BSAFE

INCIDENT CASE STUDY

No.5 | MARCH 2021

DOUBLE FATALITY RESULTING FROM ENCLOSED SPACE ENTRY

A BULK CARRIER WAS LOADING LOGS IN PORT MARSDEN, NEW ZEALAND (NZ), WHEN THE CHIEF OFFICER (C/O) ENTERED CARGO HOLD NO.5 WHICH CONTAINED LOGS. UPON ENTRY HE RAPIDLY LOST CONSCIOUSNESS AND FELL FROM THE ENTRANCE LADDER ONTO THE CARGO BELOW **(FIGURE 1).** A FELLOW CREW MEMBER WHO ENTERED THE HOLD TO TRY TO RESCUE THE C/O SUFFERED THE SAME FATE. THEY WERE LATER BOTH PRONOUNCED DEAD AT THE SCENE.

FIGURE 1 NO.5 HOLD AFT ACCESS SHOWING SHOE AND TORCH UNABLE TO BE RECOVERED
SOURCE INVESTIGATION REPORT BY THE TRANSPORT ACCIDENT INVESTIGATION COMMISSION, NEW ZEALAND

WHAT HAPPENED

On 26 April, a handy size bulk carrier arrived at Napier, NZ, where it commenced loading logs with 4,184m³ loaded in hold No. 5. During loading, showers of rain were observed. On 30 April, the ship arrived in Tauranga, NZ where another 963m³ of logs were loaded into cargo hold No.5 to fill it, with further logs loaded on deck at No.5 cargo hatch.

BSAFE

INCIDENT CASE STUDY

No.5 | MARCH 2021

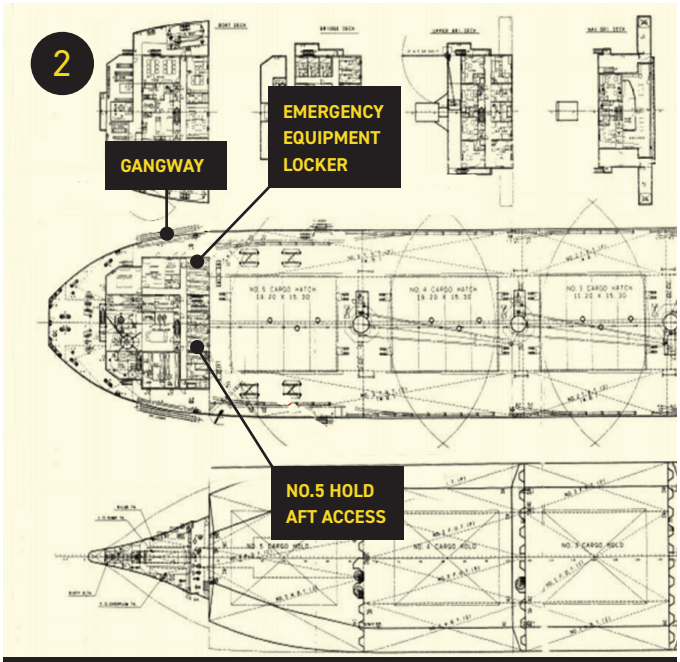

FIGURE 2 LOCATION OF CARGO HOLD NO.5 ENTRANCE.
SOURCE INVESTIGATION REPORT BY THE TRANSPORT ACCIDENT INVESTIGATION COMMISSION, NEW ZEALAND

FIGURE 3 ENTRANCE DOOR TO NO.5 CARGO HOLD AFT
SOURCE INVESTIGATION REPORT BY THE TRANSPORT ACCIDENT INVESTIGATION COMMISSION, NEW ZEALAND

WHAT HAPPENED (CONTINUED)

On arrival in Port Marsden on 2 May, another 11,476m³ of logs were loaded. The logs were to be fumigated on passage to China, and on 3 May, two fumigation officials embarked to carry out a pre-inspection to ensure the ship was compliant for the fumigation. They reported to the master that hatches 1F to 4F had excessive amounts of water visible, which needed to be removed before fumigation could take place, and that the rubber seal on hold No. 5 aft access door **(FIGURE 2)** needed replacing.

The master discussed the matter with the C/O, after which the C/O departed. The master later confirmed that he was unaware of what the C/O's intentions were, as no decisions had been made or orders given.

The C/O was next seen at the port gangway station, where he asked the bosun to follow him to hold No.5. The bosun asked what they were to do and the C/O replied that he wanted to go down into the hold as there was water in it. The bosun asked him twice not to go down due to the unpleasant smell.

The C/O and bosun opened the access hatch **(FIGURE 3)** and the C/O climbed onto the ladder. He then said "OK, no problem" and started to descend. The bosun tried to follow, but after the C/O had descended only 5 or 6 steps down the ladder, he suddenly fell onto the logs below. The bosun immediately alerted the crew at the gangway, then made his way to the aft mooring station to get a rope to retrieve the C/O.

The second officer (2/O) was at the gangway and alerted the master by radio. He then fetched a breathing apparatus (BA) set from the emergency equipment locker and also oxygen from the ship's hospital. An able seaman (AB) ran into the accommodation to alert the third officer (3/O) in the ship's office, then tried to follow the AB to the incident site. However, the AB disappeared from view, so the 3/O instead went to hold No.4, where he met the master. Both were unsure of where the incident had occurred, but then heard on the radio that it was at hold No.5 aft access and proceeded there.

CONTINUED ON NEXT PAGE

BSAFE

INCIDENT CASE STUDY

No.5 | MARCH 2021

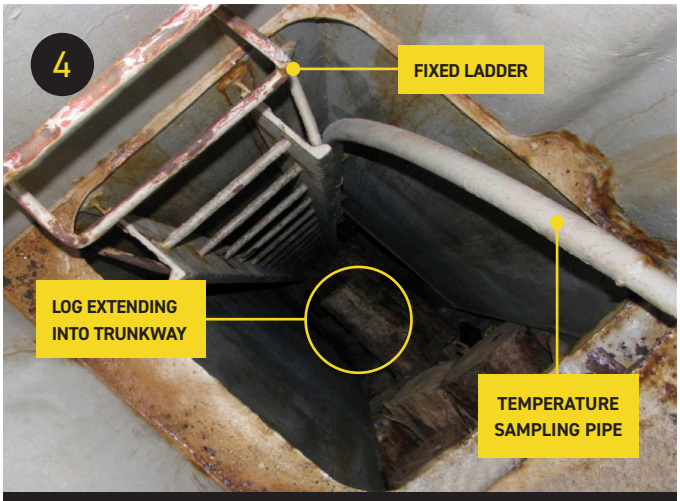

FIGURE 4 NO.5 AFT HOLD LADDER FROM INSIDE HOLD ENTRANCE DOOR
SOURCE INVESTIGATION REPORT BY THE TRANSPORT ACCIDENT INVESTIGATION COMMISSION, NEW ZEALAND

FIGURE 5 EEBD USED DURING THE RESCUE
SOURCE INVESTIGATION REPORT BY THE TRANSPORT ACCIDENT INVESTIGATION COMMISSION, NEW ZEALAND

WHAT HAPPENED (CONTINUED)

The bosun returned to the access and found the AB, who had alerted the 3/O, climbing down into the hold with another crew member about to follow. The bosun managed to prevent the latter from entering but heard the AB fall. Looking down he noticed him lying, apparently unconscious, on top of the C/O.

The master arrived at the scene and instructed the 3/O to fetch a BA set and instructed the bosun and a crew member to raise the alarm. The master then went to the wheelhouse to activate the general alarm. On his way he informed the fumigation officials, who called the local emergency services to request an ambulance and also alerted port security. The fumigation officials then went on deck to offer assistance.

The 3/O returned and put on the BA set, tied the rescue rope around his waist and entered the hold. He was able to tie the rope around the C/O, who was then hauled onto deck with the 3/O pushing from below. One of the fumigation officials then began cardiopulmonary resuscitation (CPR) on the C/O.

As the 3/O was too exhausted to attempt to rescue the AB, the first engineer (1/E), who had by now arrived, put on the other BA set and entered the access hatch and descended down to the hold. However, the BA set prevented him manoeuvring past a protruding log ((**FIGURE 4**) so he exited the hold and instead put on an emergency escape breathing device (EEBD) (**FIGURE 5**), then re-entered. When he got to the AB, he noticed what he thought were signs of life. He took off his EEBD mask and placed it momentarily on the AB to try to revive him. He then replaced his mask and managed to attach the rescue rope to the AB, who was hauled onto deck. As the 1/E was nearing the top of the access ladder his EEBD ran low on compressed air, and he had to be hauled out. When he reached the upper deck, he was suffering from asphyxia.

Ambulance staff arrived and tried to resuscitate the C/O and the AB, but both were pronounced dead at the scene. The ambulance staff also administered oxygen to the 1/E, and he was airlifted to the nearest hospital. However, he was discharged later that day and returned to the ship.

LESSONS LEARNED ON NEXT PAGE

BSAFE

INCIDENT CASE STUDY

No.5 | MARCH 2021

LESSONS LEARNED

THE FOLLOWING LESSONS LEARNED HAVE BEEN IDENTIFIED. THESE ARE BASED ON THE INFORMATION AVAILABLE IN THE INVESTIGATION REPORT AND ARE NOT INTENDED TO APPORTION BLAME ON THE INDIVIDUALS OR COMPANY INVOLVED:

- Testing of the hold atmosphere after the incident revealed that the oxygen level 3 metres down the ladder was as low as 3%. This would have only supported useful consciousness for 9 to 12 seconds, rapidly followed by total unconsciousness and death within 5 minutes[1].
- According to the autopsy reports, the C/O and the AB died from asphyxia due to oxygen deprivation, which was consistent with the depleted level of oxygen in the cargo hold.
- Oxygen levels in the cargo hold would have been depleted by organic decomposition of the logs, while toxic gases such as CO, CO_2 and H_2S may also have been present, a phenomena well-known to the shipping industry and documented in the ship's cargo-handling procedures.
- The ship's safety management manual referred to the dangers associated with the cargo and the procedures to be taken if entering an enclosed space. This tragic incident should have been prevented if the C/O had followed these procedures. This included ensuring that any such space has been adequately ventilated and the atmosphere properly tested before entering.
- As a dedicated log carrier, the risk of death by entering a hold containing logs and the rescue process should have been high on the ship's training programme. No evidence could be found of such a drill or training having been performed during the previous 3 months. Regular and effective enclosed space drills and training are key to ensuring awareness and preparedness.
- The investigation could not establish what enclosed space training the deceased AB had received. It is also possible that he did not realise that the C/O had lost consciousness due to the atmosphere, as the entrance had been left unattended after the initial incident.
- The reason why the experienced C/O ignored the bosun's warnings and entered the hold could not be established. An effective Stop Work Authority program would have supported the bosun.
- The onboard rescue response was not well coordinated or practised, taking 15 to 20 minutes to remove the bodies from the hold and attempt resuscitation. Given the survival time in the atmosphere, any rescue attempt would have had to have been immediate and efficient.
- EEBDs are designed only to be used while escaping a hazardous atmosphere and should not be used to enter an oxygen deficient space.

[1]Griffiths R, 2011, adapted from Fundamentals of Aerospace Medicine 4th Edition 2008

CONTACT

For more information on this incident email losprevention@tindallriley.com

THIS CASE STUDY IS DRAWN FROM THE INVESTIGATION REPORT 10-201 PUBLISHED BY THE TRANSPORT ACCIDENT INVESTIGATION COMMISSION, NEW ZEALAND AT:
https://www.taic.org.nz/sites/default/files/inquiry/documents/10-201%20Final%20Version.pdf