MAIB
MARINE ACCIDENT INVESTIGATION BRANCH

SAFETY BULLETIN

SB1/2022 MARCH 2022

**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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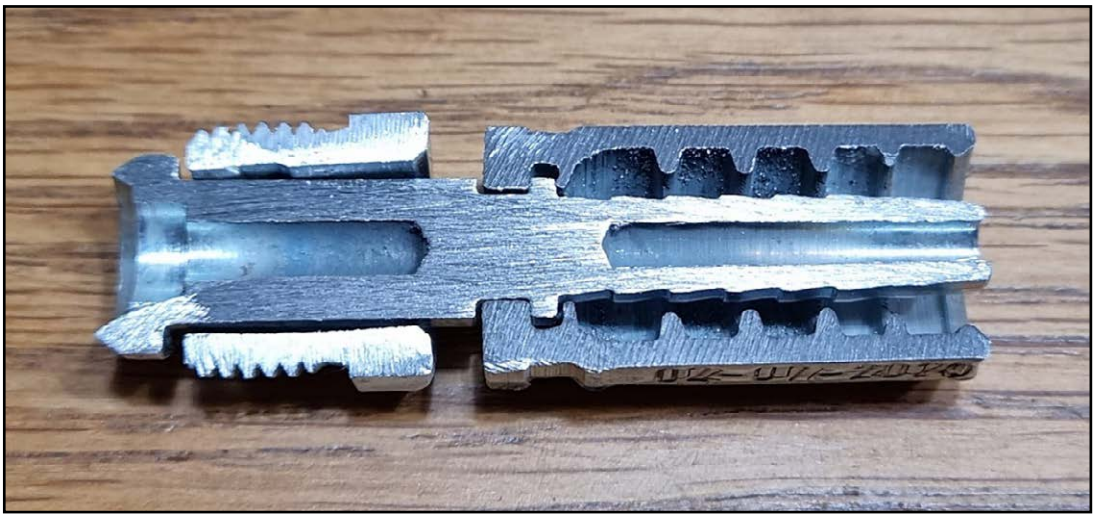
# Blockage of fixed $CO_2$ fire extinguishing system pilot hoses identified following a fire on board the roll-on/roll-off cargo ship *Finnmaster* in Hull, England on 19 September 2021



Section through blocked $CO_2$ pilot hose coupling showing incomplete bore through the stem

# MAIB SAFETY BULLETIN 1/2022

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

*The Merchant Shipping (Accident Reporting and Investigation) Regulations 2012* provides for the Chief Inspector of Marine Accidents to make recommendations or to issue safety lessons 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 the fire on board the roll-on/roll-off cargo ship *Finnmaster* in Hull, England, on 19 September 2021.

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

**Captain Andrew Moll**
**Chief Inspector of Marine Accidents**

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**This bulletin is also available on our website: www.gov.uk/maib**
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## BACKGROUND

On 19 September 2021, a fire broke out in the auxiliary engine room on board the Finland registered roll-on/roll-off cargo ship *Finnmaster* while departing Hull, England. The crew contained the fire and discharged the machinery space's carbon dioxide ($CO_2$) fire extinguishing system. Only half of the assigned $CO_2$ cylinders discharged, and the crew had to re-enter the space wearing breathing apparatus to fully extinguish the fire.

*Finnmaster* was operated by Finnlines Oyj (Finnlines) and was equipped with a fixed high-pressure $CO_2$ fire extinguishing system that provided protection for the ship's machinery spaces, encompassing the main engine room and the auxiliary engine room, and the two cargo holds. The system was designed to be activated remotely via a network of pilot lines and gas activated cylinder valves **(Figure 1)**.

## INITIAL FINDINGS

The initial MAIB investigation identified that one of the auxiliary engine room's $CO_2$ system pilot hoses was completely blocked. Subsequent examination and testing of *Finnmaster*'s fixed fire extinguishing systems identified two other hoses on the cargo hold pilot line system that were blocked. Radiographic images taken of the blocked hoses **(Figures 2** and **3)** showed that the pilot hose couplings had not been fully bored through during the manufacturing process. The testing process also identified several coupling leaks in the pilot lines.

In March 2021, the pilot hoses had been replaced during a routine service conducted on board *Finnmaster* by the marine fire service section of Viking Life-Saving Equipment Oy Finland (Viking). The tests carried out by Viking during the service did not identify any faults with the system. Following the accident, Viking tested the high-pressure $CO_2$ fire extinguishing systems on board the remainder of the Finnlines fleet and identified two similar pilot hoses that were blocked on one of the operator's ships.

All the affected hose assemblies had been supplied to Viking by Geeve Hydraulics B.V. (Geeve), based in the Netherlands. The hose assemblies had been produced under the terms of the classification society type approval held by Geeve. Although the type approval required each completed hose assembly to be pressure tested, there was no specific test that gas could pass freely through the hose assemblies.

The hose used in the assemblies was provided in accordance with the type approval held by Geeve. However, Geeve had purchased the couplings from HSR Hydraulics B.V. in the Netherlands, who had sourced the couplings from a different manufacturer.

## SAFETY ISSUES

Safety issues identified during the initial stages of the investigation included:

- The quality assurance processes of the pilot hose assembly supplier did not identify that the hose couplings had not been fully bored through.
- Viking's onboard installation testing processes did not identify both that some of the hose assemblies were blocked and that there were leaks in the $CO_2$ system pilot lines.

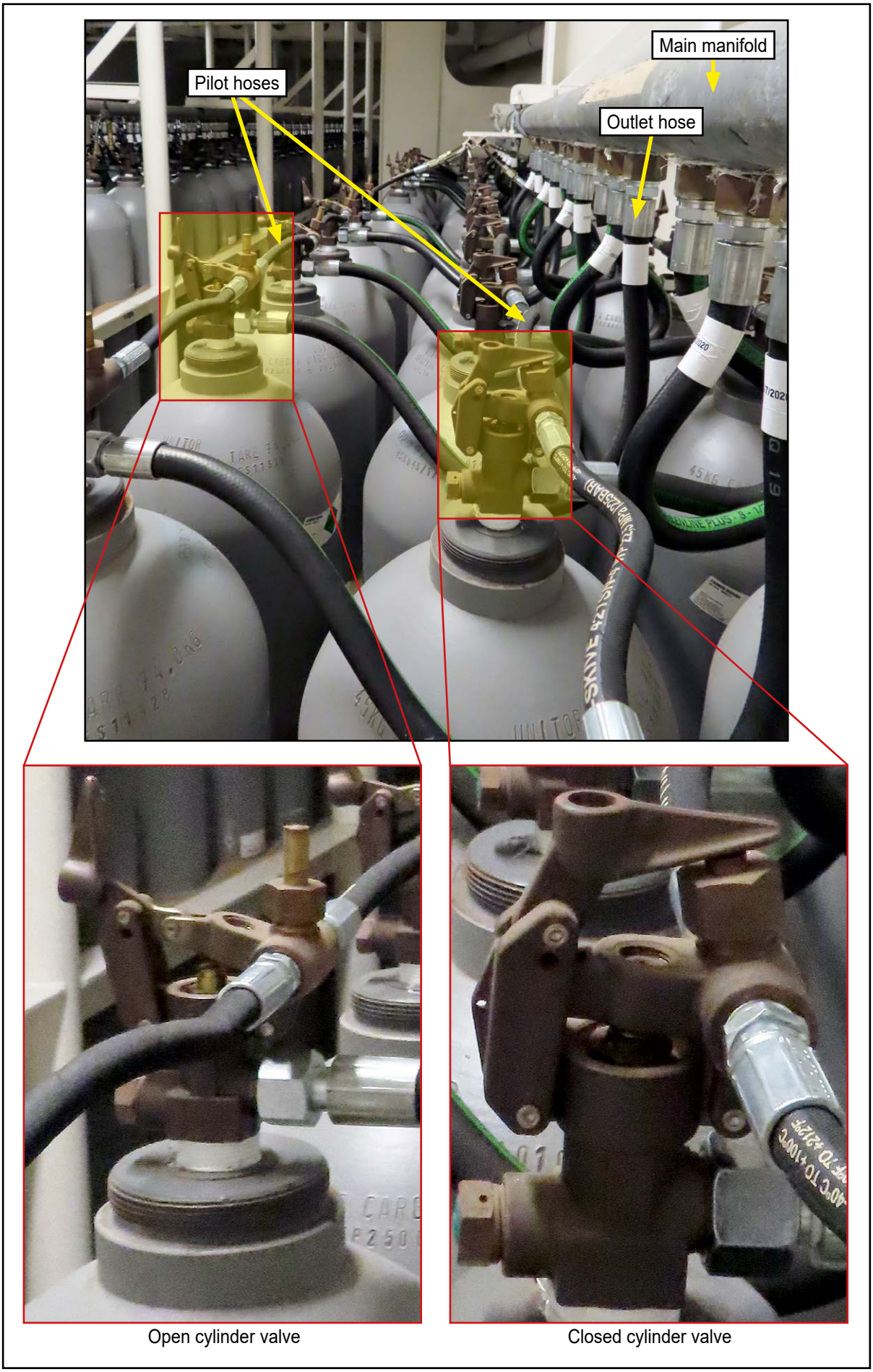


**Figure 1:** Part of the *Finnmaster* $CO_2$ fire extinguishing system post-accident

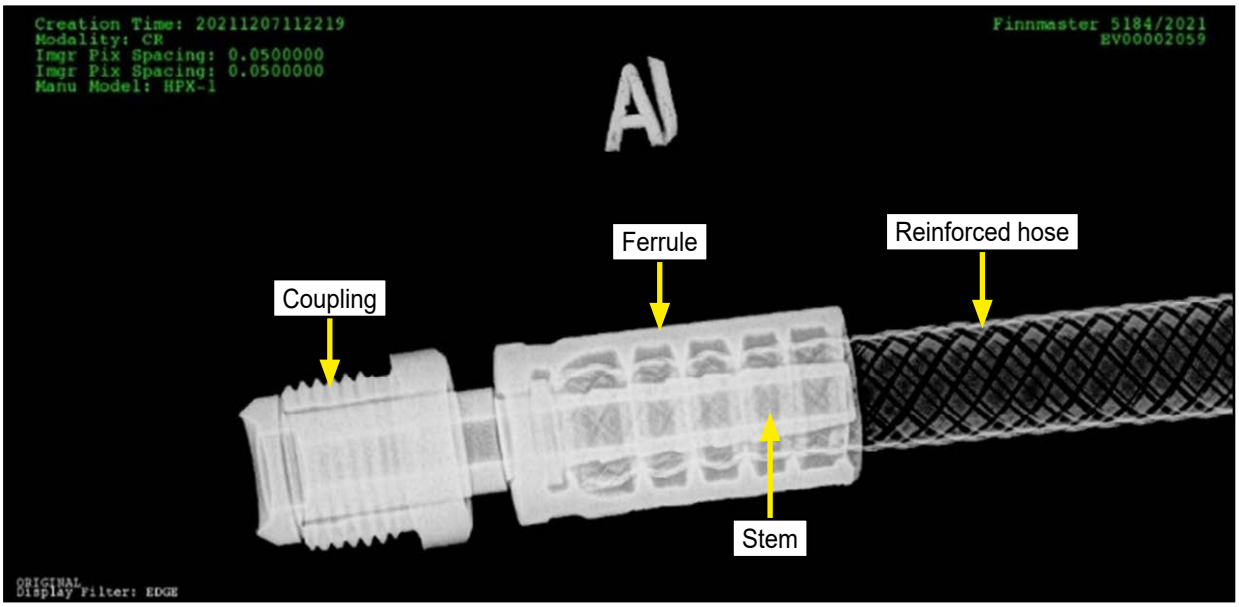


**Figure 2:** $CO_2$ pilot hose coupling, showing clear passage through the stem

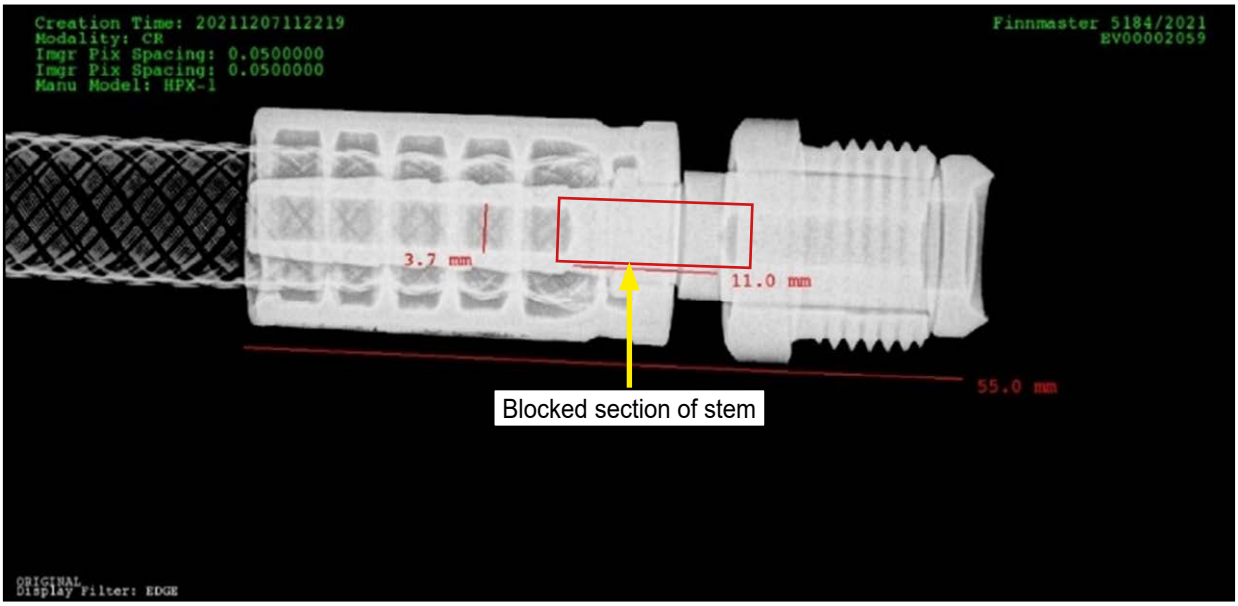


**Figure 3:** $CO_2$ pilot hose coupling, showing incomplete bore through the stem

## ACTION TAKEN BY THE MAIB

The **MAIB** has:

Contacted the companies identified as having been supplied with the affected hose assemblies to make them aware that these assemblies may be blocked and to recommend that they take immediate remedial action in accordance with recommendation S2022/107M, as detailed below.

## ACTIONS TAKEN BY OTHER ORGANISATIONS

**Geeve Hydraulics B.V.** has:

- Discontinued the supply of the affected hose assemblies.
- Amended its testing procedure to incorporate a pneumatic flow test of the complete hose assemblies to verify that they are not blocked.

**Finnlines Oyj** has:

Issued instructions to its fleet to ensure that crews on board its vessels are fully acquainted with the procedures for the manual activation of $CO_2$ fire extinguishing systems in the event of the pilot actuation system failing.

**Viking Life-Saving Equipment Oy Finland** has:

Amended its procedures for the servicing of high-pressure $CO_2$ systems to incorporate a positive test for blockages of the pilot system pipework. It has also issued a health and safety awareness notice highlighting the issues identified.

## RECOMMENDATIONS

**Geeve Hydraulics B.V.** is recommended to:

S2022/105 Provide a copy of this safety bulletin to all customers supplied with hose assemblies fitted with couplings supplied by HSR Hydraulics B.V. that do not meet the required type approval, and draw attention to the safety issues raised and the need for immediate action to identify and rectify any defects found in safety critical systems.

S2022/106 Amend its purchasing and quality control procedures to ensure that hose assembly components are procured in accordance with the relevant type approval requirements.

**All companies identified as having been supplied with the affected hose assemblies by Geeve Hydraulics B.V., with couplings sourced from HSR Hydraulics B.V.**, are recommended to:

S2022/107M Take immediate remedial action to identify and rectify any blocked pilot hose assemblies and pilot system leaks on potentially affected $CO_2$ fire extinguishing systems.

## REQUEST FOR INFORMATION

To assist this investigation, it is requested that service providers, owners and operators pass details of any blocked pilot system hose assemblies that they find to the MAIB.

Email maib@dft.gov.uk with the title '$CO_2$ Pilot System Hose Assembly Issues' and include the name of the vessel, the date and place of installation of the affected hose assemblies, and details of the defects identified.

This information is for internal use only and will be treated in strict confidence.

**Issued March 2022**