



Office of Transport Safety Investigations

FERRY SAFETY INVESTIGATION

ENGINE ROOM FIRE ON BOARD *FANTASEA SPIRIT*
KISSING POINT SYDNEY HARBOUR

8 MAY 2016



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Published by: The Office of Transport Safety Investigations
Postal address: PO Box A2616, Sydney South, NSW 1235
Office location: Level 17, 201 Elizabeth Street, Sydney NSW 2000
Telephone: 02 9322 9200
Accident and incident notification: 1800 677 766
Facsimile: 02 9322 9299
E-mail: info@otsi.nsw.gov.au
Internet: www.otsi.nsw.gov.au

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THE OFFICE OF TRANSPORT SAFETY INVESTIGATIONS

The Office of Transport Safety Investigations (OTSI) is an independent NSW agency whose purpose is to improve transport safety through the investigation of incidents and accidents in the rail, bus and ferry industries. OTSI investigations are independent of regulatory, operator or other external entities.

Established on 1 January 2004 by the *Transport Administration Act 1988 (NSW)*, and confirmed by amending legislation as an independent statutory office on 1 July 2005, OTSI is responsible for determining the contributing factors of accidents and to make recommendations for the implementation of remedial safety action to prevent recurrence. Importantly, however, OTSI does not confine itself to the consideration of just those matters that contributed to a particular accident; it also seeks to identify any transport safety matters which, if left unaddressed, might contribute to other accidents.

OTSI's investigations are conducted under powers conferred by the *Transport Administration Act 1988 (NSW)* and *Passenger Transport Act 1990 (NSW)*. Additionally, all OTSI publications that are considered investigation reports are also conferred by these Acts. OTSI also conducts rail investigations on behalf of the Australian Transport Safety Bureau under the *Transport Safety Investigation Act 2003 (Cwlth)*. OTSI investigators normally seek to obtain information cooperatively when conducting an accident investigation. However, where it is necessary to do so, OTSI investigators may exercise statutory powers to interview persons, enter premises and examine and retain physical and documentary evidence.

It is not within OTSI's jurisdiction, nor an object of its investigations, to apportion blame or determine liability. At all times, OTSI's investigation reports strive to reflect our balanced approach to the investigation, in a manner that properly explains what happened, and why, in a fair and unbiased manner.

Once OTSI has completed an investigation, its report is provided to the NSW Minister for Transport and Infrastructure for tabling in Parliament. The Minister is required to table the report in both Houses of the NSW Parliament within seven days of receiving it. Following tabling, the report is published on OTSI's website at www.otsi.nsw.gov.au.

CONTENTS

TABLE OF PHOTOGRAPHS	ii
TABLE OF FIGURES	ii
ACRONYMS AND ABBREVIATIONS	ii
GLOSSARY OF TERMS	iii
EXECUTIVE SUMMARY	iv
PART 1: FACTUAL INFORMATION	1
Incident Overview	1
Ferry	2
Ferry Crew	2
Incident Location	3
PART 2: ANALYSIS	4
Damage	4
Examination and Ignition Source of the Fire	4
Other Safety Issues	9
PART 3: FINDINGS	12
Remedial Actions	12
PART 4: RECOMMENDATIONS	13

TABLE OF PHOTOGRAPHS

Photograph 1:	<i>Fantasea Spirit</i>	2
Photograph 2:	Damage to port engine room	4
Photograph 3:	Fire damage near exhaust	5
Photograph 4:	Exhaust lagging removed	6
Photograph 5:	Removed section of exhaust	7
Photograph 6:	Hole in hydraulic pipeline	7
Photograph 7:	Uncapped hydraulic lines under steering position	8
Photograph 8:	Fire damage to air intake filter	9
Photograph 9:	Port Engine room fire suppression activation	10
Photograph 10:	Fire suppression cylinder	10

TABLE OF FIGURES

Figure 1:	Kissing Point Wharf	3
Figure 2:	Plan view of cylinder	11

ACRONYMS AND ABBREVIATIONS

AMSA	Australian Maritime Safety Authority
DIP	Directly Involved Party
GPH	General Purpose Hand
HCF	Harbour City Ferries
MED III	Certificate of Competency as a Marine Engine Driver Grade 3
OTSI	The Office of Transport Safety Investigations
PANSW	Port Authority New South Wales
RMS	Roads and Maritime Services
SMS	Safety Management System
VTs	Vessel Traffic Service

GLOSSARY OF TERMS

Ferry	A vessel designed and surveyed to carry passengers for payment or reward.
Port	The left hand side of a vessel when looking forward from the stern. The side where a red light is exhibited at night.
Starboard	The right hand side of a vessel when looking forward from the stern. The side where a green light is exhibited at night.
Survey Class	The figure in a Survey Class designation identifies the type of vessel e.g., “1” identifies the vessel as passenger carrying. The letter defines the permitted area of operation: A = unlimited offshore operation; B = offshore operation to 200 nautical miles seaward of the coast; C = restricted offshore operations up to 30 nautical miles seaward of the coast; D = sheltered operations (partially smooth water operations); and E = sheltered waters (smooth water operations).
Vessel Traffic Service (VTS)	VTS is a marine traffic control system, similar in concept to air traffic control, which uses information from radar, closed circuit television, a vessel’s automatic identification system and VHF radio to provide active monitoring and navigational advice to vessels. It is “ <i>a service designed to improve the safety and efficiency of vessel traffic and to protect the environment. The service should have the capability to interact with the traffic and to respond to traffic situations developing in the VTS area.</i> ” (IMO Resolution A.857 (20))

EXECUTIVE SUMMARY

At 2020 on 8 May 2016, a fire occurred in the port engine room of the ferry *FantaSea Spirit*. Seven passengers were about to disembark at the Kissing Point ferry wharf at the time of the fire. The crew attended to the fire with the onboard fire-fighting equipment. Emergency services also responded to the fire.

OTSI determined that flammable oil leaked onto a hot exhaust pipe and ignited a fire in the port engine room. The incorrect installation of the onboard fixed fire suppression system hampered the crew's initial response to the fire.

OTSI has made a number of recommendations to ferry operators and marine industry bodies with respect to the management of redundant systems and maintenance of fire suppression systems. Refer to Parts 3 and 4 of this report for further details.

PART 1: FACTUAL INFORMATION

Incident Overview

- 1.1 At 2020 on 8 May 2016, the Riverside Marine ferry *FantaSea Spirit* had an onboard fire while disembarking seven passengers at the Kissing Point ferry wharf on the Parramatta River. *FantaSea Spirit* was on charter to Harbour City Ferries (HCF). The master was alerted by a fire alarm in the ferry's port engine room. The crew and passengers had also observed black smoke emanating from the same location.
- 1.2 The crew immediately secured the ferry to the wharf and disembarked all passengers. The crew closed fuel feed lines, closed the engine air intakes vents and turned off the engine room ventilation fans. The crew carried out boundary cooling of the area surrounding the port engine room using an onboard fire hose until the arrival of the Fire and Rescue NSW. The master attempted to activate the ferry's emergency fire suppression unit, however, this system failed to discharge.
- 1.3 The master notified Sydney Ports VTS and HCF Control of the emergency by VHF radio. Fire and Rescue NSW, NSW Water Police and Port Authority NSW fire tugs were notified by VTS and all attended. Roads and Maritime Services (RMS), and the OTSI Duty Officer were also advised of the incident.
- 1.4 With the fire extinguished, the ferry was towed under NSW Water Police escort to the RMS holding wharf at Rozelle Bay. The ferry was secured and quarantined pending further examination on 9 May 2016.

Ferry



Photograph 1: *FantaSea Spirit* (Image courtesy of Fantasea Cruising)

- 1.5 *FantaSea Spirit* is a 23.85 metre aluminium catamaran and was built in 2001 by New Wave Catamarans in Queensland. The ferry is powered by two 433kW Cummins diesel engines (one in each hull) and utilises conventional drive to provide main propulsion. The ferry was in current survey as Category 1D and 1E and licenced to carry 222 passengers including crew (Survey Number 22241).
- 1.6 The ferry is owned by Riverside Marine and was operated by FantaSea Cruising NSW.

Ferry Crew

- 1.7 In accordance with the ferry's survey requirements, the ferry was crewed with a Master 5 and two General Purpose Hands.
- 1.8 The actions of the master and crew upon receiving the fire alarm were prompt and effective. The crew performed in accordance with procedures set down in the ferry's Safety Management System (SMS).
- 1.9 The master and crew had regularly carried out emergency drills and had completed their most recent fire drill on 19 April 2016.

Incident Location

- 1.10 The incident occurred in close proximity to the Kissing Point ferry wharf, downstream on the Parramatta River, which feeds into Port Jackson.

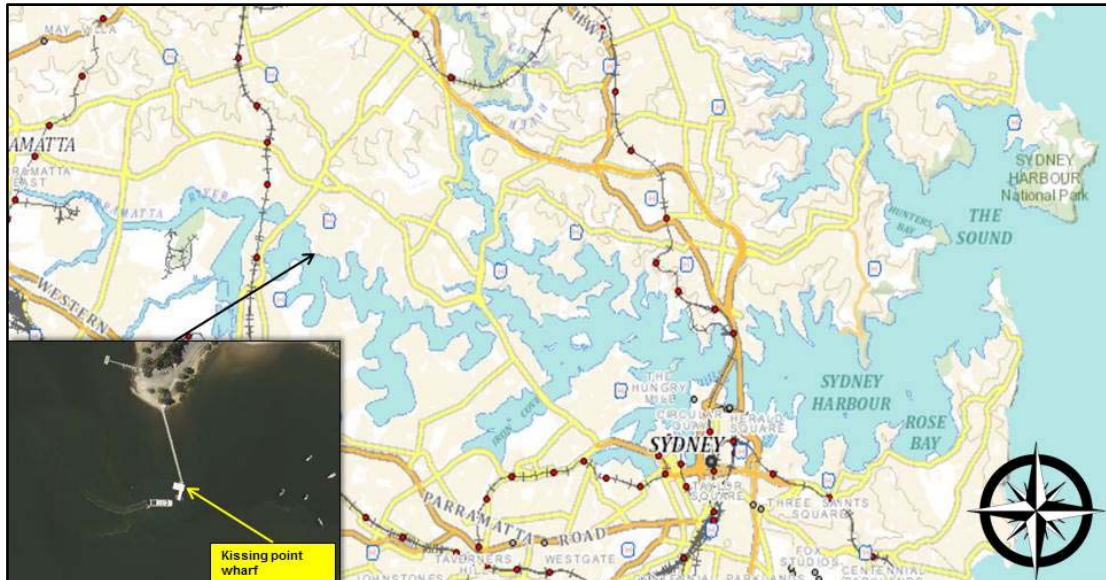


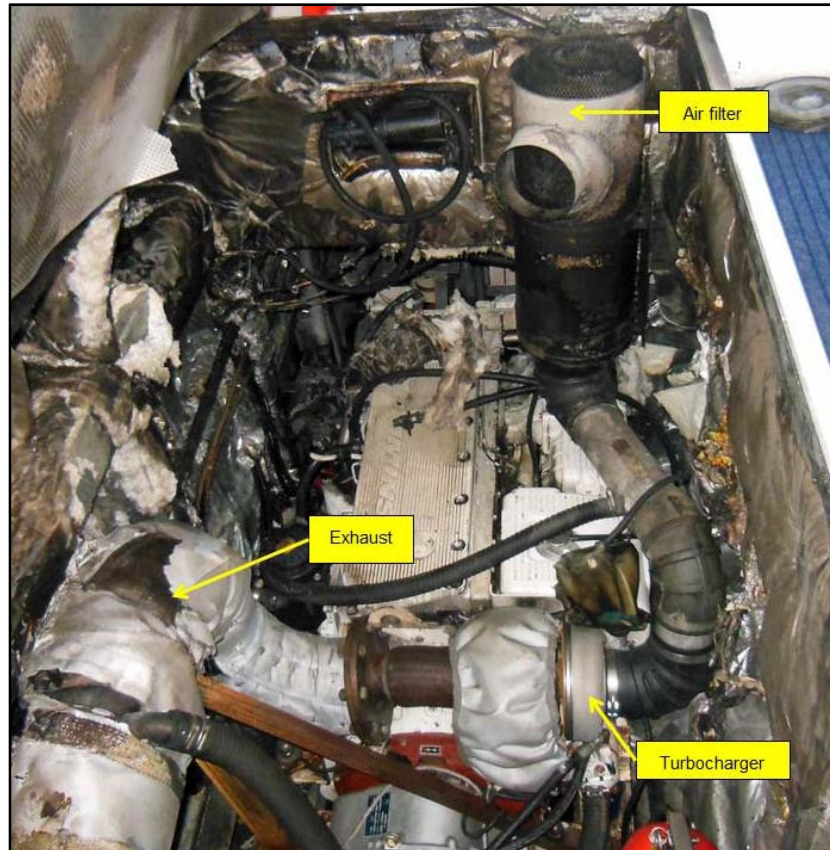
Figure 1: Kissing Point wharf

- 1.11 The investigation examined the ferry and the communication recordings captured by the PANSW VTS and HCF Control. OTSI interviewed the master of *FantaSea Spirit* and a volunteer officer of Fire and Rescue NSW who attended the incident. The volunteer fire officer was also a RMS Surveyor.
- 1.12 The ferry's Safety Management System, maintenance and servicing records, crew emergency drills records and training records were also examined.
- 1.13 Investigators from OTSI examined the ferry at the RMS complex at Rozelle Bay on 9 May 2016. OTSI was accompanied by an RMS investigator, and the Operations Manager and QHSE Superintendent of FantaSea Cruising NSW.

PART 2: ANALYSIS

Damage

- 2.1 Damage was restricted solely to the port engine room of the ferry. The port engine air intake filter had received fire damage. The port cooling reservoir, sullage pump and wiring loom in close proximity to the air intake filter had been destroyed by fire. (See Photograph 2)



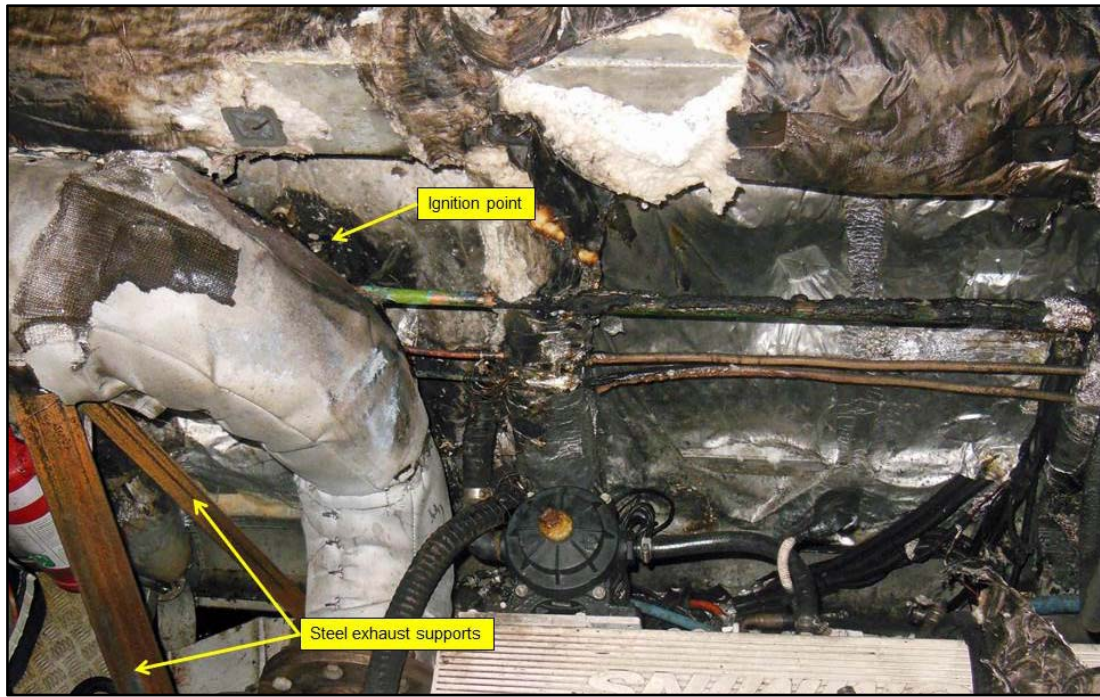
Photograph 2: Damage to port engine room

- 2.2 Additionally, there was fire damage to the exhaust pipe, exhaust lagging and a hose feeding engine gas from the rocker cover to the air intake near the turbocharger. The engine gearbox and turbocharger were intact, although there was minor wiring damage close to the exhaust and air filter.

Examination and Ignition Source of the Fire

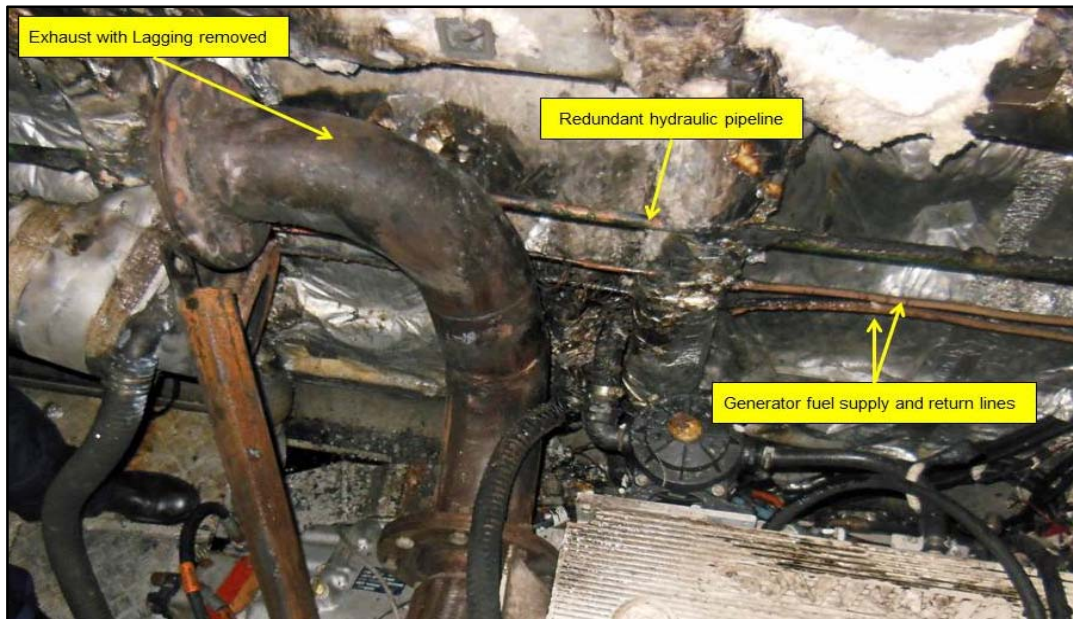
- 2.3 The initial investigation revealed that the fire was contained within the port engine room. Fire damage was located near the exhaust pipe riser and the air filter assembly.

- 2.4 An area between the exhaust riser and the port side of the engine room was identified as the most likely ignition point of the fire. Examination of the lagging around the exhaust closest to the port side revealed that the lagging had suffered fire damage (See Photograph 3).



Photograph 3: Fire damage near exhaust

- 2.5 The engine exhaust riser is supported by a steel angle-iron frame. Examination revealed that one of the supports of this frame was broken at its base. This had allowed the exhaust pipe to displace laterally and rest against the port side of the engine room. It would have been difficult to detect the broken support without physically removing the exhaust system.
- 2.6 The unrestrained exhaust pipe had contacted three pipes mounted on the port side of the engine room (See Photograph 4).



Photograph 4: Exhaust lagging removed

- 2.7 The two lower pipes were identified as the diesel fuel supply and the fuel-return for the generator in the port hull.
- 2.8 The third pipe, above the diesel lines, was identified as a redundant hydraulic steering line from a previously fitted steering control system. The hydraulic system had been replaced with an electronic control system, however; the redundant pipes had remained in place and still contained hydraulic fluid.
- 2.9 The raised section of the exhaust was removed to expose the redundant fuel and hydraulic pipelines for examination (See Photograph 5).



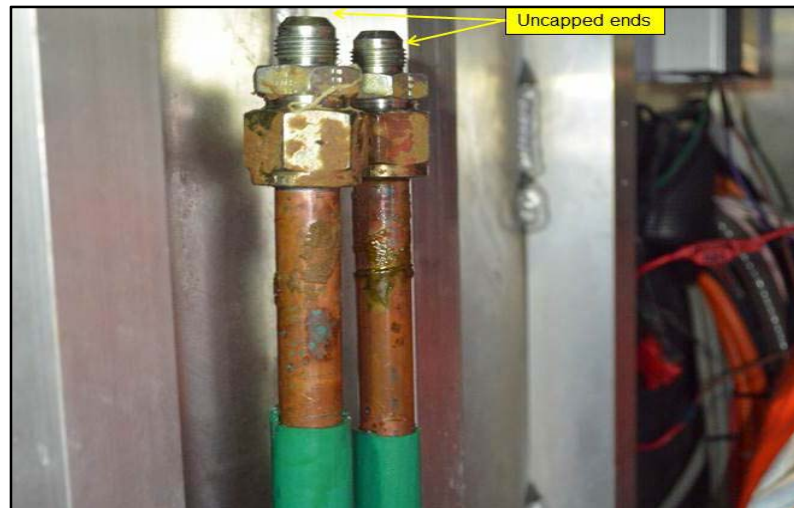
Photograph 5: Removed section of exhaust

- 2.10 A small hole was found in the redundant hydraulic pipeline and the hole corresponded with the contact by the exhaust pipe. Hydraulic fuel was still seeping from the pipe (See Photograph 6).



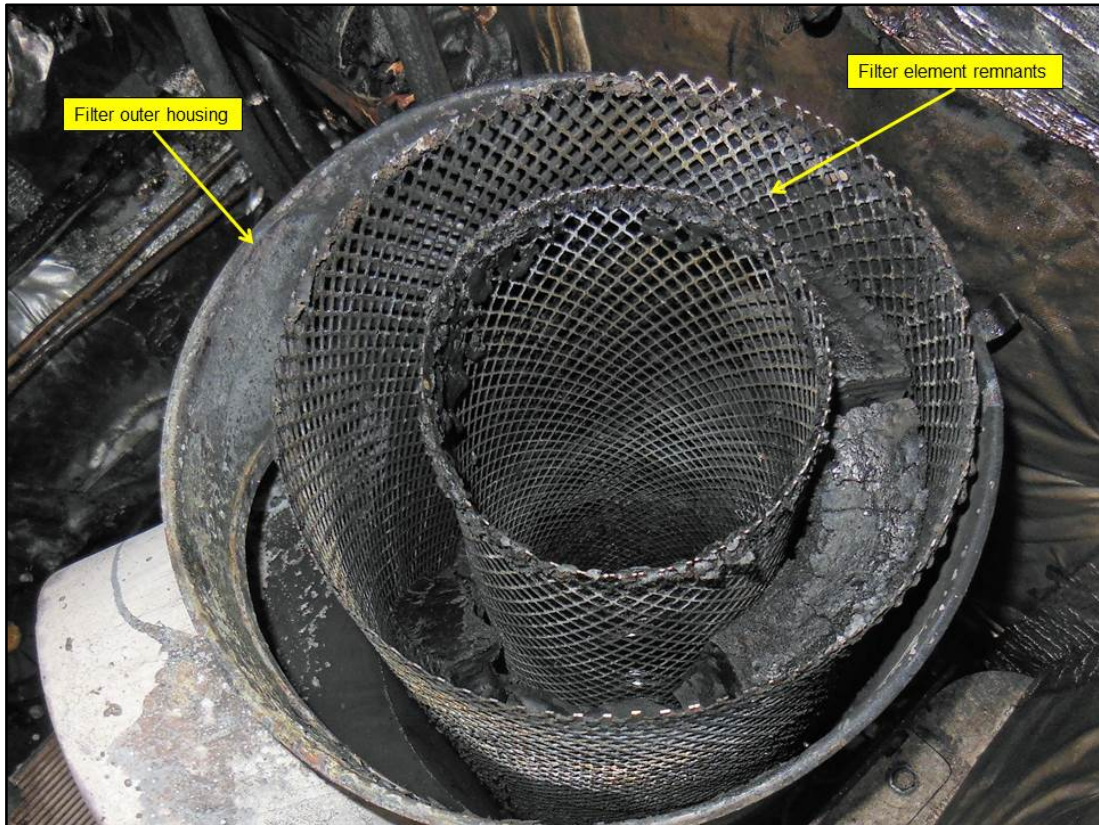
Photograph 6: Hole in hydraulic pipeline

- 2.11 Further examination of the exhaust lagging in this area revealed it was saturated with hydraulic oil. It is most likely that the fire ignited when this lagging was heated by the exhaust.
- 2.12 The redundant copper hydraulic pipe had an 18mm nominal bore and was approximately 35 metres in length. The line contained hydraulic oil. When the steering system was replaced on 28 August 2015 the line had not been capped or the residual oil drained (See Photograph 7).
- 2.13 OTSI has estimated the volume of the redundant hydraulic line was approximately nine litres. However; it is unclear what was the total volume of the remnant hydraulic oil.



Photograph 7: Uncapped hydraulic lines under steering position

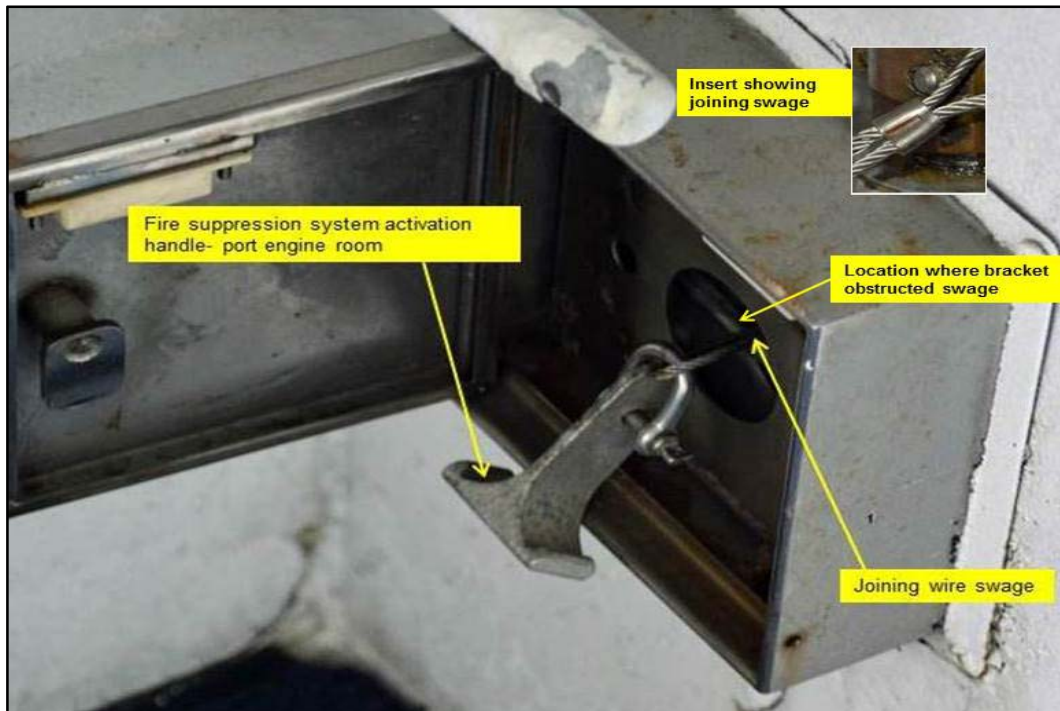
- 2.14 The investigation found there was additional damage within the port engine air filter assembly. It is likely the heat and flames from the initial fire were drawn into the air intake, igniting a secondary fire within the filter element.
- 2.15 Radiant heat from this secondary fire destroyed the coolant reservoir along with associated piping and wiring. In addition, the sullage pump mounted on the forward end of the engine room suffered fire damage (See Photograph 8).



Photograph 8: Fire damage to air intake filter

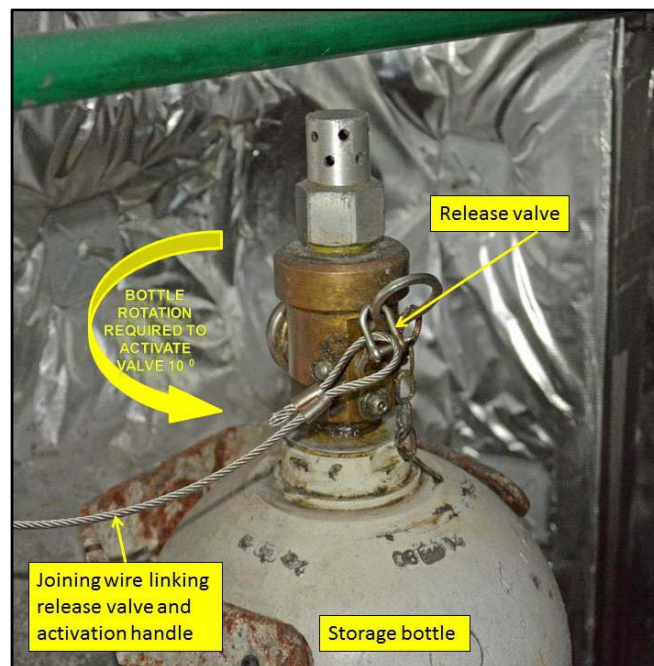
Other Safety Issues

- 2.16 The failure of the fire suppression unit to activate when needed.
- 2.17 The fire suppression system's reservoir comprised of a 20 kg pressurised FM-200 gas cylinder. To activate the system, the operator is required to pull a release handle. When the release handle is pulled; a stainless steel wire attached to the handle runs over pulleys and activates a lever on the pressurised bottle, releasing the gas.
- 2.18 Examination of the port engine fire suppression system revealed that when the activation handle was pulled, the swage connecting the handle to the wire was fouling on the supporting brackets (see Photograph 9). A change of the direction of pull was required to free the movement. However, when the swage was clear of obstruction, the wire failed to activate the valve on the storage bottle.



Photograph 9: Port Engine room fire suppression activation

2.19 Examination showed that the direction of pull was working against the valve movement and not activating as designed (See Photograph 10). The release cable was free to operate as designed once the cylinder was rotated to the correct position. (see Figure 2).



Photograph 10: Fire suppression cylinder

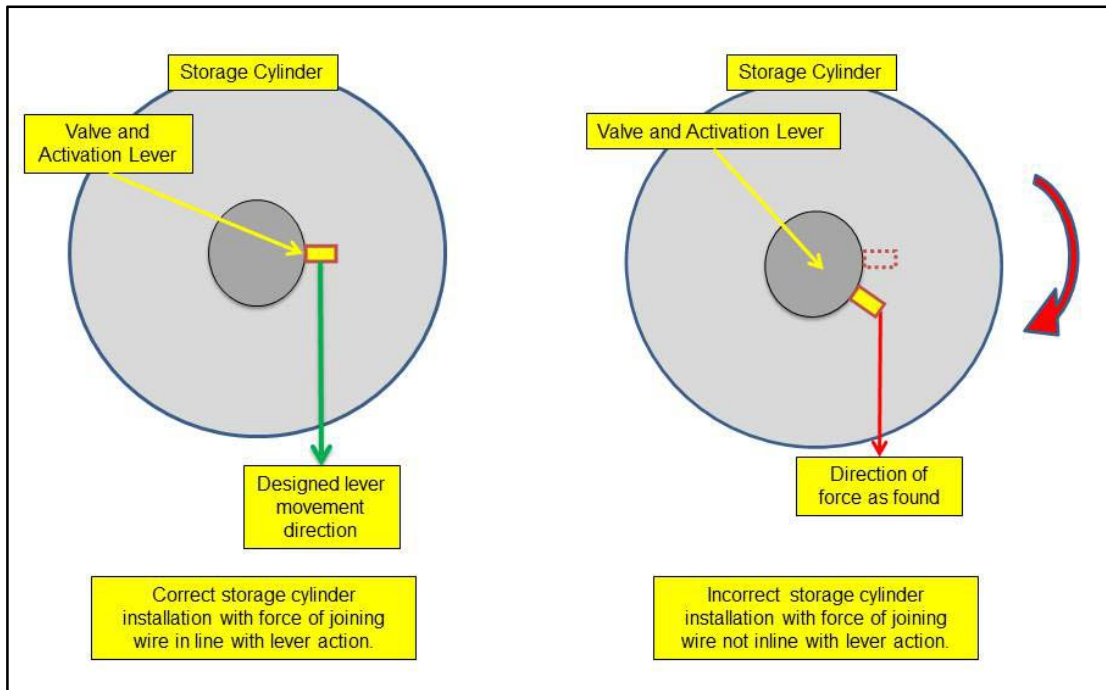


Figure 2: Plan view of cylinder

2.20 A registered contractor had examined this fire suppression system on 9 September 2015 and a compliance certificate No. 9099/09/15 issued. Both the operator and RMS/AMSA had accepted the certificate as proof of compliance.

PART 3: FINDINGS

- 3.1 The fire in the port engine room was a direct result of an unsecured exhaust pipe wearing a small hole in a redundant hydraulic pipeline that contained hydraulic oil. It is most likely that the combination of the oil-saturated lagging and heat from the exhaust ignited the fire.
- 3.2 A secondary fire started when flames from the initial fire were drawn into the engine air intake and ignited the air filter element.
- 3.3 Action taken by the master and crew contained the fire, preventing significant damage, despite being hampered by the incorrect installation of the fire suppression cylinder.

Remedial Actions

- 3.4 Since the fire, the operator has removed the redundant hydraulic pipeline and repaired the exhaust support. The operator has checked all vessels in their fleet to ensure the correct installation of fire suppression cylinders. The operator has changed their asset management procedures related to fire suppression systems.
- 3.5 The operator, in conjunction with Fire and Rescue NSW, carried out a fire response exercise to improve ferry fire emergency response practices.

PART 4: RECOMMENDATIONS

- 4.1 Ferry operators to consider and control risks to operations that may be introduced from vessel modifications.
- 4.2 Ferry operators to ensure safety equipment, including fire suppression systems, is operational as designed.

Australian Marine Safety Authority (AMSA)

- 4.3 AMSA as the national marine regulator, is to disseminate the lessons learned from this investigation to all AMSA accredited surveyors for their general awareness.

Fire Protection Industry (ODS & SGG) Board

- 4.4 The Fire Protection Industry Board is to disseminate the lessons learned from this investigation to all licenced fire service companies to ensure that during inspection, fire suppression systems are verified operational as designed.