

**Extracts from
The United Kingdom
Merchant Shipping
(Accident Reporting and
Investigation) Regulations
2012**

Regulation 5:

“The sole objective of a safety investigation into an accident under these Regulations shall be the prevention of future accidents through the ascertainment of its causes and circumstances. It shall not be the purpose of such an investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame.”

Regulation 16(1):

“The Chief Inspector may at any time make recommendations as to how future accidents may be prevented.”

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NOTE

This bulletin is not written with litigation in mind and, pursuant to Regulation 14(14) of the Merchant Shipping (Accident Reporting and Investigation) Regulations 2012, shall be inadmissible in any judicial proceedings whose purpose, or one of whose purposes is to attribute or apportion liability or blame.

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Working in refrigerated salt water tanks

Fatal enclosed space accident on board the fishing vessel

Sunbeam (FR487)

at Fraserburgh, United Kingdom

on 14 August 2018



MAIB SAFETY BULLETIN 4/2018

This document, containing safety lessons, has been produced for marine safety purposes only, based on information available to date.

The Merchant Shipping (Accident Reporting and Investigation) Regulations 2012 provide for the Chief Inspector of Marine Accidents to make recommendations at any time during the course of an investigation if, in his opinion, it is necessary or desirable to do so.

The Marine Accident Investigation Branch is carrying out an investigation into a fatal enclosed space accident on board the fishing vessel *Sunbeam* on 14 August 2018.

The MAIB will publish a full report on completion of the investigation.



Andrew Moll
Chief Inspector of Marine Accidents

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BACKGROUND

Sunbeam (**Figure 1**) was a 56m UK registered pelagic trawler. Its home port was Fraserburgh, Scotland, and it was typically manned by a crew of eleven. In the weeks prior to the accident, it had been fishing for herring in the North Sea and landing its catch in Lerwick, Shetland. The vessel had nine refrigerated salt water (RSW) tanks for storing its catch.

On 10 August 2018, *Sunbeam* arrived at Fraserburgh. It had caught and landed its seasonal quota of herring and was being prepared for a planned refit period. During the refit the vessel's owner intended to replace *Sunbeam*'s refrigeration plant.



Figure 1: FV *Sunbeam*

INITIAL FINDINGS

At about 0900 on 14 August, *Sunbeam*'s crew arrived at the vessel's berth ready to begin work. The vessel's refrigeration plant had been shut down after landing the final catch at Lerwick, and its RSW tanks had been pumped out and tank lids opened in preparation for deep cleaning. At some time between 1200 and 1350, *Sunbeam*'s second engineer entered the aft centre RSW tank (**Figure 2**) and collapsed.

At about 1350, the second engineer was seen lying unconscious at the aft end of the tank by a crewmate, who immediately raised the alarm. Three of the vessel's crew entered the tank and tried to resuscitate the second engineer but they soon became dizzy, confused and short of breath. One of the crew managed to climb out of the tank unaided, the other two crewmen and the second engineer were recovered onto the open deck by two crewmen wearing breathing apparatus. The two crewmen made a full recovery, but the second engineer could not be resuscitated and died.

It is unclear when and why the second engineer entered the tank. However, evidence indicated that his intention was to sweep the residual seawater that had settled at the aft end of the tank forward in to the tank's bilge well. No safety procedures for entering or working in RSW tanks had been completed before he entered the tank.



Figure 2: Aft centre RSW tank

Tests of the atmosphere in the tank following the accident showed that the level of oxygen at the bottom was less than 6% (normal level should be 20.9%). Further tests of both the tank atmosphere and residual water samples showed the presence of Freon R22, the refrigerant gas used in the RSW tank's refrigeration plant.

The MAIB's initial investigation identified that the refrigeration plant sea water evaporators had suffered several tube failures resulting in a number of repairs (**Figure 3**). It is likely that the refrigerant leaked through one or more failed tubes into the seawater system, and was released into the RSW tank. Freon R22 is four times heavier than air so it will displace oxygen at the bottom of an enclosed space, such as an RSW tank. It is a toxic, tasteless and mostly odourless gas. If it is deeply inhaled, it can cut off vital oxygen to blood cells and lungs.

SAFETY LESSONS

The RSW tanks on board *Sunbeam* were, by design, enclosed spaces that did not have a fixed means of positive ventilation. Such spaces can become dangerously hazardous to life. The atmosphere in the tanks can become oxygen deficient through the effects of corrosion, or toxic through the decomposition of sludge or fish, or, as in this case, the accidental release of gas. Other hazards, such as flooding and heat exhaustion can also be a threat to life.

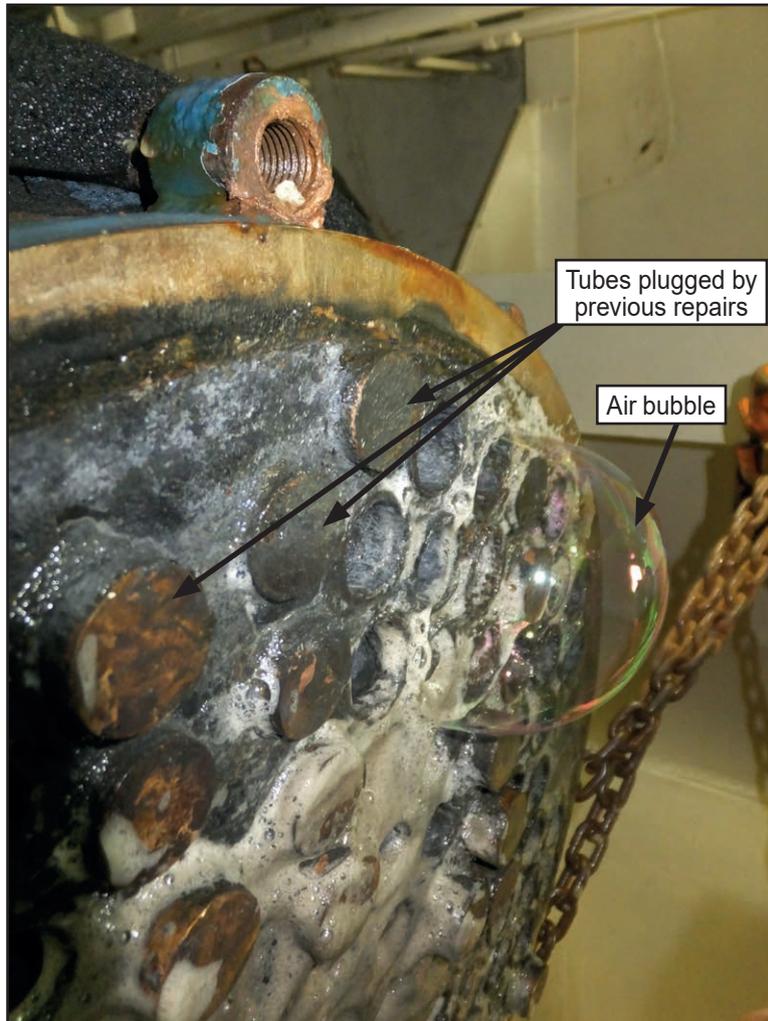


Figure 3: Starboard evaporator tube leak

It is the responsibility of vessel owners/operators to ensure that suitable measures are taken to safeguard the crew. All work activities should be subject to risk assessment and safe systems of work should be put in place. Working in enclosed spaces is particularly hazardous, and procedures for entering and working in them should be robust and understood. Similarly, rescue plans need to be put in place and fully understood and should be practised.

Widely recognized safety controls for working in enclosed spaces include:

- Atmosphere testing.
- Provision of positive ventilation.
- Safety sentry at entry point.
- Breathing apparatus available for rescue team.
- Safety harness and means of recovering an unconscious person.

It is also the responsibility of crew members to behave in a safe manner. This is particularly important when working alone.

This was a tragic accident, which nearly resulted in multiple fatalities. The crew did not appreciate the levels of risk they were taking, even after the second engineer had collapsed. The Maritime and Coastguard Agency provides further guidance in its Marine Guidance Note MGN 309 (F) Fishing vessels: the dangers of enclosed spaces, and the Fishermen's Safety Guide. The findings from an investigation into a similar accident on board the pelagic trawler *Oileán An Óir*, in Ireland in 2015, which resulted in two fatalities, also highlight the potential dangers of RSW tanks.¹

RECOMMENDATION

Sunbeam's owners are recommended to:

S2018/129 Conduct risk assessments specifically for entering and working in RSW tanks and provide safe operating procedures for its crew to follow and appropriate levels of safety equipment to use.

Safety recommendations shall in no case create a presumption of blame or liability

¹ The Department of Transport, Tourism and Sport in Ireland issued Marine Notice No.43 of 2016.