MCIB
Marine Casualty Investigation Board
Bord Imscrúdú Taismí Muirí

REPORT OF AN INVESTIGATION INTO A MARINE CASUALTY INVOLVING A VESSEL IN OR AROUND CARRICK-ON-SHANNON MARINA, CO. LEITRIM ON OR ABOUT 7 AUGUST 2023

REPORT NO. MCIB/331
(No.3 OF 2025)

The Marine Casualty Investigation Board (MCIB) examines and investigates all types of marine casualties to, or onboard, Irish registered vessels worldwide and other vessels in Irish territorial waters and inland waterways.

The MCIB objective in investigating a marine casualty is to determine its circumstances and its causes with a view to making recommendations to the Minister of Transport - for the avoidance of similar marine casualties in the future, thereby improving the safety of life at sea and inland waterways.

The MCIB is a non-prosecutorial body. We do not enforce laws or carry out prosecutions. It is not the purpose of an investigation carried out by the MCIB to apportion blame or fault.

The legislative framework for the operation of the MCIB, the reporting and investigating of marine casualties and the powers of MCIB investigators is set out in the Merchant Shipping (Investigation of Marine Casualties) Act, 2000.

In carrying out its functions the MCIB complies with the provisions of the International Maritime Organisation's Casualty Investigation Code and EU Directive 2009/18/EC governing the investigation of accidents in the maritime transport sector transposed into Irish law by the European Communities (Merchant Shipping) (Investigation of Accidents) Regulations 2011.

This report is published under and in accordance with the Merchant Shipping (Investigation of Marine Casualties) Act 2000 as amended by the Merchant Shipping (Investigation of Marine Casualties) (Amendment) Act 2022 and/or under and in accordance with the European Communities (Merchant Shipping) (Investigation of Accidents) Regulations 2011. It is not published under the Merchant Shipping (Investigation of Marine Accidents) Act 2025, Parts 1 and 5 of which were commenced by the Merchant Shipping (Investigation of Marine Accidents) Act 2025 (Commencement) Order 2025 S.I.188 of 2025 from 1 June 2025.

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The Marine Casualty Investigation Board was established on the 25th March 2003 under the Merchant Shipping (Investigation of Marine Casualties) Act, 2000.

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Glossary of Abbreviations and Acronyms

AC	Alternating Current
AGS	An Garda Síochána
C	Celsius
CoP	Code of Practice
DC	Direct Current
GRP	Glass Reinforced Plastic
LPG	Liquid Petroleum Gas
MCIB	Marine Casualty Investigation Board
MN	Marine Notice
S.I.	Statutory Instrument
UTC	Co-ordinated Universal Time
VHF	Very High Frequency

Foot	ft
Hour	hr
Horsepower	hp
Inch	in
Kilogram	kg
Kilometre	km
Metre	m
Tonne	t
Volt	V

Report MCIB/331 published by the Marine Casualty Investigation Board.
6th October 2025.

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1. SUMMARY

1.1 Early in the morning of the 7 August 2023, a 33-foot (ft) motor cruiser berthed at a marina on the River Shannon in Carrick-on-Shannon caught fire. Attempts to put out the fire by members of the public staying on their own vessels nearby were unsuccessful. Units of the local fire brigade attended the scene and brought the blaze under control. The fire claimed the life of one individual sleeping onboard the vessel.

Note: Times are local time = UTC + 1 (Co-ordinated Universal Time + 1 hour).

Location of Carrick-on-Shannon.

Location of the vessel at the time of the incident.

2. FACTUAL INFORMATION

2.1 Vessel Details

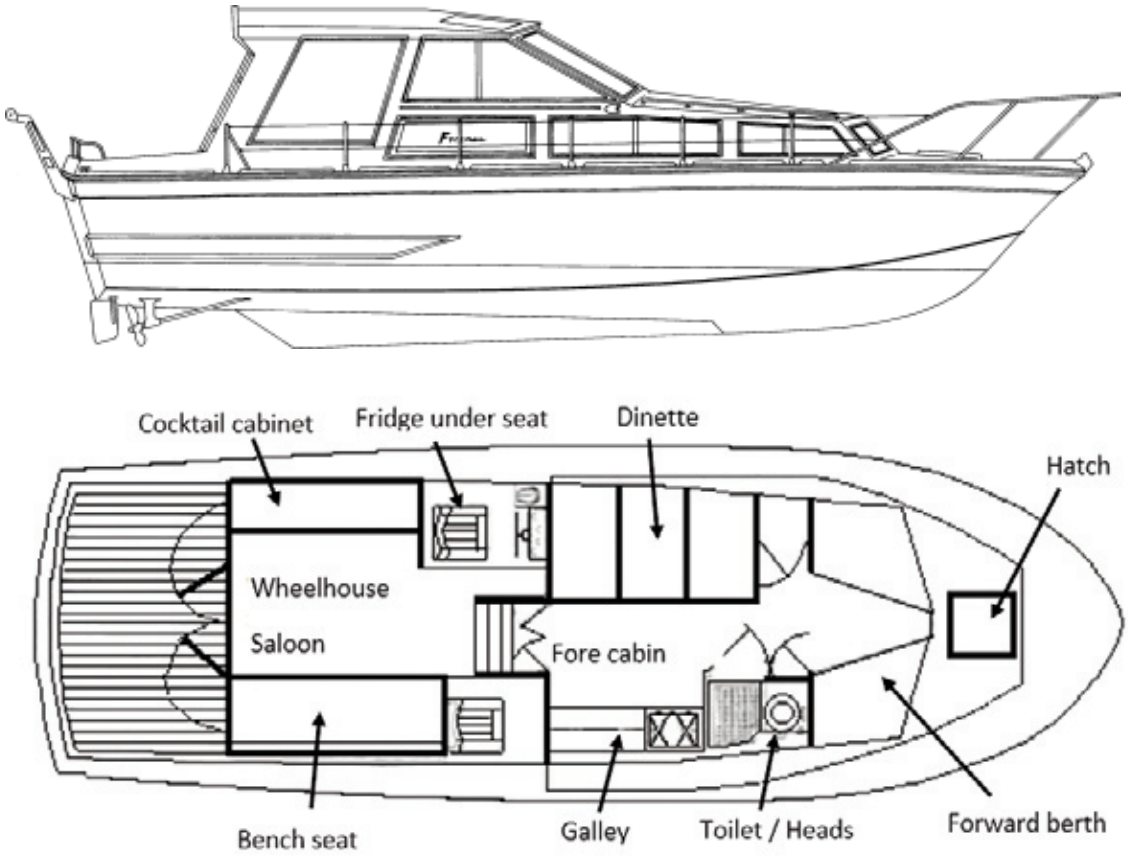
Name of Vessel:	DollFinn.
Type of Vessel:	Motor Cruiser – Freeman 33.
Length Overall:	33 ft 6 inches (in) – 10.20 metre (m).
Beam:	9 ft 10 in – 3.0 m.
Draught:	3 ft 7 in – 1.10 m.
Year Built:	1979.
Construction Material:	Glass reinforced plastic (GRP).
Engine:	Ford Sabre 2712E – inboard engine.
Fuel Type:	Diesel.
Hull Number:	5224.

2.1.1 The Freeman 33 motor cruisers were built in the United Kingdom between 1976 and 1983. DollFinn was built in 1979. This vessel was purchased privately by the Owner five years before in 2018 and was kept on the River Shannon.

2.1.2 The vessel was last surveyed on 19 May 2022 when DollFinn was being stored ashore at Albert Marina, Jamestown, Co. Roscommon. The survey was conducted to the relevant codes of practice published by the International Institute of Marine Surveying. The external hull was visually inspected and sounded with a plastic headed hammer, with no indication of delamination of the fiberglass lay-up. High moisture readings near the waterline revealed osmotic gelcoat blisters, not of immediate concern. All skin fittings were observed to be bronze and securely fitted. No play was found in the rudder stock. Overall, the hull exterior was found to be in serviceable condition. The interior of the hull, all hatches, windows and vents were also found to be in serviceable condition, however, a number of window leaks were noted (common on a vessel of the type/age).

2.1.3 The 2022 Condition Survey stated that the liquid petroleum gas (LPG) system onboard DollFinn was not pressure tested as part of the survey. The survey also noted that the rear of the LPG powered appliances could not be accessed in order to determine the condition of the LPG pipework, recommending that *"All LPG installations should be installed as outlined in Marine Notice No.37 of 2017 and in compliance with International Standard ISO 10239:2014 (Small craft – Liquefied petroleum gas (LPG) systems)"*.

See Appendix 7.1 - 2022 Condition Survey Report.



Drawings of a similar type of vessel.

2.1.4 The vessel had a full displacement GRP hull with the topsides constructed of marine plywood cored GRP mouldings. DollFinn was fitted with a Ford Sabre 80 horsepower (hp) inboard diesel engine.

2.1.5 The vessel had both 12 Volt (V) Direct Current (DC) and 220V Alternating Current (AC) electrical power systems fitted onboard. Three 12V/110 ampere hour batteries provided power for onboard services such as freshwater pump, lighting, bilge pump and engine cranking. The vessel was fitted with the facility to be supplied by a 220V/16 ampere shore supply cable.

2.1.6 Hot water was supplied by either a calorifier fitted on the starboard side of the machinery space which was heated by the engine coolant circuit or by a Rinnai BU150 on demand LPG fired water heater fitted in the galley.

2.1.7 The galley was equipped with a Flavel B.700 two ring gas cooker with an oven and grill. An Electrolux three-way refrigerator was fitted under the helm seat in the main saloon. This refrigerator could be run on 12V DC, 220V AC or LPG. The operator could choose which way they wanted to operate the refrigerator at any given time.

2.1.8 The LPG locker was fitted beneath the starboard side seating in the main saloon, it contained two LPG cylinders. The locker was constructed with a drain so that any LPG leaks should be drained overboard.

2.2 Crew Details

The vessel was privately owned and operated by a person in their mid-fifties. The individual had owned the vessel for the past five years and regularly used it for recreational activities. The Owner was the only person onboard at the time of the incident.

2.3 Relevant Safety Requirements

2.3.1 DollFinn was used as a Category "E" Craft for use on Ireland's Inland Waterways and therefore the vessel was required to comply with the Code of Practice (CoP) for the Safe Operation of Recreational Craft (revised edition 2024)[1] issued by the Irish Maritime Administration.

2.3.2 The Code recommends that a category E vessel should comply with Marine Notice (MN) No. 37 of 2017 "Use of liquefied petroleum gas (LPG) installations and systems on merchant vessels, fishing vessels, pleasure craft and other marine craft"[2]. The MN references LPG "cylinders", which includes LPG "canisters", being smaller more portable LPG cylinders.

2.4 Safety Equipment

2.4.1 The 2022 Condition Survey Report noted that DollFinn was fitted with the following safety and navigation equipment: magnetic compass at the helm position; 1 kilogram (kg) and 3 kg dry powder extinguishers fitted at the helm position; fire blankets were fitted in the galley and wheelhouse; 12V DC electric bilge pump and manual back up pump were fitted onboard. The condition survey report did not reference the presence of carbon monoxide, smoke or flame detectors onboard DollFinn.

2.5 Voyage Particulars

2.5.1 At the time of the casualty occurring, DollFinn was moored to a pontoon at the Emerald Star Marina, located on the River Shannon, Carrick-on-Shannon, Co. Leitrim, Ireland.

1. Code of Practice: The Safe Operation of Recreational Craft
2. Marine Notice No.37 of 2017

2.6 Marine Incident Information

2.6.1 This incident resulted in a marine casualty as defined in Section 2 of the Merchant Shipping (Investigation of Marine Casualties) Act, 2000, which defines a marine casualty and a vessel in the following terms:

"marine casualty" means an event of process which causes or poses the threat of-

(a) death or serious injury to a person;

(b) the loss of a person overboard;

(c) significant loss or stranding of, or damage to, or collision with, a vessel or property; or

(d) significant damage to the environment,

in connection with the operation of-

(i) a vessel in Irish waters:

(ii) an Irish registered vessel, in waters anywhere; or

(iii) a vessel normally located or moored in Irish waters and under the control of a resident of the State, in international waters contiguous to Irish waters, and includes an accident or damage referred to in section 26(1)(b);"[3]

Date: 7 August 2023.

Time: 07.55 hrs local time. Co-ordinated Universal Time plus one hour (UTC+1).

Position: 53° 56.6' North, 008° 06.0' West.

Wind: Variable 2-3 knots between 22.00 hrs and 04.00 hrs, increasing to 3-4 knots from the south south-west between 04.00 hrs and 08.00 hrs.

Air temperature: Around 10° Celsius (C), possibly colder above the water.

Precipitation: Mostly dry.

See Appendix 7.2 - Met Éireann Weather Report.

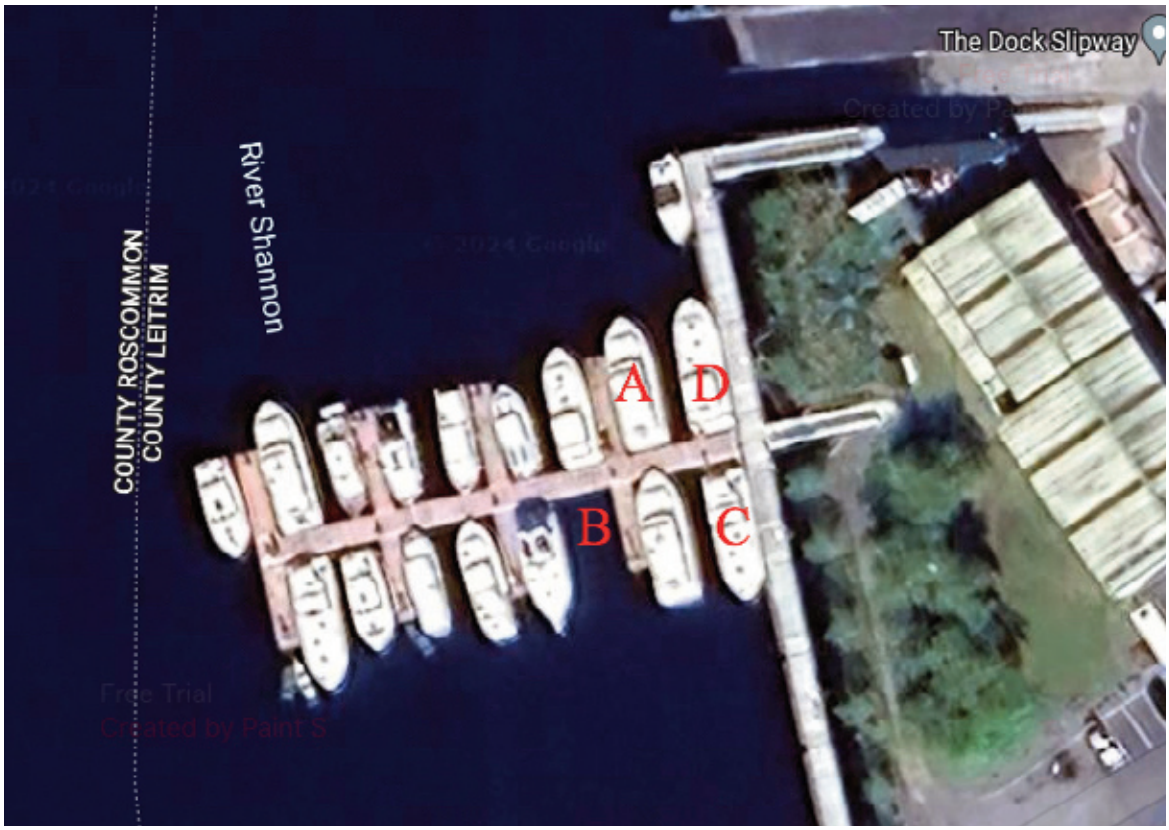
See Appendix 7.3 – Knock Airport Weather Record for 7 August 2023 with the time leading up to the incident highlighted.

3. Merchant Shipping (Investigation of Marine Casualties) Act,2000

3. NARRATIVE

3.1 The vessel DollFinn was taking part in the 61st Shannon Boat Rally. The event is organised by the Inland Waterways Association of Ireland. It was run between 28 July and 6 August 2023, with vessels gathering and visiting a number of towns in the Shannonside region. The event attracts all classes of vessel and upwards of three hundred people with the aim of promoting the waterways and development of facilities as well as promoting an improvement of boating skills and safe practices.

3.2 DollFinn was moored port side too at the northern most leg of the Emerald Star Marina in Carrick-on-Shannon.



Aerial view of the marina layout at Emerald Star Marina, Carrick-on-Shannon showing the location of the Casualty's vessel in berth 'A' and the berths of vessels nearby marked 'B', 'C' and 'D' that assisted in trying to extinguish the fire. Note this image is taken from Google Maps and does not reflect the other berthing arrangements or vessels at the time of the incident.

3.3 The closing gala dinner was held at the Landmark hotel in Carrick-on-Shannon on the evening of the 6 August. The Casualty attended the dinner with over two hundred other participants. The celebrations at the Landmark hotel concluded around 02.00 hrs on the morning of the 7 August. The Casualty and a few other boat crews made their way back to their boats in small groups.

3.4 Following the dinner the Casualty and eleven other crew from various vessels were hosted onboard one of the vessels that had taken part in the rally. This was onboard the vessel moored next to DollFinn, vessel D, until approximately 04.00 hrs. At about this time the participants returned to their respective vessels, and one of the parties, from vessel C, walked with the Casualty as she went back to her vessel. Text messages exchanged between the Casualty and a friend on one of the neighbouring boats B, who had been in the Casualty's company, are the last known contact with the Casualty at 04.20 hrs on the 7 August.

3.5 A witness statement taken by An Garda Síochána (AGS) from a rally participant onboard a vessel in location B stated: *"I got back to my boat at about 6am - 6.30am and jumped into bed. I didn't hear anything as I laid in bed. I didn't sleep from the time I got back into the boat. At 7.55am I sent a text to a group chat on WhatsApp. As I rolled over I looked out the windows and I saw smoke billowing out of [the Casualty's] boat."* The witness described the smoke as yellow and being toxic. He sprayed numerous fire extinguishers into the boat without effect. At this stage other people staying on other boats were up and were trying to put the fire out with many fire extinguishers.

3.6 This witness statement is the first mention of a fire onboard DollFinn at 07.55 hrs on the 7 August. This person immediately raised the alarm and ran to try to extinguish the fire onboard DollFinn using portable fire extinguishers. Carrick-on-Shannon Garda Station reported that at approximately 07.55 hrs they were alerted to a boat on fire at the Marina, Townparks, Carrick-on-Shannon, Co Leitrim.

3.7 Several individuals from nearby boats attempted to get the blaze onboard DollFinn under control but without success. One AGS statement estimates that more than 20 portable fire extinguishers and a hose were used in the effort to fight the fire but *"didn't have any effect"*. One witness attempted to locate the Casualty, stating in his AGS witness statement as follows: *"I ran over to [the Casualty's] boat and I could see the boat engulfed in flames and the heat was intense. I was only wearing my boxer shorts and I was in my bare feet. I tried to break a window to gain access and I tried to open the hatch over the end of where her bed would be. I eventually got the hatch open and as I did a huge amount of black smoke came out. I took a deep breath and took a dive down with my arms to try and feel around. I pulled out the duvet and tried to use that for some protection against the heat. I took a second deep breath and tried again. I couldn't feel anything and at this stage the heat became over whelming. I had to get off the boat, my back was getting singed"*.

3.8 None of the statements taken by the Gardaí from those involved in the incident, report seeing the Casualty attempting to fight the fire or trying to escape from the boat.

3.9 The Gardaí arrived at approximately 08.00 hrs and took charge of the operation. The retained fire fighter that took charge of the initial fire-fighting operation stated the following in his AGS witness statement:

"8:14am, we arrived on scene, our initial attack on the fire was with the hose, reel and water, while the other lads set up CAFS (Compressed air foam system). This system puts a blanket of foam over the fire and because it is lighter than water this would help with keeping the boat afloat. We eventually got the fire under control. With our previous experience with boats sinking due to fire, we quickly moved the boat over and up the slip, this would also help with access to the boat."

One of the fire officers stated to the AGS that, upon observing two LPG cylinders at the rear of DollFinn he used his fire gloves to place the cylinders in the river in order to cool them down.

3.10 A body was found in the forward sleeping area. The coroner's autopsy report states that death was due to inhalation of combustion products including carbon monoxide. The determination of the cause of death is a matter for a coroner's inquest.

3.11 Members of AGS's Ballistics and Forensic Investigation Section attended the vessel on Wednesday 8 August 2023. The technical report produced after that inspection of the vessel noted that the rear half of the vessel was destroyed above the deck with almost all combustibles consumed by fire and that the front half of the vessel was less burnt with some soft furnishings and bedding surviving. The initial Garda technical report pointed towards the LPG powered refrigerator as the most likely cause of the blaze, but it remained unclear as to what caused the actual ignition. Additional evidence came to light and the 2022 Condition Survey (referred to above) came to hand. Therefore, in April 2024 AGS engaged an external forensic engineer to review all the then available evidence to see could the cause of the fire be more definitively determined.

See Appendix 7.4 – Ballistic and Forensic Investigation Unit Statement.

See Appendix 7.5 - Forensic Engineers Report.

4. ANALYSIS

4.1 As a privately owned and operated recreational vessel the only Irish legislation applicable to DollFinn is the Code of Practice for the Safe Operation of Recreational Craft. As the vessel is less than 13.7 m in length, the Merchant Shipping Fire Appliances rules do not apply. There are currently no statutory fire appliance requirements for recreational craft less than 13.7 m in length.

4.2 Part B of the CoP provides guidance for the safe operation of recreational craft. It offers advice on best safe operating practice for a variety of types of craft and sets out the applicable regulatory regimes. Chapter 3 of Part B provides information specific to sail and motorboats - Inland Waterways, this chapter of the Code applies to DollFinn. Under this section of the Code DollFinn would be considered a Category E vessel, that are:

- *"Capable of operating on larger exposed lakes in extreme weather conditions;*
- *Have accommodation and can be used for overnight habitation;*
- *Are capable of extended voyages."*

The CoP provides a safety equipment checklist which specifies the minimum equipment that should be carried. Owners are encouraged to equip their boats to a higher standard. For a Category E vessel, the following table specifies the firefighting requirements:

3. Fire Fighting	E	F
3.1 Fire blanket – CE marked.	✓	
3.2 Fire extinguishers, one of which is suitable to fight oil fires in engine spaces or fire bucket.*	(2)	
3.3 All cooker/heaters using LPG should be installed as outlined in Marine Notice No. 37 of 2017.	✓	

*** Do not deploy the bucket overboard while the boat is moving.**

The Code also notes that:

"The levels of recommended equipment should be regarded as a minimum. Owners are encouraged to equip boats to a higher standard. Mariners should stow fire extinguishers and a hand-held VHF in the cockpit in order that they are readily accessible in the event of an emergency, and in order to avoid having to go below to retrieve them."

4.3 One of the recommendations from the 2022 Condition Survey Report was that a carbon monoxide alarm should be fitted in the forward cabin/galley area. An Marine Casualty Investigation Board (MCIB) investigator inspected the remains of the vessel in January 2024 at a storage yard in Co. Sligo. On inspection of the vessel, it was not possible to determine if this recommendation had been acted upon. The MCIB investigator could find no evidence of a smoke or fire alarm onboard DollFinn, similarly there is no mention of any such alarms in the AGS technical report. While the CoP does not specify that a Category E vessel requires smoke or fire alarms, it does recommend that a Category E vessel should comply with MN No. 37 of 2017 "Use of liquefied petroleum gas (LPG) installations and systems on merchant vessels, fishing vessels, pleasure craft and other marine craft" which advises that vessels fitted with an LPG system should be fitted with a gas detector, as well as carbon monoxide and smoke and/or heat detectors.

4.4 The vessel was fitted with an Electrolux three-way refrigerator. These refrigerators have three ways of generating power: through a 12V battery, 240V mains power, or from LPG supplied from a cylinder. Refrigerators such as this are regularly used on inland waterways craft, caravans, and campervans. Onboard DollFinn there was one of these refrigerators fitted on the port side under the seat by the wheel. Photograph No.1 below shows the setup onboard DollFinn. The refrigerator had been removed from the vessel before the MCIB inspected it, however the statement of evidence compiled by the Ballistics and Forensic Investigation Section at the Garda National Technical Bureau noted that the dial on top of the refrigerator for regulating supply of LPG was at its highest setting, indicating that the LPG power option had been selected prior to the fire.

4.5 In order to operate the refrigerator using LPG, first the operator must check that 12V DC and 220V AC power is turned off. The LPG isolation valve for the in-use LPG cylinder must be opened i.e. located on top of external LPG cylinder. Any taps in the supply line must also be opened. The refrigerator has an LPG control knob, and this is turned to the maximum position for approximately five seconds in order to allow any air to purge from the supply line. Whilst still pressing in the knob the operator pushes a button activating the Piezo igniter, several times in quick succession. A click should be heard each time the button is pushed in. After ignition of the LPG pilot light burner (see below), a further 15 seconds of pushing in the LPG control knob is required in order to allow time for the thermocouple tip over the burner to heat up. The operator then releases the LPG control knob and conducts a visual check that the burner is alight by looking directly through the flame viewer located inside the cabinet at the rear left-hand lower corner. If the burner has not lit, the lighting procedure must be repeated. The refrigerator is fitted with a flame failure device which will automatically shut off the LPG to the burner if the flame is blown out. While the knob is being pressed in, this device is temporarily inoperative.

4.6 When a refrigerator is operating on LPG it relies on a pilot light to work. A pilot light in an LPG-powered refrigerator serves as a small, continuously burning flame that ignites the main burner when the refrigerator's cooling system requires heat to operate. The primary function of the pilot light is to act as a reliable ignition source for the main burner. When the refrigerator's thermostat signals that cooling is needed, the LPG supply valve opens, allowing LPG to flow to the main burner. The pilot light ignites this LPG, starting the heating process which allows the refrigerator to cool down.

4.7 According to the 2022 Condition Survey Report, the vessel was fitted with a 1 kg and 3 kg ABC dry powder fire extinguishers at the helm position, and fire blankets were fitted in the galley and the wheelhouse. As the refrigerator could operate on LPG it came under MN No.37 of 2017 “Use of liquefied petroleum gas (LPG) installations and systems on merchant vessels, fishing vessels, pleasure craft and other marine craft”. The MN strongly recommends the use of an automatic gas detection and alarm system and recommends that LPG systems should be installed at least in accordance with the International Standard ISO 10239:2014 (Small Craft – Liquefied Petroleum Gas (LPG) systems). The main points of the ISO standard are included in the MN, one of the points is that smoke and/or heat detectors should be provided in each compartment containing LPG appliances. The MN also highlights the importance of adequate ventilation for LPG appliances, the requirement for LPG systems to be serviced by a competent person at least annually and recommends that LPG systems should be checked for leakage, general condition and correct operation at least monthly. The MN also recommends that LPG systems should have an automatic safety LPG cut-off device fitted in the low-pressure supply line within the LPG locker. The damage to this section of the vessel was such that it was not possible to determine if this was fitted, however, the condition report did not highlight this as an issue with the LPG system onboard.

4.8 A Condition Survey was carried out on the vessel in 2022 on the instruction of the Casualty for valuation/insurance purposes. The LPG fired water heater was found to be in good condition with no leaks. The 2022 Condition Survey Report notes that the LPG locker was correctly drained overboard and that all LPG appliances were correctly vented and appeared serviceable, however, they were not tested during the survey inspections and the rear of the appliances could not be accessed to determine the condition of the pipework. The LPG system was not pressurised for the survey. Recommendations from the 2022 Condition Survey Report included that i) a carbon monoxide alarm should be fitted in the forward cabin/galley area; ii) the flexible LPG hose in the LPG locker was not dated and should be replaced; and iii) and a 1 kg ABC dry powder fire extinguisher should be put in the galley.

4.9 The 2022 Condition Survey did not use MN No.37 of 2017 “Use of liquefied petroleum gas (LPG) installations and systems on merchant vessels, fishing vessels, pleasure craft and other marine craft” as a check list for the survey,

which would not be unusual. While the 2022 Condition Survey Report does not refer to any issue with a cut-off device, it does not expressly record whether an automatic safety LPG cut-off device was fitted in the low-pressure supply line within the LPG locker. If it was fitted it may have prevented the build-up of gas and hence the fire. Its absence could be a significant causal factor. However, as the evidence was destroyed in the fire it has not been possible for either the MCIB or AGS technical experts to determine this.

4.10 The installation manuals for all Electrolux models warn that the installation should only be carried out by an authorised LPG fitter. MN No. 37 of 2017 and the ISO standard 10239:2014 recommend checking the system monthly and servicing the system by a competent person annually. Any service or installation records for the LPG system on DollFinn were destroyed in the fire so it is not possible to ascertain when the system was last serviced.

Photograph No.1: The interior of DollFinn looking forward showing the position of the fridge and the storage location of the LPG cylinders.

4.11 An Garda Síochána Ballistics and Forensic Investigation Unit at the Garda National Technical Bureau Technical Report.

4.11.1 Members of AGS's Ballistics and Forensic Investigation Section attended the vessel on Wednesday 8 August 2023. The technical report produced after the inspection of the vessel noted that the rear half of the vessel was destroyed above the deck with almost all combustibles consumed by fire and that the front half of the vessel was less burnt with some soft furnishings and bedding surviving. The MCIB inspection in January 2024 concurred with these findings. See Photographs No.2 and No.3 below comparing a stock photo of a Freeman 33 to the remains of the vessel DollFinn.

Photograph No.2: Stock image of a standard Freeman 33 similar to DollFinn.

Photograph No.3: The remains of DollFinn clearly showing the extensive fire damage to the after section of the vessel.

4.11.2 The Garda witness statements from those that attempted to fight the fire report thick smoke emanating from the vessel. None of the witnesses report seeing the Casualty attempting to fight the fire or escape from the vessel. Phone message records show that the Casualty was still awake at 04.20 hrs. Smoke was first noticed coming from the boat at 07.55 hrs. There is no record or reports of any activity onboard DollFinn or the surrounding vessels between the hours of 04.20 hrs and 07.55 hrs.

4.11.3 In addition to the three-way refrigerator the vessel was fitted with an LPG powered cooker with oven and water heater. The AGS technical report noted that both the cooker and water heater were in the off position indicating that they were not in use during the fire. Remains of the cooker were onboard during the MCIB inspection. Both the refrigerator and water heater had been removed by AGS for further inspection by a consultant forensic engineer. The cooker was in the off position at the time of the MCIB inspection.

4.11.4 On the port side of the main cabin of the vessel, forward of the helm area, opposite the galley, were two double sockets. The Garda technical report noted that there were a number of items plugged into these sockets including a hair straightener, charger and a toaster. These items had been removed at the time of the MCIB inspection, however, it is the opinion of the MCIB investigator and the Garda technical report that as the fire appears to have started in the aft section of the vessel, the electrical items were not the cause of the fire.

4.11.5 One of the members of the public, from the vessel located in berth C that assisted in attempting to fight the fire, reported in his AGS statement as to hearing *"a couple of pops - aerosol cans. I then heard a larger explosion which*

I believe was batteries used for domestic use". The MCIB investigation of the vessel after the fire, noted a number of intact LPG cylinders in the boat. The MCIB investigator believes that given the evidence presented that the LPG cylinders onboard DollFinn were not the source of the "larger" explosion heard and agrees with the witness's assessment that it may have been the batteries. As can be seen in Photograph No.4, the LPG cylinders were found intact by AGS.

Photograph No.4: The LPG cylinders from DollFinn.

4.11.6 A statement made by a sub-officer of the Carrick-on-Shannon Fire Station to the AGS confirmed that the fire fighters removed the intact LPG cylinders from the vessel when fighting the fire.

4.11.7 It would appear from the MCIB's inspection of the vessel that the onboard fire extinguishers were not used. The Casualty was found in the starboard side of the forward berth. The Garda witness statements from those that attempted to fight the fire report thick smoke emanating from the vessel. None of the witnesses report seeing the Casualty attempting to fight the fire or escape from the vessel. This all indicates that the Casualty was not aware of the fire and did not attempt to tackle it. A member of the public onboard a vessel that also took part in the regatta (moored in location B) that attempted to extinguish the fire, stated that he tried to access the boat through the forward hatch, which was situated above the Casualty's bunk, but was overwhelmed by the heat. This individual stated that he was successful in opening the forward hatch and *"took a dive down with my arms to try to feel around"*. The individual was

unsuccessful in locating the Casualty and had to retreat from the area due to the heat and smoke.

4.11.8 The Casualty was still awake at 04.20 hrs when texting, followed by no record or reports of any activity onboard DollFinn or the surrounding vessels between the hours of 04.20 hrs and 07.55 hrs when smoke was first noticed coming from the boat. No attempts were made by the Casualty to tackle the fire or escape which means that it can safely be assumed that the Casualty went to sleep at some time after 04.20 hrs and was never aware of the fire starting.

4.11.9 The initial Garda technical report conducted by a member of AGS had pointed towards the LPG powered refrigerator as the most likely cause of the blaze, but it remained unclear as to what caused the actual ignition. There was some inconclusive suggestion that the refrigerator pilot light could have been defective (which was later clarified as not being the case) and a question as to whether the cylinders had been re-located and the system modified (also later confirmed as not being the case). Also, the 2022 Condition Survey Report (referred to above) came to hand. Therefore, in April 2024 AGS engaged an external forensic engineer to review all the then available evidence to see could the cause of the fire be more definitively determined. Following further investigation and inspection, the forensic engineer reported that the fire pattern on the side of the refrigerator indicated that the fire had reached the refrigerator from the deck level and from the rear of the boat. He noted that the insulation of the exhaust pipe from the burner was intact, though exhibiting a covering of black carbon, thereby further indicating that the fire was not seated at the rear of the refrigerator. He noted that a copper fitting linking the LPG cylinders to the refrigerator had melted during the subsequent fire. This would indicate temperatures of 1000 C° at the height of the fire.

4.11.10 The AGS's forensic engineer determined the following:

"The pipe supplying LPG gas to the gas -fired refrigerator failed, thereby releasing LPG gas onto the after deck of the boat."

His report examined several scenarios and concluded that the most likely one was as follows:

- The leaking LPG, being heavier than air, would settle on the deck;
- Weather conditions at the time (calm conditions and high atmospheric pressure) could have contributed to the LPG being undisturbed;
- Over time sufficient LPG could escape, so that the concentration of LPG, close to the deck, would reach the lower limit of flammability;
- The initial ignition of the pilot light requires a series of actions by the operator when starting the refrigerator with LPG power. The pilot light cannot light automatically. Once lit, the pilot light provides a potential source of ignition to any leaking LPG;

- The consequence would be a fire engulfing the whole of the after deck.

This scenario would match with the evidence as:

- The source of the fire located close to the deck;
- The fire consumed the timber and plastic materials which were part of the after deck of the boat;
- A fire in a confined area such as the well of the boat along the after deck would not be able to access sufficient oxygen to completely burn either the timber or, more particularly, the plastic;
- The fire attacked the refrigerator from the left-hand side (or stern of the boat);
- As the fire progressed, it would attack the upright timber walls of the cabin, resulting in both walls exhibiting the same pattern of damage;
- The burning plastic and the burning timber would release large volumes of carbon monoxide gas because of incomplete combustion of the carbon;
- The concentration of carbon monoxide gas entering the forward sleeping would have been in quantities capable of being fatal;
- Evidence that the Casualty was found lying on her back in a relaxed position would suggest that she was asleep when she inhaled carbon monoxide gas in high concentration and never knew or responded to the fire or the effects of the gas.

See Appendix 7.5 Forensic Engineers Report.

5. CONCLUSIONS

5.1 Having inspected the vessel in January of 2024 and considered all the available evidence, with no contradictory evidence ascertained, the causation put forward by the forensic engineer as to the cause of the fire is the most likely scenario.

5.2 The MCIB inspection of the vessel concurs with the conclusion that the fire started in the after section of the vessel and spread forward to the main accommodation and sleeping area. This is consistent with the burn pattern and smoke damage observed on the vessel.

5.3 The AGS forensic engineers report states that the fire pattern on the side of the refrigerator indicated that the fire had reached the refrigerator from the deck level and from the rear of the boat. This is consistent with the damage observed by the MCIB investigator.

5.4 Although the refrigerator was not available for the MCIB investigator to inspect, the AGS forensic engineers report notes that the insulation of the exhaust pipe from the burner was intact, though exhibiting a covering of black carbon, thereby further indicating that the fire was not seated at the rear of the refrigerator.

5.5 As LPG is a colourless, odourless, tasteless gas it is possible that a slow release of LPG may have gone undetected for some time. The Condition Survey Report from 2022 did not flag any issues with the LPG installation, however, the report did advise that a carbon monoxide alarm should be fitted and noted that the flexible LPG hose in the LPG locker was not dated and should be replaced. It was not possible to determine if these recommendations had been followed. It was also not possible to determine whether a low pressure shut off valve had been installed in the LPG system.

5.6 On the morning of the 7 August 2023, in all probability, LPG filled the after deck of the vessel DollFinn. The calm conditions and high atmospheric pressure at that time ensured the LPG was not disturbed allowing it to build-up in volume until it reached a point that the pilot light for the refrigerator ignited the built-up LPG. The resulting fire generated a large and fatal level volume of carbon monoxide gas, which flooded into the sleeping quarters ahead of the fire.

6. SAFETY RECOMMENDATIONS

6.1 Preamble

6.1.1 Waterways Ireland have primary responsibility for the Shannon waterways known as the Shannon Navigation under the Shannon Navigation Act 1990. Waterways Ireland noted that this Marine Casualty Investigation Board report highlighted the importance of gas systems inspections and monitoring and advised the Marine Casualty Investigation Board that the current Shannon Bye-Laws and Canal Bye-Laws require that all gas installations be installed in line with the relevant standard and placed in a well-ventilated area with ventilation piping.

6.1.2 Waterways Ireland advised the Marine Casualty Investigation Board that it was updating the Shannon Bye-Laws and Canal Bye-Laws which date from 30 years ago. The draft bye-laws were submitted to the Department of Housing, Heritage and Local Government for consideration on 17 June 2024. In response to a request from the Department, Waterways Ireland submitted a further revised draft of the bye-laws to the Department on 27 September 2024 for detailed consideration and legal review. As of May 2025, Waterways Ireland advise that this process would need some time to complete.

6.1.3 The proposed bye-laws would grant Waterways Ireland enforcement powers regarding the unsafe operation of vessels including the use of equipment such as gas installation systems. It is their intention to utilise the bye-laws legislation for that purpose. In the interim, Waterways Ireland will continue to promote safe on water behaviours under the current bye-laws.

6.1.4 In 2023 the Inland Waterways Association of Ireland featured an article on fire safety in the Shannon Boat Rally brochure, which is a publication that issues to all rally attendees.

See Appendix 7.6 - Inland Waterways Association of Ireland Fire Safety List.

6.1.5 Following this casualty in August 2023 the members of the Shannon Boat Rally committee met with a member of the Leitrim Fire Service. It was agreed that further steps should be taken to make Shannon Boat Rally participants aware of fire safety requirements and recommendations with a focus on prevention and evacuation (rather than encouraging firefighting). It was decided that a fire drill would be carried out at each rally. Therefore, in 2024, a fire safety talk took place at the start of the rally followed by a fire drill. Rally participants were given the following recommendations and advised to have the following safety equipment on board:

- *"Smoke alarms in each cabin*
- *CO2 alarm in each cabin*
- *Fire extinguishers*

- *Fire blanket*
- *Fire axe*
- *Automatic fire extinguisher in the engine area*
- *Fuel must be kept in proper containers at all time*
- *Do not use candles on the boat, battery operated candle recommended - no naked flames"*

6.2 To the Minister for Transport:

6.2.1 Consider a review and update of MN No. 37 of 2017 "Use of liquefied petroleum gas (LPG) installations and systems on merchant vessels, fishing vessels, pleasure craft and other marine craft" to emphasise the importance for owners and operators of any vessel operating liquefied petroleum gas systems onboard:

- to ensure the recommended detectors are fitted, and are in good working order
- to comply with the recommendations of MN No. 37 of 2017 "Use of liquefied petroleum gas (LPG) installations and systems on merchant vessels, fishing vessels, pleasure craft and other marine craft"
- to emphasise that onboard installation and/or moving/relocating any appliance that uses liquefied petroleum gas should only be done by a registered liquefied petroleum gas installer at least to a standard in accordance with the International Standard ISO 10239:2014 (Small Craft – liquefied petroleum gas systems)
- to emphasise the importance for owners and operators of any vessel operating liquefied petroleum gas systems onboard to ensure compliance with ISO standard 10239:2014 (Small craft–liquefied petroleum gas systems), with regard to the recommendation to check the system monthly for leakage, general condition, and correct operation, and
- to emphasise that smoke and/or heat detectors, and carbon monoxide detectors, should be provided in each compartment containing liquefied petroleum gas appliances and to have the system serviced at least annually by a competent person.

6.2.2 Consideration should be given to amending the Code of Practice for the Safe Operation of Recreational Craft to include specific reference to fitting gas, carbon monoxide, smoke and/or heat detectors in all vessels with onboard liquefied petroleum gas systems in addition to referencing MN No. 37 of 2017.

6.3 To Waterways Ireland:

6.3.1 That (in addition to enhancing their legal powers) they should consider whether they can promulgate the recommendations from this report and in particular the contents of MN No. 37 of 2017 "Use of liquefied petroleum gas (LPG) installations and systems on merchant vessels, fishing vessels, pleasure craft and other marine craft" to owners, operators, and commercial operators of water craft on the Shannon navigation.

6.4 To the Irish Marine Federation:

6.4.1 To the Irish Marine Federation which is the national organisation representing both commercial and leisure sectors of the marine industry in Ireland. They should consider how best to promulgate the recommendations from this report and in particular the contents of MN No. 37 of 2017 "Use of liquefied petroleum gas (LPG) installations and systems on merchant vessels, fishing vessels, pleasure craft and other marine craft" to owners, operators, and commercial operators of water craft within their membership.

6.5 To the Inland Waterways Association of Ireland:

6.5.1 To the Inland Waterways Association of Ireland; notwithstanding the valuable steps taken immediately after this casualty, the Association should consider the contents of this report and the recommendations in the context of their ongoing safety improvement processes.

7. APPENDICES

Appendix 7.1 2022 Condition Survey Report

[redacted]

Condition Survey Report

"DollFinn"

[redacted]

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[redacted]

Appendix 7.1 2022 Condition Survey Report

[redacted]

"DollFinn"

Condition Survey Report

Survey completed by [redacted] for the sole use of the vessel owner [redacted] on the 19th of May 2022.

Contents

Appendix 7.1 2022 Condition Survey Report

[redacted]

1. Introduction

This survey was conducted on the instructions of the vessel owner [redacted] The vessel was inspected while stored ashore at Albert Marina, Jamestown, Co. Roscommon on the 19th of May 2022.

The survey was conducted by [redacted] and was carried out in accordance with the agreed terms and conditions and with relevant codes of practice published by the International Institute of Marine Surveying.

2. Summary

DollFinn is a Freeman 33 GRP river cruiser built in 1979 by John Freeman (Marine) Ltd., Hinckley, Leicestershire, UK.

She was surveyed while stored ashore. The topsides, deck fittings and internal hull were found to be in serviceable condition. The electrical systems and vessels machinery were also found to be in serviceable condition.

DollFinn was in reasonable cosmetic condition with some new safety equipment required prior to relaunching.

The vessel was found to be in serviceable condition.

3. Scope of the Survey

DollFinn was inspected while stored ashore. There was good access to all sections of the hull exterior.

This vessel was surveyed without the removal of any parts, including fittings, screwed or nailed boards, tacked carpet, anchors and chain, fixed partitions, instruments, clothing, spare parts and miscellaneous materials in the bilges or lockers, or other fixed or semi-fixed items. Locked compartments or otherwise inaccessible areas would also preclude inspection. The owner is advised to open up all such areas for further inspection. No determination of stability characteristics or inherent structural integrity has been made and no opinion is expressed with respect thereto. This survey report represents the condition of the vessel on the above date only, and is the unbiased opinion of the surveyor, [redacted] but it is not to be considered an inventory or a warranty either specified or implied.

Appendix 7.1 2022 Condition Survey Report

The survey was carried out to ascertain the overall physical condition and value of the vessel for insurance purposes only.

One single diesel engine was examined externally only. The internal mechanical condition of the engine is not within the scope of this report. The engine could not be started as the vessel was ashore during the survey inspection.

Electrical installations were examined visually, with switch testing where practical.
Tanks were inspected where accessible but not internally and they were not pressure tested.
Their contents have not been tested for contamination.
Windows, hatches and external doors have not been tested for water tightness.
Skin fittings and valves have not been dismantled.
The gas system has not been pressure tested.

A sea trial was not performed.

4. Vessel – General

Year Built	1979		Engines	Ford Sabre 2712E
Length Overall	33' 6" / 10.20m	C	Engine power	80hp@2500rpm
Beam	9' 10" / 3.00m	C	Drive type	Propeller on Shaft
Draft	3' 7"/ 1.10m	C	Fuel type	Diesel
Hull Material	GRP		Hull Number	5224
Hull Type	Displacement			
W.I. Reg. No.	1702			

(C= Checked, N= Nominal, not checked)

5. Inspection Findings

a) Hull – Exterior

The hull was visually inspected all round and found to be symmetrical with no evidence of distortion.

The hull form is full displacement with deep forefoot and hard chine. The transom is radiused and the stem is raked. A hardwood keel is bolted through the bottom of the GRP hull moulding.

The hull exterior has been painted cream gloss over the original gelcoat with a few visible repairs to the finish. The finish was in serviceable condition.

Appendix 7.1 2022 Condition Survey Report

[redacted]



The hull was sounded with a plastic headed hammer giving sound returns with no indication of delamination of the FRP lay-up.

Moisture readings were taken over the entire outer surface of the hull from the rubbing strake down to the keel on both sides. High readings were observed below the waterline and closer inspection revealed a number of gelcoat blisters which proved to be osmotic in nature. This should be considered intermediate stage osmotic blistering and not currently of concern however this vessel should be stored ashore with dry bilges each winter to slow the progression of this condition.

All skin fittings fitted below the waterline were bronze and securely fitted.
A GRP blade rudder (12.5" x 19") was well fixed to a mild steel rudder shaft with no play found in the rudder stock.

The hull below the waterline is finished in a light blue anti-fouling paint which was in serviceable condition.

The hull exterior was found to be in serviceable condition.

b) Hull – Interior

DollFinn is constructed using a full displacement GRP hull moulding that is stiffened internally by fibreglass encapsulated longitudinal and transverse timber stringers.
Two structural bulkheads made of epoxy encapsulated ¾" marine plywood are fitted transversely and fixed/bonded to the hull interior.

All sea cocks were brass gate valves and in serviceable condition with all hoses connected to through hull fittings below the waterline correctly double clipped.

The interior of the hull was seen to be in serviceable condition (where accessible) with no visible damage or evidence of delamination.

[redacted]

Appendix 7.1 2022 Condition Survey Report

[redacted]

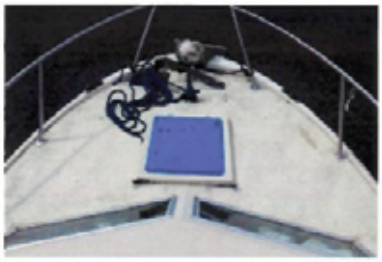
c) Topsides and External Fittings

The topsides are constructed of a marine plywood cored grp moulding and were found to be in good structural condition with no visible damage.

All deck fittings and rubbing strakes (hardwood) were well attached and secure. Deck fillers for both freshwater and fuel were secure and clearly marked.

A 25lb galvanised plough anchor was fitted on the foredeck this anchor is attached with a length of galvanised chain (length of chain could not be determined during the inspection). No anchor windlass was fitted.





The pulpit rail fitted to the bow was found to be well secured and in serviceable condition. All mooring bollards fitted on deck (with fairleads on the foredeck) were found to be well secured and in serviceable condition.

All hatches, windows and vents were found to be in serviceable condition however a number of window leaks were noted during the survey inspection.

d) Propulsion

DollFinn is fitted with a Ford Sabre 80 (2712E) inboard diesel engine. The engine is mounted beneath the cabin sole of the cockpit/wheelhouse. This is a marinised Ford 2712E diesel engine producing 80hp at 2500rpm and driving a Borg Warner Velvet Drive hydraulic gearbox with a reduction ratio of 2.1 : 1.

The 1 ¾" stainless steel propeller shaft exits the hull through a water lubricated, packed stern gland and is supported by a water lubricated rubber bearing held in a bronze carrier

Appendix 7.1 2022 Condition Survey Report

[redacted]

("P" bracket) just forward of the 3 blade 19" turbine type propeller. The propeller was secured with a bronze nut and stainless steel cotter pin.

The engine was securely fixed on flexible mounts fixed to longitudinal stringers that are moulded into the hull.

Engine cooling is an indirect system using raw water pumped through a heat exchanger on the engine before exiting via a wet exhaust that exits through the transom.

Engine and directional control is via a Morse control lever mounted at the helm position in the cockpit/wheelhouse.

The fuel system comprises of a stainless steel fuel tank mounted aft on the port side beneath the aft deck. The tank is filled by a flexible filler terminated by a clearly marked screw cap on the port side deck. Fuel is fed from the tank through copper pipe to filter/water separator and then via flexible fuel hose to the primary and secondary fuel filters. Fuel filters, lines and shut off valves were in serviceable condition.

Steering is via a push/pull cable system. The steering system was found to be in serviceable condition. This vessel was being fitted with a Vetus 12v/55kgf DC electric bow thruster at the time of the survey inspection.

The engine could not be started as the vessel was ashore during the survey inspection.

[redacted]

Appendix 7.1 2022 Condition Survey Report

e) Systems and Services

(i) Electrical System

DollFinn has a both 12v DC and 220v AC electrical power systems fitted on-board. Three 12v/110Ah batteries provide power for on-board services such as fresh water pump, lighting, bilge pump and engine cranking.
These batteries are split into two banks and are charged through a split charging diode by the engine alternator.

Shore power is supplied by a 220v/16A shore supply cable that plugs into a waterproof socket located on the port side of the aft deck. A RCD is fitted to this circuit and located under the seating in the main saloon.

The 12v DC wiring is of the correct type with switch and fuse panels mounted at the helm position for on-board services.

Both the AC shore supply system and the on-board DC system appeared to be in serviceable condition however they were not tested during the survey inspection.

(ii) Water and Heating System

A stainless steel fresh water tank is fitted beneath the aft deck on the starboard side and is filled through a flexible filler pipe terminated by a clearly marked screw cap on the starboard side deck.
Water is supplied under pressure by a 12v fresh water pump. Hot water is supplied by a calorifier fitted on the starboard side of the machinery space which is heated by the engine coolant circuit.

A Rinnai BU150 "on demand" type gas fired water heater is fitted in the galley.

All piping and fittings were found to be secure and in serviceable condition with no visible leaks.

(iii) Gas Installation

The Gas Locker is situated beneath the starboard side seating in the main saloon. This locker is a metal enclosure with space for two 6 kg Butane cylinders and was correctly drained overboard.

A Flavel B.700C 2 ring gas cooker with oven and grill was fitted in the galley and an Electrolux 3 way fridge fitted in the wheelhouse (beneath the helm seat).

Appendix 7.1 2022 Condition Survey Report

[redacted]

All gas appliances were correctly vented and appeared serviceable however they were not tested during the survey inspection and the rear of the appliances could not be accessed to determine the condition of the pipework.

All LPG installations should be installed as outlined in Marine Notice No.37 of 2017 and in compliance with International Standard ISO 10239:2014 (Small craft –Liquefiedpetroleum gas (LPG) systems)

(Iv) Heads

A single Raske & Van der Meyde manual sea toilet was fitted onboard. This toilet is located in a compartment on the starboard side of the main/forward cabin. This toilet appeared to be in serviceable condition however it discharges directly overboard as there was no waste holding tank fitted onboard.

Fitting a waste holding tank onboard would bring this vessel into compliance with current waterways regulations with regard to the disposal of waste.

a. Safety and Navigation

DollFinn is fitted with the minimum of navigation equipment.

A magnetic compass was fitted at the helm position.

1kg and 3kg ABC Dry Powder fire extinguishers were fitted at the helm position.

Fire blankets were fitted in the galley and wheelhouse.

A 12v DC electric bilge pump and manual back up pump were fitted onboard.

DollFinn is being used as a Category "E" Craft for use on Irelands Inland Waterways and must comply with the Code of Practice for The Safe Operation of Recreational Craft issued by the Maritime Safety Directorate and Irish Coast Guard.

http://www.safetyonthewater.ie/sites/default/files/brochures/Irish%20MotorBoat%2028.06.04_cr.pdf

[redacted]

Appendix 7.1 2022 Condition Survey Report

[redacted]

b. Accommodation

DollFinn has 6 berths in 3 cabins with a single toilet and shower. The forward vee berth provides a large double in the bow with the dinette converting to provide another double berth.
Two single berths are available in the main saloon.



The galley is equipped with a Flavel B.700C 2 ring gas cooker with oven and grill.
An Electrolux 3 way fridge is fitted under the helm seat in the main saloon.

The accommodation is functional and comfortable with all fittings and storage lockers found to be well appointed and in serviceable condition.

The spacious aft deck is enclosed by a blue fabric canopy. The canopy was found to be well secured and in serviceable condition.

6. Conclusions

DollFinn was found to be a typical example of a late 1970's Freeman 33 motor cruiser.

All machinery, equipment, domestic services and interior fittings were in serviceable condition with some new safety equipment required prior to relaunching.

a) Valuation

For insurance purposes, **DollFinn** should be covered for an estimated replacement value of approximately **€25,000**.

[redacted]

Appendix 7.1 2022 Condition Survey Report

[redacted]

6.1 Recommendations

These recommendations are presented in three categories:

- Safety and structural
- Repairs and modifications
- Maintenance

a) Safety and Structural Defects

i. Lifejackets should be available for all persons on-board.
ii. The flexible gas hose in the gas locker was not dated and should be replaced.
iii. A Carbon Monoxide alarm should be fitted in the forward cabin/galley area.
iv. A 1kg ABC dry powder extinguisher should be fitted in the galley.
v. A lifebuoy should be fitted on the aft deck.

b) Repairs and Modifications

i. Fitting a waste holding tank onboard would bring this vessel into compliance with current waterways regulations regarding the disposal of waste.
ii. A number of window leaks were observed during the survey inspection. These leaks should be repaired as a matter of urgency so as to prevent further water damage to the vessels interior cabinetry.

c) Maintenance

i. Clean and disinfect the water tank and all associated pipework annually.
ii. This vessel should be stored ashore with dry bilges every winter to slow the progression of gelcoat blistering

[redacted]

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Appendix 7.1 2022 Condition Survey Report

[redacted]

Data Protection

The information contained in this report is the intellectual property of [redacted] This document contains confidential information that is legally privileged and is intended for use of the addressee only. All information contained herein is covered by the EU Data Protection Directive and Data Protection Acts 1988 to 2018.

Disclaimer

If this survey does not discuss a specific item, equipment or machinery, it is not covered by this survey. Every effort has been made to ensure the accuracy of the information presented within this report. The report is issued in good faith as a statement of facts ascertained at the time of the survey, during which due diligence and reasonable skill were exercised and reasonable care taken, using common professional practice and where available published guidelines or codes such as those published by the International Institute of Marine Surveying.

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Legal and Jurisdiction

This document should be interpreted under Irish Law and Irish Law shall be used in the event of any dispute or claim resolution arising from or connected with this document.

Recommendations

Recommendations should only be considered "**Urgent**" if they are listed under the **Safety and Structural Defects** heading. **Repairs, Modifications** and **Maintenance** recommendations should not be considered items detrimental to the safety or structural integrity of the vessel if not carried out immediately following the survey inspection.

Page **12** of **12** [redacted]

Appendix 7.2 Met Éireann Weather Report

Met Éireann
The Irish Meteorological Service
Climate Services
Glasnevin Hill
Dublin 9

Seirbhísí Aeráide
Cnoc Ghlas Naíon
Baile Átha Cliath 9

Tel: +353-1-8064200
Email: legal@met.ie

WEATHER REPORT
Estimate of weather conditions in the vicinity of Carrick-on-Shannon Co Leitrim for the overnight period between 6pm Sunday 6th to 12noon Monday 7th August-2023 (times Local Time=UTC+1)

Meteorological situation: A ridge of high pressure and a light southwesterly airflow covered Ireland during the overnight period from 6pm on the 6th to 12noon on the 7th August 2023. A weak front (occlusion) embedded in the flow tracked eastwards over the country.

Weather & Precipitation: It was dry at first in Carrick-on-Shannon Co Leitrim area with variable cloud and clear spells at the start of the period. Cloud increased from 9pm onwards and it was then overcast and mostly dry until around 6am. Patchy drizzle or light rain affected the area between 6am and 12noon.

The rainfall amount is estimated at less than 1mm during the period in question.

Temperatures: The air temperature ranged from a minimum of 9 or 10 degrees Celsius to a maximum of 16 or 17 degrees Celsius.

Wind: Winds were light Beaufort Force 2 or 3 mainly from southwesterly direction (mean wind speed less than 11 knots).

Time	Wind Direction	Wind Speed (10-minute mean)	Wind Speed (maximum gust)
18:00 – 22:00	NW	4 – 9 knots	18 knots
22:00 – 04:00	Variable W / S	2 – 3 knots	8 knots
04:00 – 08:00	S / SSW	3 – 4 knots	9 knots
08:00 – 12noon	SW	4 – 8 knots	15 knots

Visibility: Meteorological visibility was mostly good (greater than 10km) and was occasionally moderate (4 km to 10 km) in drizzle or rain

Met Éireann, Ireland's National Meteorological Service, is maintained by the State under the UN Convention of the World Meteorological Organisation (WMO) and is the leading provider of weather information and related services in the State. Met Éireann operates the national meteorological observational network to World Meteorological Organisation standards, and the data is securely stored in the national climate archive. This weather report is derived from a number of sources to give the best estimate of conditions for the location requested, including, ground based observations, radar and satellite imagery, surface weather analysis charts, upper air charts and lightning data, all which are retrieved from the national climate archive.

Report issued on: 25/06/2024 Our ref: WS1730/2406_16 Page | 1 of 1

Appendix 7.3 Knock Airport Weather record for 7 August 2023 with the time leading up to the incident highlighted.

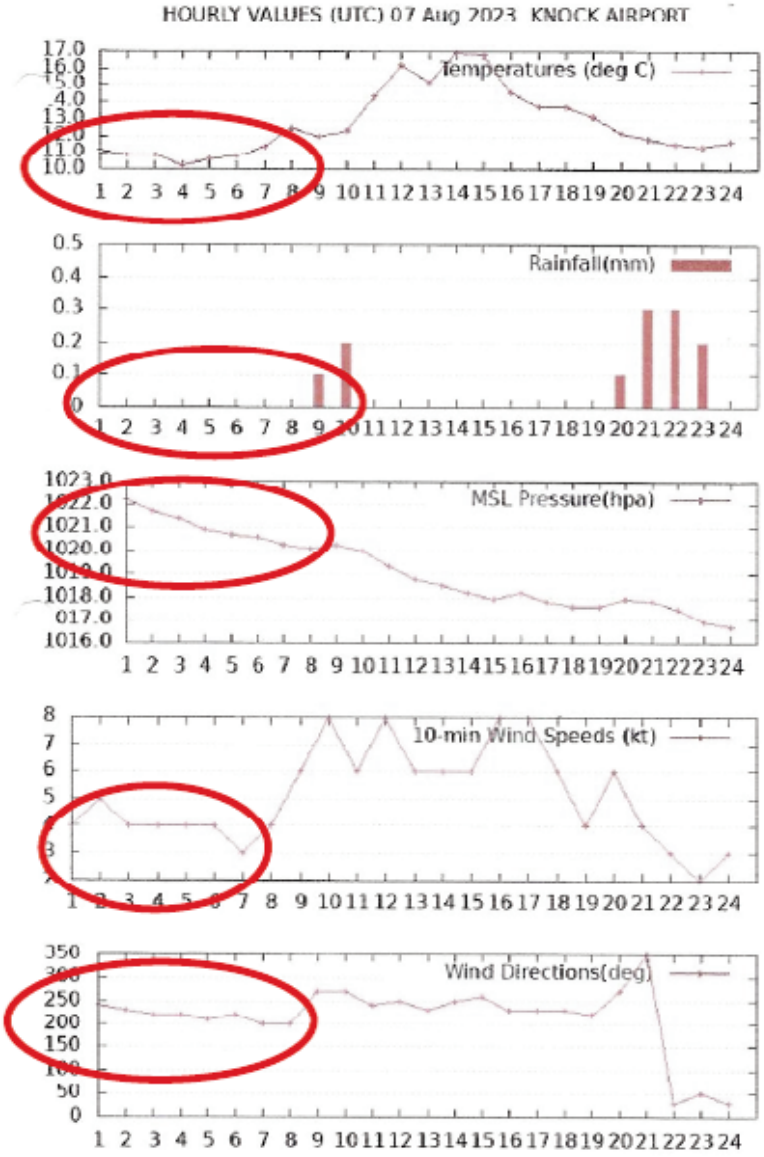
Daily Data

Weather station Data is available from 16/10/2015 to 14/04/2024

Select Station & Date: Station Knock Airport Date 07/08/2023 Go

Weather Station Reports from Knock Airport

Date	Rainfall (mm)	Max Temp (°C)	Min Temp (°C)	Grass Min Temp (°C)	Mean Wind Speed (knots)	Max Gust (>= 34 knots)	Sunshine (hours)
07/08/2023	1.2	16.9	9.8	8.3	5.3		



Daily Data

Appendix 7.4 Ballistic and Forensic Investigation Unit Statement

Statement Of Evidence [redacted]
[redacted] **Ballistics & Forensic Investigation Unit Garda Technical Bureau, Garda Headquarters, Phoenix Park, Dublin 8.**

I am a member of An Garda Síochána attached to the Ballistics & Forensic Investigation Section at the Garda National Technical Bureau. My duties include the detailed examination of fire scenes.

On Wednesday the 8th of August 2023 I travelled to The Emerald Star Marina, Carrick-on-Shannon, Co. Leitrim for the purpose of carrying out a forensic examination of a boat that had been the subject of an earlier fatal fire. I was accompanied by D/Sergeant [redacted] of the Photographic Section and D/Garda [redacted] of the Ballistics & Forensic Investigation Section and Sergeant [redacted] of Sligo Garda Station. The boat in question was named the Dollfinn and had been removed from its mooring and kept under preservation by local Gardai in a large Emerald Star shed adjacent to the marina. Upon arrival we were brought to where the Dollfinn had been moored which was the first mooring on the right side of the gangway coming from the bank. At this location I observed loose fire debris on the dock against which the Dollfinn had been moored. I noted a fire damaged diesel compressor on that dock and a mains electricity outdoor socket on a post. There was a mains outdoor cable on the ground beside the socket. This cable which, was approximately one meter long, was a split and fed two separate plugs. One plug had a white extension lead, approximately two meters long attached which was badly burnt on one end.

Examination of the Dollfinn

I was subsequently escorted to the adjacent boat shed. Inside this shed was the badly burnt remains of a 33 foot river cruiser named Dollfinn. The exterior of this vessel was constructed of glass fibre, it had a steel frame and the deck and walls were made of plywood. I noted that the rear half of the boat which encompassed the deck and steering position (helm), was destroyed above the deck with almost all combustibles consumed by fire. The front half of this vessel, which included the galley and sleeping area at the stern, was less burnt than the rear with some soft furnishings and bedding surviving quite well.

Appendix 7.4 Ballistic and Forensic Investigation Unit Statement

On the ground, immediately inside the galley on the starboard side was the remains of a Rinnai gas water heater, this had been hanging on the wall on that side. Although the plywood backing on this wall was partially charred, it had survived quite well. The temperature dial on the water heater was at the lowest setting, which indicated to me that it was off during the fire. Similarly, the four dials controlling the nearby cooker oven and grill combo were in the 'off' position. In the sleeping area I found a Prada brand, leather handbag containing a mobile phone and a purse within which, amongst various personal items was an Irish, Driving licence bearing the details: [redacted]

On the port side of the boat, within the living area were two double sockets. The first of these sockets, which was very badly burnt, was fixed to a partition at the foot of the bed. There were two electrical items plugged in to this socket, one of these items appeared to be a speaker while the second, was seized for further examination if required. The second double socket had a four gang extension lead plug attached. There was a hair straightener plugged into the first plug of the extension, the second plug was unused. There was an Ikea USB adaptor plugged into the third socket, while the kettle was attached to the fourth socket, a toaster was plugged into the second plug of that double socket.

At the helm, I found the badly burnt remains of an Electrolux, 3-way fridge. It is my understanding that this fridge, which was positioned under the captain's seat at the helm was been ran using a bottled LPG gas supply and that it had been running for several days. This type of fridge can also be ran off a mains or battery electricity supply. It is further my understanding that prior to the fire this fridge had been giving trouble and was reluctant to start. I noted that the dial on top of the fridge for regulating the gas was at its highest setting indicating to me that the gas option was in use prior to / during the fire. This fridge was well stocked with beverages on the shelf and food in the lower compartment. From my examination at the Emerald Star Marina and the Dollfinn on the 8th of August 2023 I took the following items which I packaged appropriately and labelled as follows:

SOD1: Sample of fire debris from the deck area of the Dollfinn.

SOD2: A 3 way Electrolux fridge from the deck of the Dollfinn.

SOD3: A Rinnai gas water heater from the galley.

Appendix 7.4 Ballistic and Forensic Investigation Unit Statement

SOD4: A double socket from the living area of the Dollfinn.

SOD5: A double socket from the partition at the foot of the bed in the Dollfinn with two items plugged in.

SOD6: A leather, Prada handbag containing various items including at driving licence in the name of [redacted]

SOD7: An outside mains plug and extension lead with one end badly burnt from the marina alongside where the Dollfinn had been moored.

Opinion

Having carried out a fire investigation of the river cruiser 'Dollfinn' I found no evidence suggesting a malicious cause to this fire. I have noted the post fire indicators present and it is my opinion that this fire started in the rear half of the vessel, above the deck, as this was the area that suffered greatest fire damage. The most likely cause of fire in this area, in my opinion was the 3-way fridge which, when running on gas uses a partially guarded, LPG burning pilot light. I am aware that this type of fridge can cause a fire if not sufficiently ventilated and periodically maintained. In general, the more contents in a fridge, the more energy that is used (in this case the burning gas pilot) in order to keep the contents cool. I examined all other electrical / gas appliances throughout the vessel and noted no evidence of faults likely to cause a fire.

I hereby declare that this statement is true to the best of my knowledge and belief and that I make it knowing that I shall be liable to prosecution if I state in it anything which is false or which I do not believe to be true.

[redacted]

Date: 22/11/2023

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

[redacted]

Consultant Forensic Engineers

[redacted]

PRIVATE AND CONFIDENTIAL

THIS REPORT IS PRIVILEGED.

Care Of:	[redacted] Sligo Garda Station, Pearse Road, Sligo Co. Sligo, F91 E372.
Your reference:	Fatal fire on a boat in Carrick-on-Shannon
Subject:	Technical investigation of a fatal fire scene
Date of incident:	7th of August 2023
Loss Address:	Emerald Star Marina, Carrick-on Shannon
PGCA reference:	2401 2
Report date:	26th of April 2024
Author:	[redacted]

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

1. Objectives

In accordance with the instruction received on 23rd of January 2024 from Garda Sergeant [redacted] of Sligo Garda Station, the objective of this examination was to establish the cause and circumstances of the fire that occurred on the 7th of August 2023 on a boat in the Emerald Star Marina at Carrick-on-Shannon that resulted in the death of a serving member of An Garda Siochana.

I can confirm that I conducted an examination of the vessel on the 4th of April 2024.

2. Circumstances

I was advised that:

- At 7.45 on the morning of the 7th of August 2023 Garda Sergeant [redacted] received a phone call from a passerby in Carrick-on-Shannon to the effect that a boat was on fire in the Emerald Star Marina;
- Garda Sergeant [redacted] arrived on scene at about 8.10 hrs;
- He observed that a boat in the marina was blazing, with a pillar of smoke extending into the sky;
- The fire service arrived on scene shortly after his arrival and extinguished the fire;
- Investigation revealed that a serving member of An Garda Siochana, Detective Garda [redacted] the owner of the boat, was dead in the sleeping area in the forward part of the boat;
- There was an LPG gas-fired refrigerator on board the boat that was suspected of being the cause of the fire.

3. My Investigation

3.1 Site Visit to view Fire scene.

I was escorted to view the vessel which Had been removed from the water and weas now in secure storage.

I observed that;

- The boat was named the Doll Finn;
- The vessel was a motor cabin cruiser with a single screw Propellor;
- It was tilted towards the port side by in the order of 10^0; (See Appendix A Page 11 Photo 1)

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

- The vessel was 9.9 metres from stern to stem at the waterline and 2.5 metres across the stern also at the waterline; (See Appendix A Page 11 Photo 2)
- The width increased to approx. 3 metres near to the accommodation cabin towards the bow of the boat; (See Appendix A Page 15 Sketch 1)
- The whole of the after deck exhibited the effects of burning;
- There was no identifiable locus of the seat or start of the fire;
- The scene was consistent with the fire having stated everywhere at the same time; (See Appendix A Page 12 Photo 3)
- The hatchway to the engine compartment was missing its cover;
- The hatchway was burned around the outside but was comparatively undamaged on the inside; (See Appendix A Page 12 Photo 4)
- The timber walls of the cabin facing the after deck on both sides of the boat exhibited the same effects of exposure to elevated temperature gases and flame;
- All the exposed timber exhibited similar "alligatoring" effects; (See Appendix A Page 13 Photos 5 & 6)
- Inside the accommodation cabin the scene exhibited a scene consistent with a fire progressing from the after deck into the accommodation cabin; (See Appendix A Page 14 Photo 7)
- The roof of the cabin exhibited a fire pattern consistent with a fire travelling forward towards the bow. (See Appendix A Pages 15 & 16 Sketch es 1 & 2)

3.2 <u>Examination of LPG gas -fired refrigerator.</u>

I was given an opportunity to examine the refrigerator.

I observed that:

- The refrigerator was a small steel box gas-fired refrigerator commonly used where there is no access to electrical power, or in camper vans;
- It had been exposed to extremely elevated temperatures causing some buckling and distortion;
- The door was missing;
- The outer covering was missing; (See Appendix a Page 17 Photos 8 & 9)
- The fire pattern on the sides of the refrigerator indicated that a fire had reached the refrigerator from the deck level and from the rear of the boat; (See Appendix a Page 17 Photo 9)

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

- The refrigerator had 4 number base supports of 10 mm in height;
- The refrigerator measured 550 mm high (See Appendix A Page 17 Photo 9) and 490mmx 490 mm at the base (See Appendix A Page 19 Photo 12);
- The insulation of the exhaust pipe from the burner was intact, though exhibiting a covering of black caron, thereby further indicating that the fire was not seated at the rear of the refrigerator; (See Appendix A Page 18 Photo 10)
- The rail at the top of the refrigerator was buckled and all the controls were missing;
- The gas supply pipe had disconnected from the rail; (See Appendix A Page 20 Photo 14)
- There was a residue of melted brass at the end of the pipe but otherwise no indication of how the pipe was connected to the gas supply; (See Appendix A Page 20 Photo 14)
- The supply pipe to the burner was 6mm in outside diameter and had an internal diameter of 4.1mm; (See Appendix A Page 20 Photo 15)
- There was a rupture on a bend of a steel pipe that was part of the ammonia circulation system, close to the heat exchanger at the top rear of the refrigerator;
- The rupture was measured as being in the order of 16.8 mm in length and 6 mm in width at the widest; (See appendix A Pages21 & 22 Photos 16. 17 & 18)

3.3 Examination of Met Eireann website

I examined the Met Eireann website.

I observed that:

- The nearest weather station producing a full record was the one at Knock Airport;
- Through the night into the morning of the 7th of August 2023 weather conditions were calm;
- There was no rain recorded as falling during the hours up to the time of the fire;
- The wind speed varying between 4 Knots and 3 Knots would, on the Beaufort Scale, be categorised as a light Breeze reducing to light air and in which rising smoke would show the direction of the wind, wind vanes would not move;
- The atmospheric pressure was high which would tend to keep the LPG gas low;
- The temperature of about 10^0 C would have felt cool for the time of year and would also tend to keep the gas low to the deck;
- The temperature of 10^0C at Knock could have been less at the Marina due to the large volume of flowing water in the River Shannon;

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

- The wind direction was from the southwest;
- Air movement in this direction would assist in enabling the fire to travel towards the bow of the boat. (See Appendix C Page24 satellite view of the Marina)

3.4 Discussion of potential scenarios providing opportunities for a fire.

Scenario 1

The pipe supplying LPG gas to the gas -fired refrigerator failed, thereby releasing LPG gas onto the after deck of the boat.

In my opinion:

This scenario is by far the most likely because:

- The leaking LPG gas, being heavier than air, would settle on the deck;
- Weather conditions at the time could have contributed to the gas being undisturbed;
- (See Appendix B Page 23 Weather Station Report)
- Over time sufficient LPG gas could escape, so that the concentration of LPG gas, close to the deck, would reach the lower limit of flammability;
- The pilot light of the refrigerator would provide a source of ignition;
- The consequence would be a fire engulfing the whole of the after deck.
- This scenario would match with the observed evidence as:
- The source of the fire would be located close to the deck;
- The fire would be consuming the timber and plastic materials which were part of the after deck of the boat;
- The fire attacked the refrigerator from the left-hand side (or stern of the boat)
- As the fire progressed, it would attack the upright timber walls of the cabin, resulting in both walls exhibiting the same pattern of damage;
- The burning plastic and the burning timber would release large volumes of Carbon Monoxide gas because of incomplete combustion of the carbon;
- The evidence of Garda Sergeant [redacted] demonstrates just how incomplete the combustion was (the thick black cloud is mostly unburned carbon);

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

- A fire in a confined area such as the well of the boat along the after deck would not be able to access sufficient oxygen to completely burn either the timber or, more particularly, the plastic;
- A search of the literature would suggest that exposure to concentrations of CO as small as 50 parts per million can be fatal;
- In this case, the concentration of CO entering the forward sleeping area could be several hundred, maybe even a thousand, times higher than 50 parts per million, leading to rapidly occurring death;
- Properly burning fossil fuels can still generate CO concentration values between 100 ppm and 400 ppm;
- Evidence that Detective Garda [redacted] was found lying on her back in a relaxed position would suggest that she was asleep when she inhaled CO in high concentration and never knew or responded to the effects of the CO.

Scenario 2

The gas-fired refrigerator itself was the seat of the fire.

The small gas-fired refrigerator looked like a potential possibility because:

- The refrigerator had a source of ignition in the pilot light:

In my opinion:

- The pilot light may have contributed to the ignition of the fire;
- The burn pattern at the opposite side of the boat to the location of the refrigerator exhibited the same damage as on the side where the refrigerator was located;
- My investigation demonstrated that the fire, which destroyed the refrigerator, resulted in the death of Detective Garda [redacted] and caused the damage to the boat, came from deck level, and from the left- hand side of the refrigerator (i.e. stern of the boat);
- The rupture in the steel (ammonia circulation) pipe is a consequence of the exposure of the already stressed pipe (to make the bend), coupled with exposure to very high temperatures in the order of 1000^0C (from the fire), and subjected to very high internal pressures of the ammonia gas (because of the fire).

I therefore reject this scenario of the seat of the fire being the refrigerator.

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[redacted] Report on a fire on a boat leading to a fatality.

Scenario 3

The engine compartment below deck was the seat of the fire.

This seemed like a potential possibility because:

- There are electrical wires and fuel below deck towards the stern of the boat.

In my opinion;

- The location of the engine compartment, being closer to the stern, offers agreement with the direction of fire damage exhibited by the fridge;
- There was evidence of burning around the outside of the hatch frame but only smoke and heat damage to the inside of the hatch frame;
- Had the fire originated in the engine compartment below deck I would have expected to have observed evidence of burning and the effects of the impingement of flame and elevated temperature gases on the inside of the hatch frame.
-

I, therefore, reject the scenario of the engine compartment as being the seat of the fire,

Scenario 4

An unknown Third Party pored an accelerant (such as petrol) onto the after deck of the boat.

This scenario seemed a potential possibility because:

- The boat was moored stern on to the dock of the marina;
- The fire involved the whole of the after deck;
- The witness, who spoke by telephone, to Garda Sergeant [redacted] described the scene as being a boat on fire rather than a fire on a boat;
- In my opinion, this suggests that the greater part of the boat was involved in the fire;
- If the witness had said that there was a fire on a boat this would suggest a more localised, and smaller in extent, fire;
- The evidence from Garda Sergeant [redacted] that on his arrival on scene within a brief time of the phone call, there was a column of smoke rising into the air, like what

Appendix 7.5 Forensic Engineers Report

was seen at the time of the bombardment of Sarajevo, indicates a well stablished fire, consuming copious quantities of carboniferous materials;

- All of this suggests that some kind of accelerant was involved.

In assessing this scenario, the following must be considered:

- The marina is remotely located;
- The people using the marina are longstanding users of the facility;
- Detective Garda [redacted] was herself a member of longstanding in the boat community;
- Detective Garda [redacted] was a popular member of the community, as evidenced by her attending a party in the hours before she died;
- There were people still partying up to approximately 6.30 hrs on the morning of the fire;
- There was no evidence of arson.

For all these reasons Scenario 4 is dismissed as the true situation.

3.5 Calculations

I made some calculations to determine the parameters of the event.

1.**The area of the well of the after deck.**

The well is the area along the flat deck of the boat between the sides of the boat.

I calculate this area as being 4.9 metres x 2.5 metres. (See Appendix A Pages Sketches 1& 2)

The burner of the gas -fired refrigerator provides a flame at approximately 30 mm above the deck.

2.**LPG gas would then have to occupy a volume of 1.8 % of 4.9 m x 2.5 m x 30 mm.**

A volume of 1.8% of 0.368 cubic metres or 368 litres.

The volume of gas involved would be 1.8%X 368 litres which is t 6.6 litres.

3.**The refrigerator is rated to burn gas at o,27 kg/24 hrs.**

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[redacted] Report on a fire on a boat leading to a fatality.

If the working 10 kg LPG Bottle were fully charged at the start of Detective Garda [redacted] holiday and had been in constant use throughout the 2 weeks 0.27 Kg X 14 would have been used, that is 3.78 kg of liquid LPG gas would have been used.
There would have been, therefore, plenty of gas available in the bottle.

4. 1kg of liquid LPG will produce 260 litres of gas.

6.6 litres of gas would be produced from 25 grammes of liquid LPG.
Even if the concentration reached the upper limit of flammability the amount of escaped gas would be produced from in the order of 140 grammes of liquid LPG.
The leak was a small leak over a period of, perhaps, 12 hours.
The failure would have amounted to a puncture one fifth the size of the internal diameter of the steel pipe supplying gas to the burner.

4. Debris

I was given an opportunity to examine the refrigerator which was recovered from the scene. The debris was returned to An Garda Siochana and is retained in their custody.

5. My opinion

In my opinion:

- The fire that resulted in the death of Detective Garda [redacted] was accidental.
- The fire resulted from the ignition of LPG gas;
- The LPG gas had escaped from a failure of the supply piping supplying LPG gas to the gas-fired refrigerator;
- It is likely that the flame of the gas -fired refrigerator provided the ignition source of the fire.

My opinion is based on the evidence and information available to me at the time of writing and may change in the event of further or better information and/or evidence becoming available.

[redacted]

[redacted] 2401 2 Page 9 of 24 26th of April 2024

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

[redacted]

Attachments

Photographs 1 -18 taken by the author during the examination, further photographs are available under the PGCA reference number on the report cover page.

Appendix A

Photo 1 showing a view of the vessel from the stern.

Photo 2 showing a view from starboard of the vessel.

Photo 3 showing a view of the well of the boat looking sternwards.

Photo 4 showing the hatch to the engine compartment.

Photo 5 showing a view of the outside of the upright timber wall s of the cabin.

Photo 6 showing an alternative view of the outside of the walls of the cabin.

Photo 7 showing a view inside the accommodation cabin.

Sketch 1 illustrating a plan view of the boat.

Sketch 2 illustrating a cross sectional elevation view through the well of the boat.

Photo 8 showing a view into the refrigerator.

Photo 9 showing a view of the refrigerator looking towards where the bow was.

Photo 10 of the fridge looking towards the starboard.

Photo 11 of refrigerator looking towards the stern.

Photo 12 showing the base of the fridge.

Photo 13 showing a view of the locus of the name plate.

Photo 14 showing the connection end of the gas supply piping to the burner.

Photo 15 showing a view of the measured outside diameter of the gas supply pipe to the burner.

Photo 16 showing a view of a rupture in the ammonia circulation system.

Photo 17 showing the length of the rupture as 16.8 mm.

Photo 18 showing the width of the rupture.

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

Photo 1 showing a view of the vessel from the stern.

Photo 2 showing a view from starboard of the vessel.

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

Photo 3 showing a view of the well of the boat looking sternwards.

Photo 4 showing the hatch to the engine compartment.

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

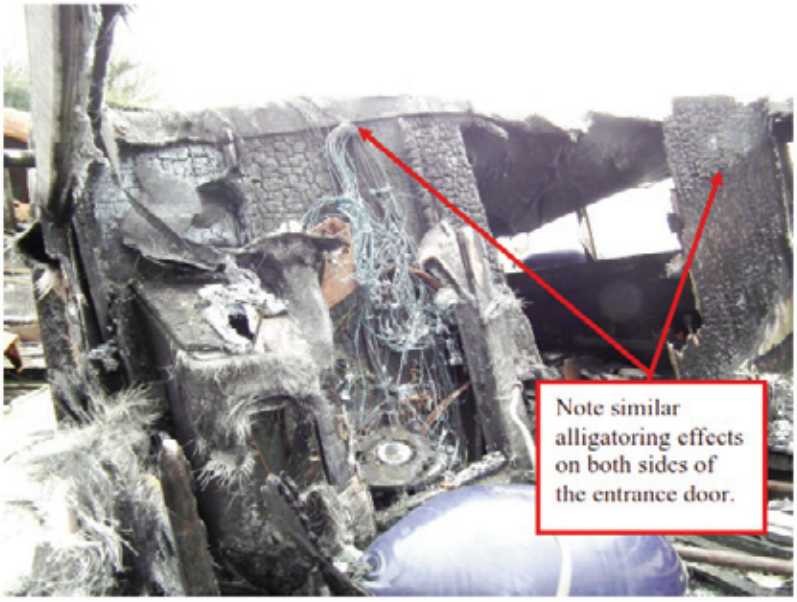


Photo 5 showing a view of the outside of the upright timber wall s of the cabin.

Photo 6 showing an alternative view of the outside of the walls of the cabin.

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

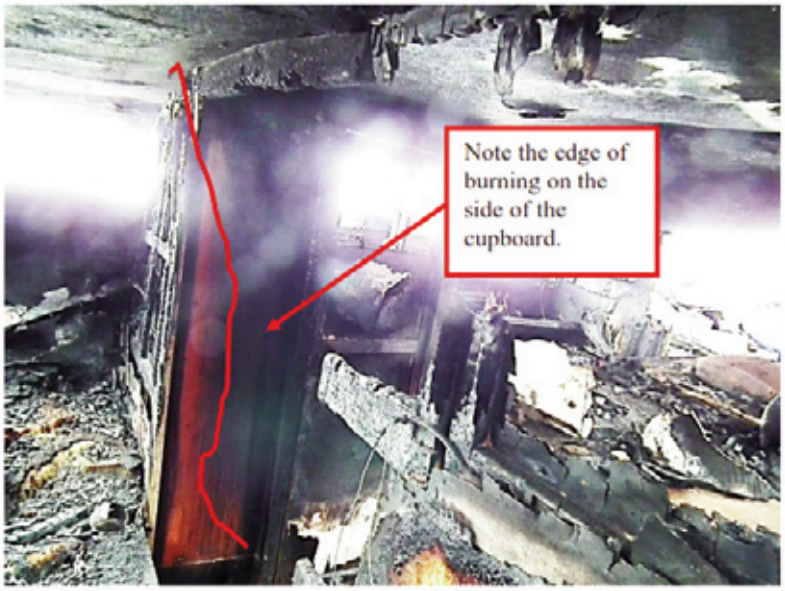
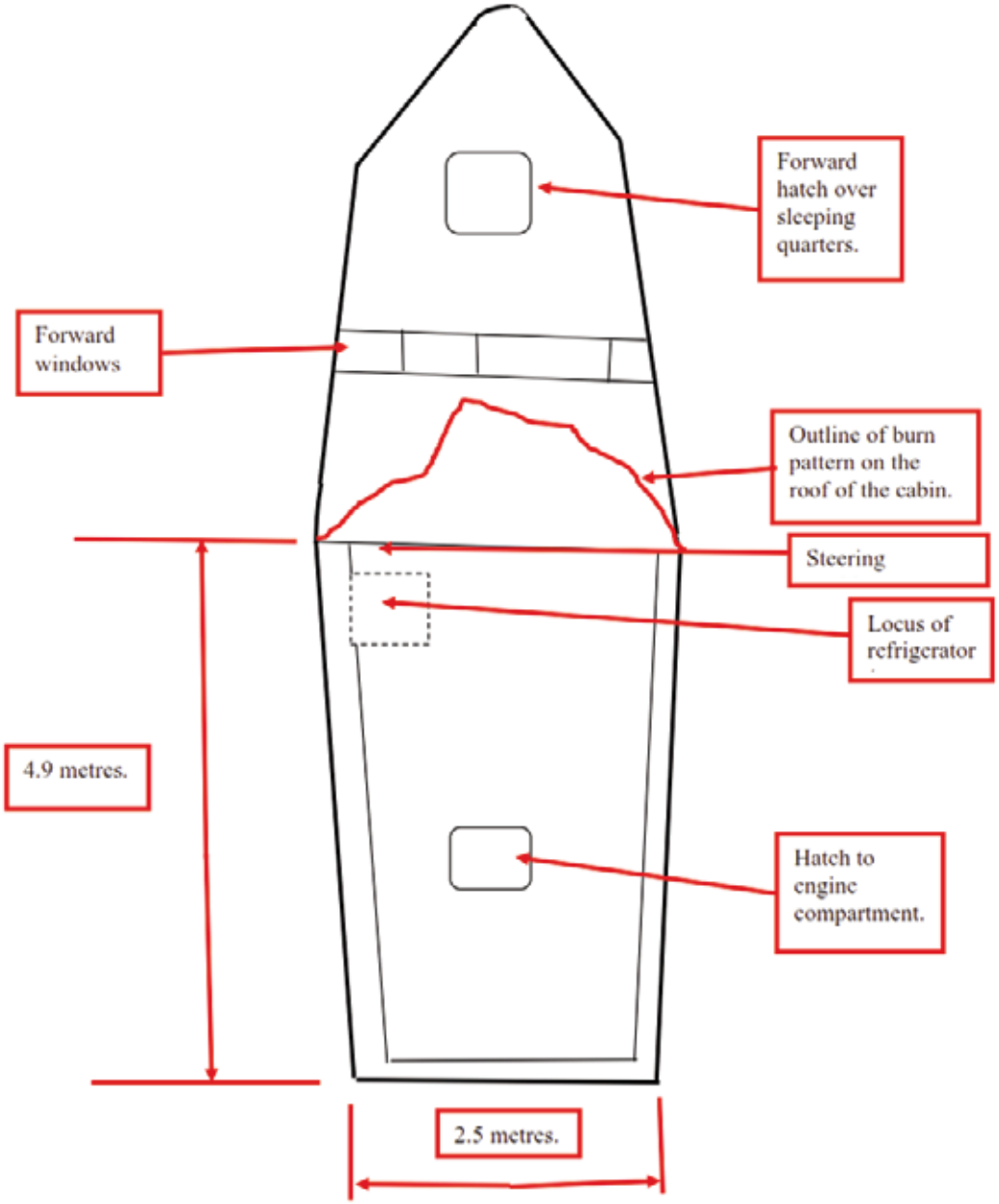


Photo 7 showing a view inside the accommodation cabin looking sternward.

Appendix 7.5 Forensic Engineers Report

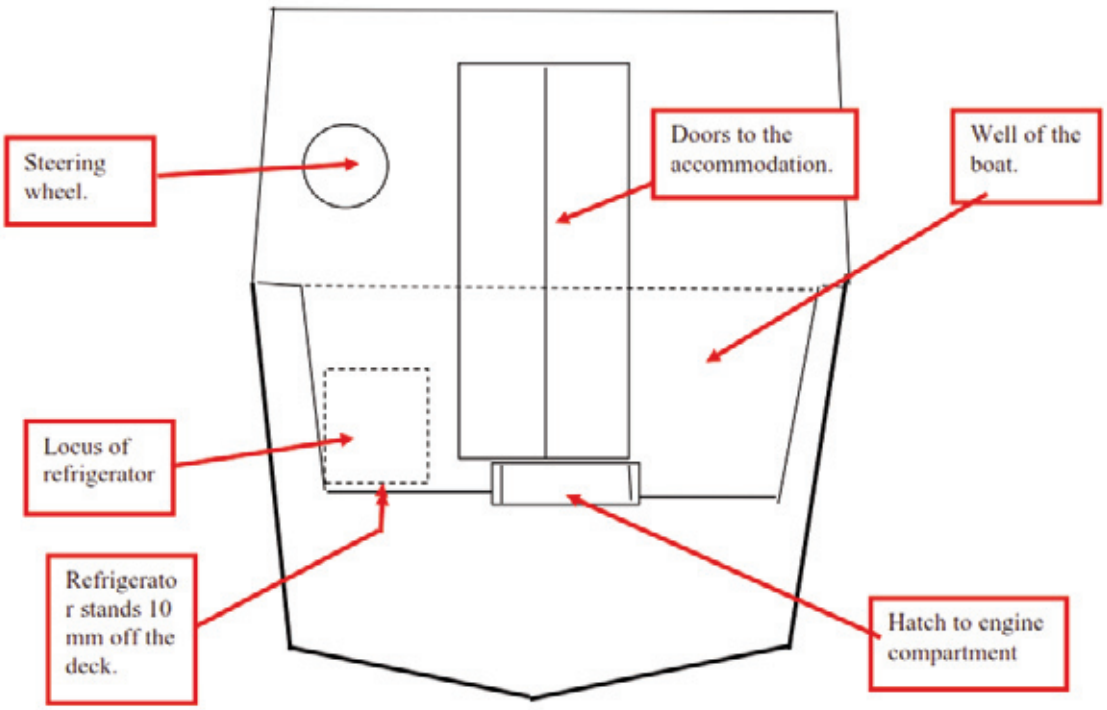
[redacted] Report on a fire on a boat leading to a fatality.



Sketch 1 illustrating a plan view of the boat.

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.



Sketch 2 illustrating a cross sectional elevation view through the well of the boat.

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

Photo 8 showing a view into the refrigerator.

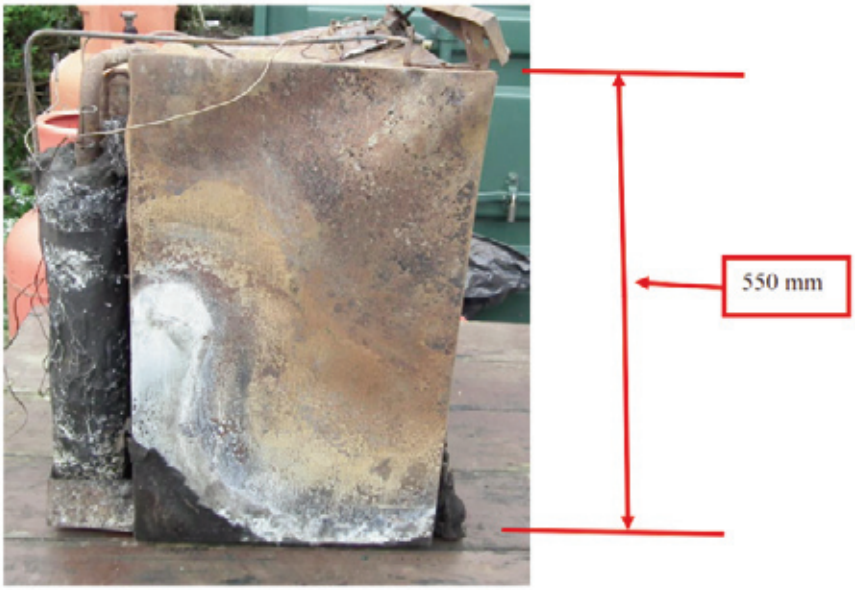
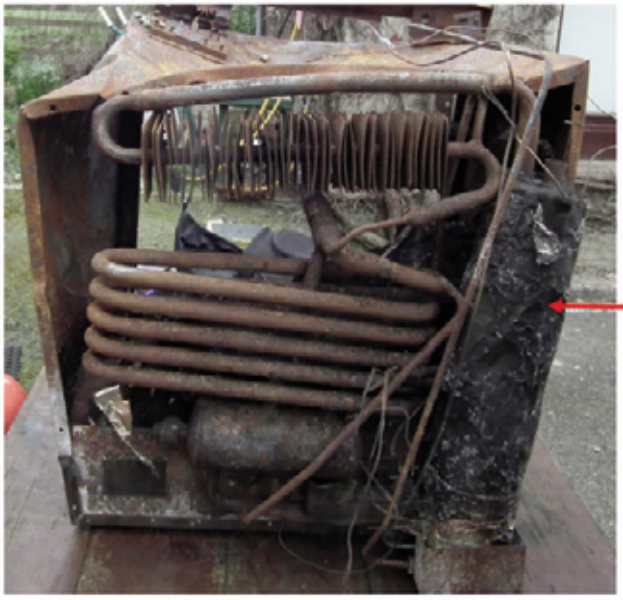


Photo 9 showing a view of the refrigerator looking towards where the bow was.

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.



Note that the insulation of the exhaust pipe, though blackened, is still intact.

Photo 10 of the fridge looking towards the starboard.

Photo 11 of refrigerator looking towards the stern.

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[redacted] Report on a fire on a boat leading to a fatality.

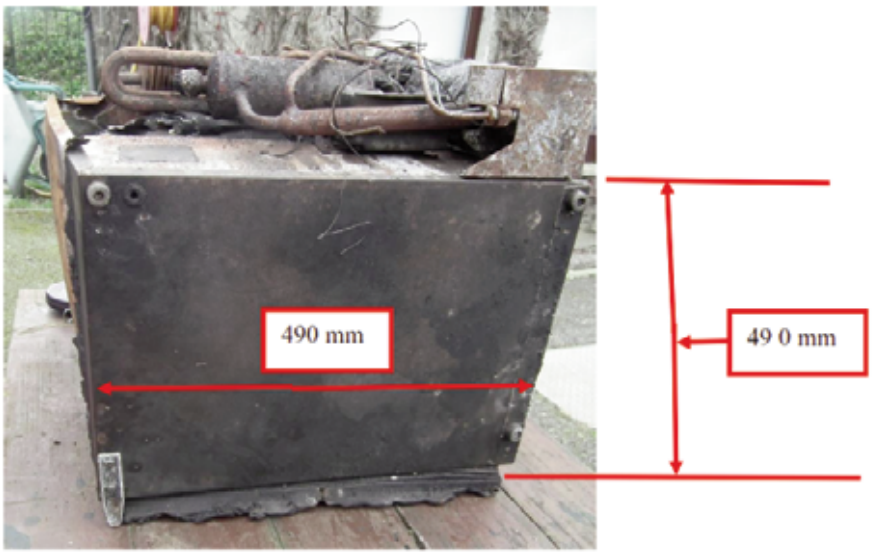

Photo 12 showing the base of the fridge.

Photo 13 showing a view of the locus of the name plate.

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[redacted] Report on a fire on a boat leading to a fatality.

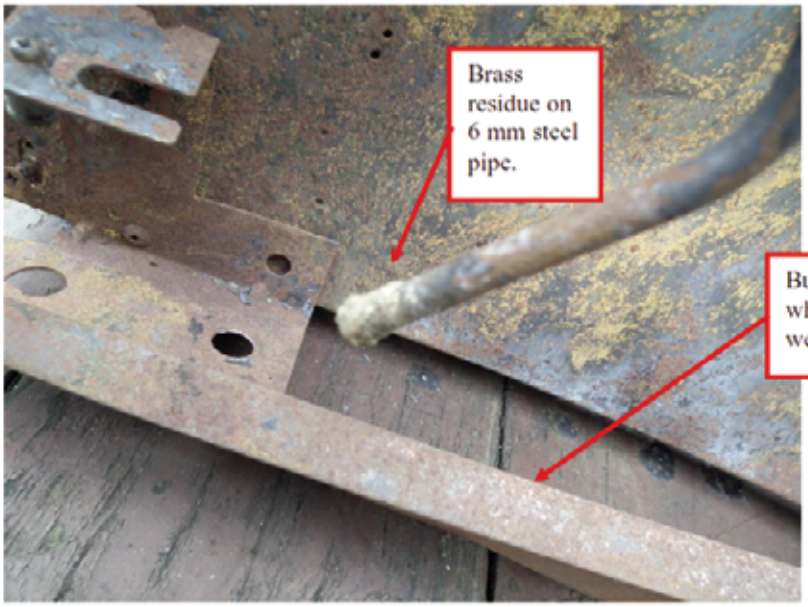


Photo 14 showing the connection end of the gas supply piping to the burner.

Photo 15 showing a view of the measured outside diameter of the gas supply pipe to the burner.

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

Photo 16 showing a view of a rupture in the ammonia circulation system.

Photo 17 showing the length of the rupture as 16.8 mm.

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

Photo 18 showing the width of the rupture.

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

Appendix B

Weather Report from Knock airport (which is 12 km from Carrick-on-Shannon)

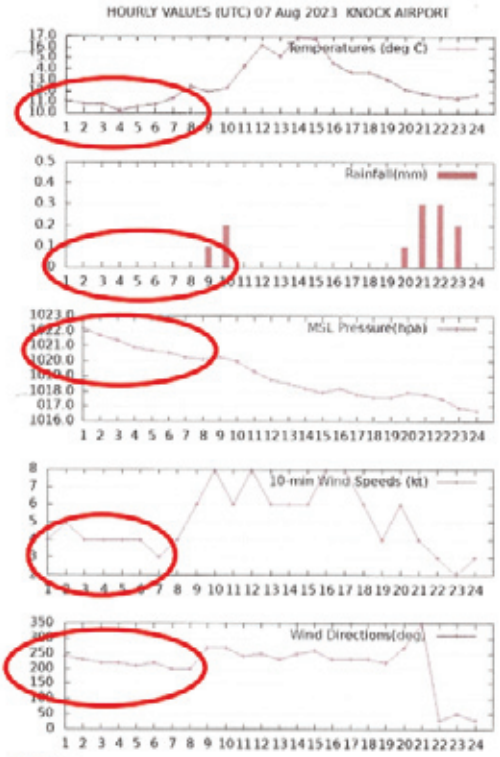
Daily Data

Weather station Data is available from 16/10/2015 to 14/04/2024

Select Station & Date: Station Knock Airport Date 07/08/2023

Weather Station Reports from Knock Airport

Date	Rainfall (mm)	Max Temp (°C)	Min Temp (°C)	Grass Min Temp (°C)	Mean Wind Speed (knots)	Max Gust (>= 34 knots)	Sunshine (hours)
07/08/2023	1.2	16.9	9.8	8.3	5.3		



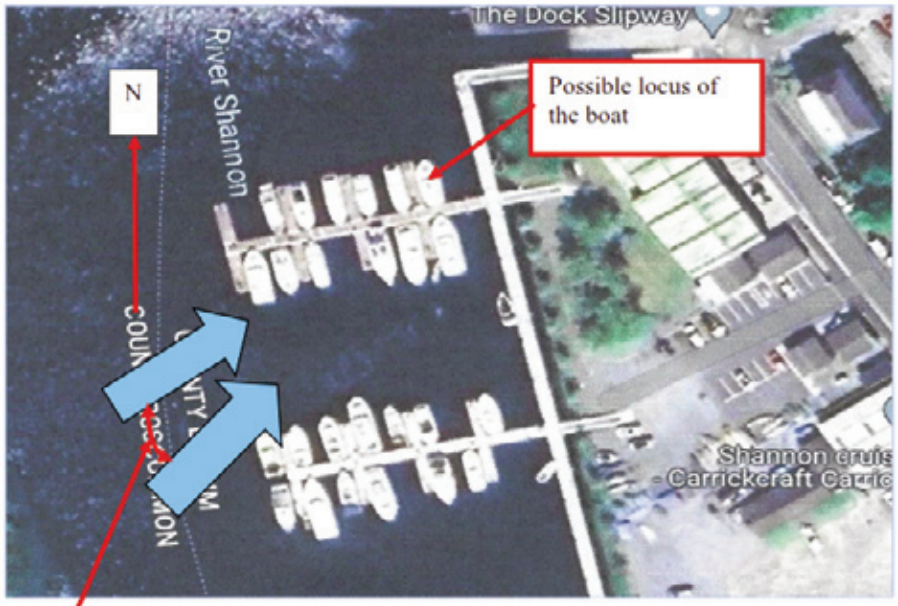
Daily Data

Appendix C

Appendix 7.5 Forensic Engineers Report

[redacted] Report on a fire on a boat leading to a fatality.

A satellite view of the Emerald Star Marina showing the wind direction as reported at Knock Airport.



Appendix 7.6 Inland Waterways Association of Ireland Fire Safety List

Fire Safety for boats

- **Smoke Alarms:**
  - ➢ Optical sensor alarms with hush buttons and "sealed for life" batteries are best for boats. Visit www.boatsafetyscheme.org/fire for further information.
  - ➢ Fit alarms in places you will hear them clearly if they go off.
  - ➢ Test alarms regularly at least monthly and **Never disconnect it or remove working batteries.**

- **Gas Leak Indicators:**
  - ➢ Fit a bubble type gas leak indicator in the LPG cylinder locker.
  - ➢ Push the gas leak indicator test button routinely to check for leaks in the gas system.

- **Carbon Monoxide (CO) Alarms:**
  - ➢ Fit a CO alarm to alert you of any poisonous carbon monoxide.
  - ➢ Check your CO alarm is suitable for marine use.

- **Safe Cooking and heating:**
  - ➢ Never leave cooking unattended. Turn all appliances off when finished.
  - ➢ Take extra care when cooking with oil – it sets alight easily.
  - ➢ Keep cooking area clean for safety – a build-up of grease could catch light.
  - ➢ Spark devices are safer than matches or lighters to light gas cookers, because they don't have a naked flame.
  - ➢ Don't change gas canisters inside the cabin or covered areas.
  - ➢ Charcoal barbecues shouldn't be used on boats – hot charcoal gives off dangerous amounts of CO and blown embers could set your boat alight.
  - ➢ Keep cabin ventilation clear to prevent a build-up

Appendix 7.6 Inland Waterways Association of Ireland Fire Safety List

of toxic CO.

- ➢ Ensure all hobs and burners have a flame supervision device to shut-off the gas if flame is blown out.
- ➢ Always ensure all gas appliances are specifically marine grade.

• **Candles / Cigarettes:**

- ➢ Don't smoke or use candles if you are drowsy because of medication or alcohol.
- ➢ Never smoke when refuelling or changing a gas cylinder.
- ➢ Empty ashtrays regularly. A build-up of ash could catch fire.
- ➢ Consider using LED candles instead of lit candles.
- ➢ If you must use lit candles, ensure they are in secure fire-proof holders and never leave them unattended.
- ➢ Try to choose fabrics that carry the fire-resistant label.

• **Fuel and Power Safety:**

- ➢ Don't let oil or debris build-up in the bilges.
- ➢ Inspect surfaces and items adjacent to exhausts for signs of heat damage or charring.
- ➢ Check all exhaust systems of inboard engines for leaks.
- ➢ Check for loose fuel joints, damaged fuel tanks or deteriorating hoses.
- ➢ Take care when refuelling. Put out naked flames first. Turn off engine and cooking before handling any fuel.
- ➢ When refuelling prevent petrol vapour from entering the boat by closing the doors, windows or hatches and closing the awning.
- ➢ Refuel outboard engines and generators well away from the boat.
- ➢ Leaks, spills and vapour can ignite easily. Clean them up straight away and make sure filler caps are secure after refuelling.
- ➢ Only carry spare petrol if necessary and store it in a self-draining locker or on open deck.
- ➢ Generators should only be used and stored outside the cabin space.

Appendix 7.6 Inland Waterways Association of Ireland Fire Safety List

- **Gas Safety:**
  - ➢ **If you smell gas, turn the supply off and get it checked out immediately!**
  - ➢ Have appliances properly installed and serviced routinely by qualified fitters.
  - ➢ Never restrict airflow by blocking vents or air gaps.
  - ➢ Make sure gas cylinders are secure after they have been changed. Test for leaks with leak detection fluid.
  - ➢ Replace gas hoses showing signs of cracking, bitterness or discolouration. Gas hoses must be replaced a minimum of 5 years after the date printed on the hose.
  - ➢ Store gas cylinders outside, in a self-draining and fire resistant locker. Keep them upright and secured from moving.

- **Electrics:**
  - ➢ **If there is any sign of a problem, turn the power off and don't switch it on until it's been checked out!!**
  - ➢ Use a qualified marine electrician to install and service electrics.
  - ➢ Don't overload adaptors. Keep to one plug per socket. Use the correct fuse or circuit breaker to avoid overheating.
  - ➢ Unplug appliances when they are not in use or when you leave the boat.
  - ➢ Take extra care when re-installing the boat's batteries. Check straps or restraints are secure afterwards.
  - ➢ Damaged wires can overheat rapidly, so look out for scorch marks or burning smells and listen out for buzzing, fizzing or crackling.

- **Plan a safe escape:**
  - ➢ **Make an emergency plan with everyone on board before you set out.**
  - ➢ Make sure people know how to close emergency valves and switches in case of fire.
  - ➢ You are more at risk from a fire when asleep, so check your boat before you go to bed. Make sure cooking and heating appliances are off and candles and cigarettes are fully extinguished.

Appendix 7.6 Inland Waterways Association of Ireland Fire Safety List

- ➢ Keep a torch easily available to help you escape at night. Make sure you have spares and test them regularly.
- ➢ Always have a working VHF radio on board ready for use at any time.
- ➢ Have enough life jackets for everyone on board and keep them in good working condition.
- ➢ Keep exits clear and keys to hand. Don't lock or bolt doors and hatches from the outside.

- **What to do if there is a fire:**
  - ➢ **If in doubt, don't fight a fire yourself. Get out, stay out, call 999 / channel 16 for help and wait for the fire and rescue services.**
  - ➢ Never return to the fire and do not enter a smoke filled space.
  - ➢ If you are already in a smoke filled space, keep low down where the air is clearer.
  - ➢ If you need to break glass to escape, use a blanket to prevent injury.
  - ➢ Starve the fire of air. Don't open engine hatches or doors unless you have to.

- **Fire Blankets and extinguishers:**
  - ➢ **Be prepared for a dry powder extinguisher to create adense powder-cloud, reducing visibility and impairing breathing. Don't jeopardise your escape.**
  - ➢ Familiarise yourself with how to use any extinguishers on board.
  - ➢ Only consider tackling a fire with an extinguisher if you are confident how to use it. Don't place yourself in danger. If in doubt, evacuate the boat.
  - ➢ Keep fire blankets and extinguishers within easy reach, close to exits and risk points, such as the galley and engine area.
  - ➢ Check extinguishers on a regular basis for serious dents, leaks and loss of pressure.
  - ➢ Check the pin and mechanism for any signs of problems or weaknesses.
  - ➢ Check the dates on extinguishers and blankets and service or replace them as recommended by the manufacturer's instructions.
  - ➢ Only use extinguishers that carry recognised European approval symbols.

Appendix 7.6 Inland Waterways Association of Ireland Fire Safety List

Chekclist

- ❖ Everybody aboard needs to know the emergency and escape plan.
- ❖ Get to know how to use the fire blanket and fire extinguishers
- ❖ Test the smoke alarms regularly – starting today.
- ❖ Keep escape routes clear – if a fire wakes you up, you have got to get out fast.
- ❖ If the boat's occupied, ensure doors and emergency exits will open from the inside.
- ❖ Don't leave the galley when cooking and don't cook while tired.
- ❖ Don't use portable LPG camping equipment aboard.
- ❖ Dispose of cigarettes carefully – put them out, right out.
- ❖ Keep fabrics like curtains, towels and clothing safely away from hobs and heaters.
- ❖ Don't ignore anything that looks smells or sounds like it is scorching, melting or sparking.
- ❖ Handle petrol away from the boat – keep petrol vapour out of the cabin.

SECTION 36 PROCESS

Section 36 of the Merchant Shipping (Investigation of Marine Casualties) Act, 2000

It is a requirement under Section 36 that:

(1) Before publishing a report, the Board shall send a draft of the report or sections of the draft report to any person who, in its opinion, is likely to be adversely affected by the publishing of the report or sections or, if that person be deceased, then such person as appears to the Board best to represent that person's interest.

(2) A person to whom the Board sends a draft in accordance with subsection (1) may, within a period of 28 days commencing on the date on which the draft is sent to the person, or such further period not exceeding 28 days, as the Board in its absolute discretion thinks fit, submit to the Board in writing his or her observations on the draft.

(3) A person to whom a draft has been sent in accordance with subsection (1) may apply to the Board for an extension, in accordance with subsection (2), of the period in which to submit his or her observations on the draft.

(4) Observations submitted to the Board in accordance with subsection (2) shall be included in an appendix to the published report, unless the person submitting the observations requests in writing that the observations be not published.

(5) Where observations are submitted to the Board in accordance with subsection (2), the Board may, at its discretion -

(a) alter the draft before publication or decide not to do so, or

(b) include in the published report such comments on the observations as it thinks fit.

The Board reviews and considers all observations received whether published or not published in the final report. When the Board considers an observation requires amendments to the report, those amendments are made. When the Board is satisfied that the report has adequately addressed the issue in the observation, then no amendment is made to the report. The Board may also make comments on observations in the report.

Response(s) received following circulation of the draft report (excluding those where the Board has agreed to a request not to publish) are included in the following section.

The Board has noted the contents of all observations, and amendments have been made to the report where required.

8. MSA 2000 – SECTION 36 OBSERVATIONS RECEIVED

Note: The names and contact details of the individual respondents have been obscured for privacy reasons.

Correspondence 8.1 Correspondence from Waterways Ireland and MCIB response.

Sent by Email

[redacted]
Chairperson,
Marine Casualty Investigation Board,
Leeson Lane,
Dublin.
D02 TR60

21st May 2025

RE: Safety Recommendations addressed to Waterways Ireland arising out of Draft Report of an Investigation into a marine casualty involving a vessel in or around Carrick-on-Shannon Marina, Co Leitrim on or about the 7th August 2023.

Dear [redacted]

Waterways Ireland acknowledge with thanks receipt of your letter dated 17th April 2025 attaching Section 36 draft Report from the Marine Casualty Investigation Board.

Waterways Ireland has considered the findings of the report and note that it highlights the importance of gas systems inspections and monitoring.

Current Shannon Bye-Laws and Canal Bye-laws require that all gas installations be installed in line with the relevant standard and placed in a well-ventilated area with ventilation piping.

Waterways Ireland proposes to update the Shannon Bye-laws and Canal Bye-laws which are more than 30 years old. The draft Bye-laws were submitted to the Department of Housing, Heritage and Local Government for consideration on 17th June 2024. In response to a request from the Department, Waterways Ireland submitted a further revised draft of the Bye-laws to the Department on 27th September 2024 for detailed consideration and legal review. This process will need some time to complete.

The proposed Bye-laws would grant Waterways Ireland enforcement powers regarding unsafe operation of vessels including use of equipment such as gas installation systems. It is the Body's intention to utilise the Bye-laws legislation for that purpose.

In the interim, Waterways Ireland will continue to promote safe on water behaviours under the current Bye-laws.

Finally, I would like to thank you and the Marine Casualty Investigation Board for the valuable work you undertake on behalf of the State.

Yours Sincerely,

[redacted]
Chief Executive

MCIB RESPONSE: The MCIB notes the contents of this observation.

Leeson Lane, Dublin 2.
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email: info@mcib.ie
www.mcib.ie