapsing.

5.4 Stowage of containers

- 5. 4. 1 Details of containers stowage at aft row on board *the DSL* was shown in Fig. 5. In the incident, four containers (marked in grey) fell onto the deck of *the Vessel*; 10 containers (marked in white) fell into water and the others (marked in green) remained inside the cargo hold of *the DSL*.
- 5. 4. 2 The aft row of containers were stacked to six to seven tiers high. While the first and the second tiers containers stowed inside the cargo hold whose side movements could be restrained by the side walls of cargo hold, the containers stacked above would shift due to ship rolling etc. if they were not properly lashed by lashing gears or restrained by twist-locks or stacking cones at the corner castings of the containers.
- 5. 4. 3 The aft row containers remained on board *the DSL* was found not properly stowed after the accident investigation. Most of them, especially those inboard containers, i.e. column B to column F were stacked with insufficient twist locks and stacking cones. As a result, the containers were not stacked in vertical alignment and rendered the weight of the containers being shifted considerably to the secondary structural members (corrugated walls and the attached stiffening members) of the containers but not mainly to the primary structural member (corner posts and side rails) of the containers. The latter were mainly to support the weight of containers as the load carrying capacity of the former was comparably lower. In the accident, some containers' beams and corrugated walls were buckled. Furthermore, when containers stacks were not aligned and failed to be fitted with twist locks and stacking cones, the containers were liable to slip sideways, due to ship movement and rolling etc that induced shear and side forces to the end row container stacks and resulted in the collapse of containers falling over the ship side (i.e. port side in this accident).



Fig. 5: The stowage condition of the aft row containers of *the DSL* (View from aft of *the DSL*)

5.5 Sequence of the Collapse of Containers

5.5.1 The collapsed containers, their identification numbers, original position and the whereabouts after the accident were tabulated below:

		1					
	Identification	Original Position on	Falling Position of the		Weights (kgs)		
No.	Number	the DSL	containers	Gross	Payload/Net	Declared	
A3	FCIU 905509 3	3 th tier, 1 st *	In the sea	32500	n/a	26000	
A4	TCNU 951326 8	4 th tier, 1 st	In the sea	30480	26640	26500	
A5	HALU 561361 8	5 th tier, 1 st	On the deck of the Vessel	30400	26600	26500	
A6	BSIU 929476 8	6 th tier, 1 st	On the deck of the Vessel	32500	28620	28000	
B4	TEMU 722553 4	4 th tier, 2 nd	In the sea	32500	n/a	16530	
B5	NSSU 703657 6	5 th tier, 2 nd	In the sea	n/a	10000	n/a	
B6	NSSU 704370 2	6 th tier, 2 nd	On the deck of the Vessel	30480	26590	8500	
B7	SEQU 444758 9	7 th tier, 2 nd	On the deck of the Vessel	32500	28670	26000	
C5	TEMU 669219 6	5 th tier, 3 rd	In the sea	n/a	n/a	26000	
C6	CAXU 913107 3	6 th tier, 3 rd	In the sea	n/a	n/a	12000	
C7	HALU 550346 2	7 th tier, 3 rd	In the sea	30480	26640	18000	
D6	BMOU 455930 2	6 th tier, 4 th	In the sea	30480	26620	29000	
D7	GESU 687879 1	7 th tier, 4 th	In the sea	n/a	n/a	18000	
E7	HALU 550056 6	7 th tier, 5 th	In the sea	n/a	n/a	22000	

*1st column was counting from the leftmost of the DSL in the rear of her cargo hold.

5.5.2 Fig. 6 showed a container which had been located at column "A" third tier (hereinafter named as A3) was recovered from water after the incident. One of the side walls, beams and posts were badly buckled. It indicated that A3 was not able to support the weight of containers stacked above it and sustained structural failure. Consequently, the containers stacked on top of A3 lost the support from A3, and fell down onto the deck of *the Vessel* after tearing off the connected twist-locks and stacking cones.



Fig. 6: The container A3

- 5.5.3 Although A3 was certified to support a stacked loading of 216,000 kg, which was much higher than the actual weight of the stacked containers weighing about 81,000 kg in total. However, A3 would yield when loading on its structures exceeded its capacity under one or a combination of the following conditions:
 - i) listing of *the DSL* leading to uneven loading on the container structures;
 - iii) improper stacking of containers (misalignment, inadequate lashing, twist-locks and stacking cones etc.) resulted in slipping sideways of containers and leading to uneven loading on the container structures; and
 - iii) dynamic loading of containers stacks due to ship movements arising from cargo operations and ship rolling, leading to increase in loading on the container structures.
- 5. 5. 4 At the time of the accident *the DSL* was further listed to port when a 20' container was being lifted higher up by the derrick crane. The crane operator failed to realize the containers were on the brink of collapse by lifting the weight that caused larger moment arm of the derrick.
- 5. 5. 5 Subsequent to the failure of A3 which led to containers stacked above it in column A

collapsed, the other containers in the inner columns (i.e. columns B, C, D, E and F) that stowed without sufficient fittings of twist locks and stacking cones slipped to port side and fell either, on the deck of *the DSL*, *the Vessel* or overboard.

5.5.6 Four containers fell onto the deck of *the Vessel* and ten containers fell into the sea. *The victim* was crushed to death by the top container at column A (i.e. A6) which was fully loaded with cargo and its maximum weight was indicated as 32.5 tonnes.

5.6 Code of Practice - Shipboard Container Handling on Vessels

5. 6. 1 Uneven loading, improper stowing and securing of containers were common hazards which should be controlled and avoided. It was the responsibility of the *PIC* to conduct a risk assessment for the cargo handling, which should be made to identify any unusual working condition, such as undue listing of *the DSL*, and take suitable control measures for the prevention of the collapse of containers. The risk assessment is required by the Code of Practice – Shipboard Container Handling on Vessels issued by Marine Department in September 2013.

5.7 Fatigue at Work

- 5. 7. 1 On 22 March 2014 at about 0800, the *PIC* had started his work on board *the DSL* for cargo handling with different vessels and at different locations. He had worked for about 20 hours with intermittent breaks of rest (a total of not less than eight hours) before the accident. Particularly, he had taken a continuous rest of about three hours before starting the cargo operation with *the Vessel*. No evidence reflected the accident was caused by the fatigue of the *PIC*.
- 5.7.2 Prior to the accident, the *victim* had worked for about 3.5 hours starting from midnight on 23 March 2014. The *victim* should not have suffered fatigue at work which did not contribute to the accident.

5.8 Weather and Environment

5. 8. 1 An extract of data on the hourly wind direction and mean wind speed recorded at Lamma Island as well as weather condition provided by the Hong Kong Observatory ("HKO") from 0300 to 0400 on 23 March 2014 was shown below:

Time	Wind Direction (8-point)	Wind Speed (km/h)	Weather Condition	Total Rainfall (mm)
0300	East	23	Cloudy	0
0400	East	19	Cloudy	0

5.8.2 According to the witnesses, the workplace was dry with adequate illumination while other weather conditions were generally matched with the data provided by HKO.

5.9 Autopsy Report

5.9.1 The autopsy report indicated the cause of death appeared to be multiple injuries. No significant finding was obtained for the blood and urine by a general screening procedure for common drugs and poisons.

6. Conclusion

- 6. 1 At about 0130 on 23 March 2014, *the DSL*, carried 67 containers of different sizes, was towed from the Stonecutters Island Public Cargo Working Area to the North West Lamma Anchorage for loading containers.
- 6.2 At about 0300, the derrick lighter was moored alongside *the Vessel* at the North West Lamma Anchorage. The port side of *the DSL* was secured to the starboard side of *the Vessel*. Cargo works was started shortly after *the DSL* was secured to *the Vessel*.
- 6. 3 The cargo hold of *the DSL* had almost fully stowed with highly stacked containers at both the forward and aft leaving only the mid-section was vacated to receive containers. However, the unevenly distributed containers to one side caused *the DSL* to list to port.
- 6. 4 At about 0345, a container in cargo hold bay no.15 of *the Vessel* was being lifted up by the derrick crane of *the DSL*, *the DSL* then listed further to port resulting in the collapse of containers. Four containers fell onto the deck of *the Vessel* and ten containers fell into the sea.
- 6. 5 At the material time, an able-bodied seaman was working on deck the starboard side of *the Vessel*, he was unfortunately hit and crushed to death by the falling containers.
- 6. 6 The investigation into the accident revealed that the main contributing factors were:
 - i. The containers inside the cargo hold of *the DSL* were not evenly distributed to prevent unduly listing of *the DSL*;
 - ii. The containers inside the cargo hold of *the DSL* were not properly stowed and secured; and
 - i i i. No risk assessment had been conducted prior to the commencement of cargo works.

7. **Recommendations**

- 7.1 The Person-In-Charge of the Works and the owner of *the DSL* are required to review the procedures for container handling, incorporate risk assessments in order to:
 - ensure that stacked containers are adequately secured by twist-locks, stacking cones and lashing equipment; and
 - ensure the proper stowage of containers on a vessel, its loading capacity and stability must be carefully considered when in planning of works.
- 7.2 A copy of this report should be sent to the Shipping Division of Marine Department for their information and follow-up actions above with the Person-In-Charge of the Works and the owner of *the DSL*.

8. Submission

- 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 Marine Department to send a copy of the draft report, either in part or in its entirety, to that person or organization for their comments.
- 8.2 A copy of the draft report has been provided to the following parties for comments:
 - The flag State of the container vessel "*Heung-A Singapore*";
 - The ship management company and Master of the container vessel "Heung-A Singapore";
 - The owner and the Person-in-charge of the Works of the dumb steel lighter "Floata 97";
 - The Marine Industrial Safety Section of the Marine Department; and
 - The Harbour Patrol Section of the Marine Department.
- 8.3 During the consultation period, the Manager of the *dumb steel lighter* had issued comments. The comments had been properly considered and the report has been amended accordingly.