Final report MO-2015-203: Loss of the fishing vessel *Jubilee* and all hands,
12 nautical miles off the Rakaia River mouth, 18 October 2015

The Transport Accident Investigation Commission is an independent Crown entity established to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future. Accordingly it is inappropriate that reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

The Commission may make recommendations to improve transport safety. The cost of implementing any recommendation must always be balanced against its benefits. Such analysis is a matter for the regulator and the industry.

Final Report

Marine inquiry MO-2015-203
Loss of the fishing vessel *Jubilee* and all hands, 12 nautical miles off the Rakaia River mouth, 18 October 2015

Approved for circulation: February 2017

Transport Accident Investigation Commission

About the Transport Accident Investigation Commission

The Transport Accident Investigation Commission (Commission) is a standing commission of inquiry and an independent Crown entity responsible for inquiring into maritime, aviation and rail accidents and incidents for New Zealand, and co-ordinating and co-operating with other accident investigation organisations overseas. The principal purpose of its inquiries is to determine the circumstances and causes of occurrences with a view to avoiding similar occurrences in the future. Its purpose is not to ascribe blame to any person or agency or to pursue (or to assist an agency to pursue) criminal, civil or regulatory action against a person or agency. The Commission carries out its purpose by informing members of the transport sector and the public, both domestically and internationally, of the lessons that can be learnt from transport accidents and incidents.

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Important notes

Nature of the final report

This final report has not been prepared for the purpose of supporting any criminal, civil or regulatory action against any person or agency. The Transport Accident Investigation Commission Act 1990 makes this final report inadmissible as evidence in any proceedings with the exception of a Coroner's inquest.

Ownership of report

Citations and referencing

Information derived from interviews during the Commission's inquiry into the occurrence is not cited in this final report. Documents that would normally be accessible to industry participants only and not discoverable under the Official Information Act 1982 have been referenced as footnotes only. Other documents referred to during the Commission's inquiry that are publicly available are cited.

Photographs, diagrams, pictures

Unless otherwise specified, photographs, diagrams and pictures included in this final report are provided by, and owned by, the Commission.

Verbal probability expressions

The expressions listed in the following table are used in this report to describe the degree of probability (or likelihood) that an event happened or a condition existed in support of a hypothesis.

Terminology (adopted from the Intergovernmental Panel on Climate Change)	Likelihood of the occurrence/outcome	Equivalent terms
Virtually certain	> 99% probability of occurrence	Almost certain
Very likely	> 90% probability	Highly likely, very probable
Likely	> 66% probability	Probable
About as likely as not	33% to 66% probability	More or less likely
Unlikely	< 33% probability	Improbable
Very unlikely	< 10% probability	Highly unlikely
Exceptionally unlikely	< 1% probability	

The fishing vessel *Jubilee* at sea

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Abbreviations

m	metre(s)
mm	millimetre(s)
RNZN	Royal New Zealand Navy
VHF	very high frequency

Glossary

bilge	a space at the lowest point of a compartment on a vessel where water collects
bilge manifold	where each bilge suction line connects to the bilge pump. Each bilge suction line is provided with a stop valve at the manifold to enable control of the suction lines from which the pump will draw
chain locker	a space in the forward part of a vessel, usually beneath the bow forward of the collision bulkhead, that contains the anchor chain and rope and in small vessels other ropes
coaming	any vertical surface on a vessel that is designed to deflect or prevent the entry of water. Usually it refers to a raised section of deck plating around an opening, such as a hatch. Coamings also provide a frame onto which a hatch cover can be fitted
con	have control of the speed and direction of a vessel
fish hold	the space on a fishing vessel where the catch is stowed; this may be refrigerated and/or rely on ice loaded into the hold
forecastle space	the forward part of a vessel containing the crew's sleeping or living quarters
freeing port	an opening in the bottom of a bulwark for rapid drainage of a weather deck in heavy seas
high-level bilge alarm	a visual and/or audible alarm provided at a vessel's operating station to indicate a high water level in the space where it is fitted
knot(s)	nautical mile(s) per hour
Maritime Rules	the maritime and marine protection rules are statutory instruments (or secondary legislation) made by the Minister of Transport under the Maritime Transport Act 1994. While the Maritime Transport Act stipulates broad principles of maritime law, the Maritime Rules contain detailed technical standards and procedures. Compliance with the rules is required because they form part of New Zealand maritime law. Failure to comply with the rules may be an offence under the Act
mayday call	a spoken distress call that indicates immediate assistance is required for a vessel in grave and imminent danger
mayday relay call	a distress relay call made by a vessel or coast radio station when it has heard a distress call that has not been acknowledged and is not in a position to render assistance itself
non-return valve	a valve that will only let a fluid pass in one direction
port	the left-hand side of a vessel when looking forward
shelter deck	a continuous deck of light construction above the principal deck of a vessel, usually covering a full-length superstructure or space not permanently closed against the weather

stabilisers	fins mounted below the waterline and emerging laterally from the hull to reduce a vessel's roll due to wind or waves. They can usually be retracted by some means to allow the vessel to sit alongside a wharf
starboard	the right-hand side of a vessel when looking forward
trawl doors	two doors on either side of a trawl net to maintain the horizontal spread of the trawl net opening
trim	the difference between the draught forward and the draught aft. Draught is the depth of a hull below the water. If the aft draught is greater, the vessel is described as being trimmed by the stern; if the forward draught is greater, the vessel is trimmed by the bow. A large or excessive trim, caused by excess weight forward or aft, will reduce the freeboard forward or aft, will change the vessel's condition from the designed seagoing trim and may affect the seakeeping characteristics of the vessel

Data summary

Vehicle particulars

Name:	*Jubilee*
Type:	fishing vessel
Class:	safe ship management
Limits:	New Zealand offshore limits
Classification:	safe ship management
Length:	16 metres
Breadth:	5.6 metres
Displacement:	91.3 tonnes
Built:	2008, Lyttelton, New Zealand
Propulsion:	one Scania D112 59M diesel engine producing 350 horsepower at 1,800 revolutions per minute. Driving a Hundested four-bladed variable pitch propeller through a Hundested CPG-32 4.45:1 marine gearbox
Service speed:	9 knots
Owner: Operator:	Cressy Fishing Limited Ocean Fisheries Limited
Home port:	Lyttelton
Minimum crew:	two

Date and time	0420c, 18 October 2015[1]
Location	12 nautical miles off the Rakaia River mouth
Persons involved	skipper and two crew
Injuries	three deceased
Damage	vessel sunk, constructive total loss

[1] Times in this report are in New Zealand Daylight Time (co-ordinated universal time + 13 hours) and are expressed in the 24-hour format.

1. Executive summary

1.1. The fishing vessel *Jubilee* had been fishing in an area southwest of Banks Peninsula for about two days. At 0030 on 18 October 2015, the *Jubilee* ceased fishing for the night and drifted to the weather while the crew rested. The weather conditions were wind from the southwest at 25 to 30 knots with little significant swell.

1.2. At 0419 a telephone call was made from the *Jubilee*'s mobile phone to another company vessel fishing in the vicinity. The call was not answered.

1.3. At 0420 the skipper of the *Jubilee* made a radio 'mayday' call[2] giving the *Jubilee*'s location, saying that the vessel was taking on water and that they were abandoning the vessel into the liferaft. Akaroa Radio acknowledged the call and relayed it to all other vessels in the vicinity.

1.4. Search vessels arrived at the location at dawn and found only a liferaft that had self-deployed, an oil slick and some flotsam. Later that day the wreck of the *Jubilee* was found by sonar on the seabed at the location given in the mayday call.

1.5. During the following week divers identified the wreck of the *Jubilee* and recovered the bodies of all three crew members from the wheelhouse.

1.6. Further dives were made to gather evidence for the investigation. Attempts to salvage the vessel from the seabed were not successful.

1.7. The Transport Accident Investigation Commission (Commission) found it was likely that flooding of the *Jubilee*'s fish hold was the main factor contributing to its sinking, or capsizing and sinking, and that it was about as likely as not that the cause of the fish hold flooding was water from a deck wash hose that had been left running through an open hatch.

1.8. The Commission also found that the absence of a bilge high-level alarm for the fish hold and the absence of an indicator in the wheelhouse alerting the crew when the bilge pump was running were missing checks in the system that would have alerted the crew and then about as likely as not prevented the sinking.

1.9. Safety issues identified included the following:

- the means of escape from the *Jubilee*'s wheelhouse in the event of an emergency were not well designed and afforded the crew too few options for escaping in the event of capsize or sinking
- although not relevant to this accident, the means of escape from the *Jubilee*'s wheelhouse and accommodation space may not have met the intent of maritime rules for providing escape for crew in the event of fire
- there is a lack of advice and guidance in the Maritime Rules on what is an acceptable standard for surveyors to approve when the Maritime Rules defer to the surveyors' discretion.

1.10. The safety actions taken by the *Jubilee*'s owner and two recommendations made to the Director of Maritime New Zealand should address these safety issues.

1.11. Key lessons arising from this inquiry were:

- good watchkeeping includes not only looking after the safe navigation of the vessel, but also being vigilant to the state of trim and stability of the vessel and any factors that could affect either

[2] A mayday call is a spoken distress call that indicates immediate assistance is required for a vessel in grave and imminent danger.

- Notwithstanding the minimum requirements set out in Maritime Rules, owners and designers of vessels should take a risk-based approach to designing and providing escape routes from all compartments for all foreseeable emergencies.
- crews need to assess and pre-plan escape routes from any part of their vessels for all foreseeable emergency situations.

2. Conduct of the inquiry

2.1. On 18 October 2015 the Transport Accident Investigation Commission (Commission) was advised by Maritime New Zealand of the accident. A watching brief was kept on developments during the day. What was thought to be the wreck of the *Jubilee* was found on the seabed in about 40 metres (m) of water by a sister vessel using its fish-finding echo sounder. None of the crew was found despite an extensive surface search.

2.2. On 19 October 2015 the Commission opened an inquiry under section 13(1)b of the Transport Accident Investigation Commission Act 1990, and appointed an investigator in charge. Two investigators travelled to Christchurch later that day to commence the investigation.

2.3. The owner and operator of the vessel were interviewed by the investigation team and evidence was gathered.

2.4. Liaison was made with New Zealand Police, the Police dive team and the Royal New Zealand Navy (RNZN) dive team. A decision was made for the RNZN dive team to carry out an underwater search to determine if the wreck was the *Jubilee* and, if confirmed, carry out a search for the missing crew.

2.5. Between 24 October and 28 October 2015, after the wreck was identified and surveyed on the seabed using a remotely operated vehicle, the RNZN dive team dived on the wreck and recovered the bodies of the three crew and videoed items of interest for the Commission.

2.6. The investigation team continued seeking evidence and interviewing previous crew members, including extracting photographs from a badly damaged tablet computer with the help of the Australian Transport Safety Bureau.

2.7. The Commission made the decision to salvage the *Jubilee*, carry out an in-depth examination, and test certain items of interest to gain a better understanding of the circumstances that may have caused the vessel to founder.

2.8. Between 15 April and 5 May 2016 salvage experts, observed by the Commission, made numerous attempts to salvage the vessel. The vessel was raised off the seabed and towed closer inshore, but ultimately the attempts were unsuccessful in raising the vessel to the surface.

2.9. On 6 May 2016 a detailed video survey of the vessel was undertaken and certain items of interest were recovered for further testing. The items of interest underwent further testing at an engineering workshop under the supervision of the Commission's investigator in charge.

2.10. On 22 February 2017 the Commission approved the draft report to be circulated to interested persons for comment.

2.11. The draft report was distributed to ten interested parties on 7 March 2017, with the closing date for receiving submissions as 29 March 2017. Five submissions were received that included comments and five submitters declined to comment.

2.12. The Commission has considered in detail all submissions made and any changes as a result of those submissions have been included in the final report

2.13. On 27 April 2017 the Commission approved the report for publication

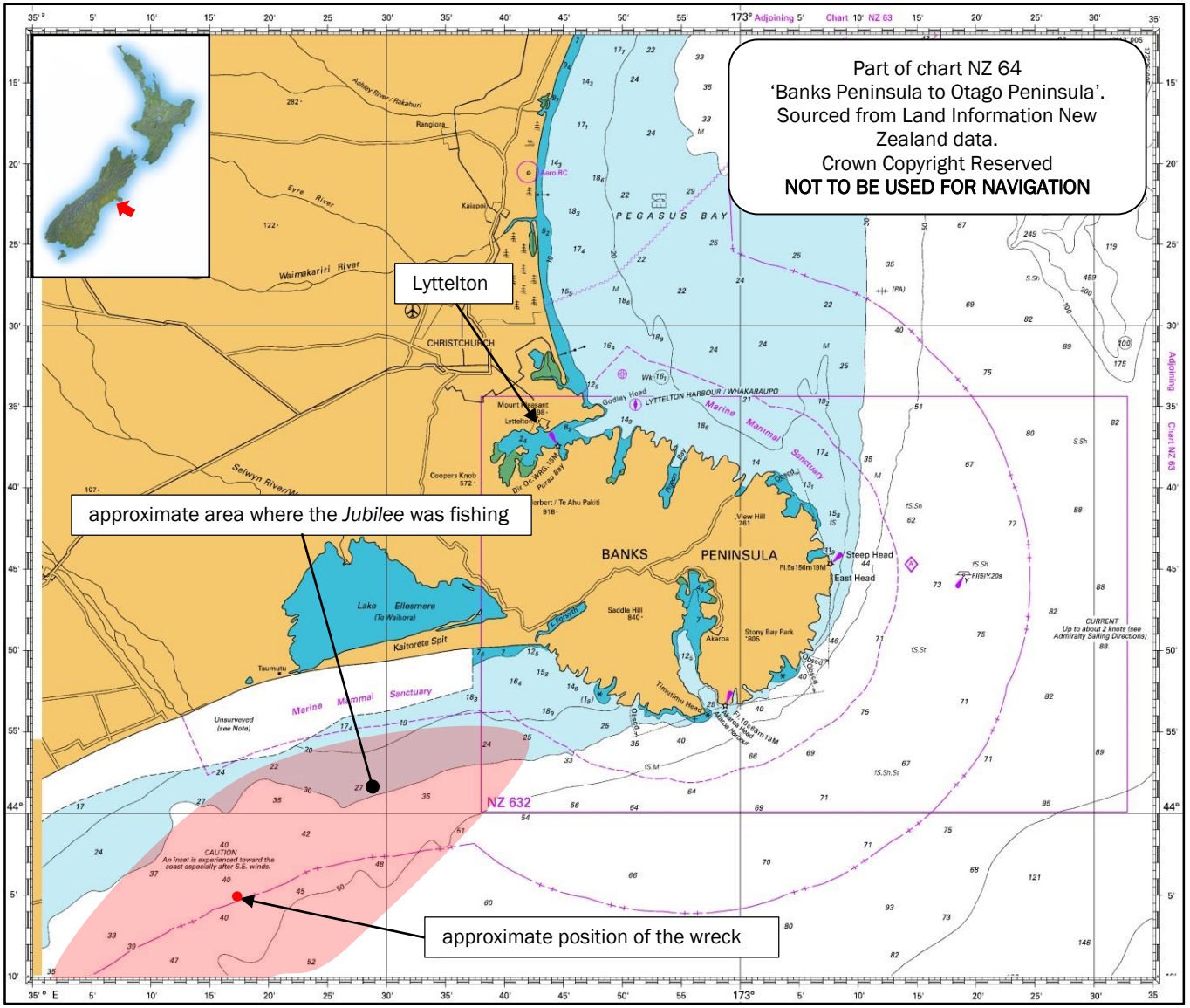


Figure 1
Chart of the general area of the accident

3. Factual information

3.1. Narrative

3.1.1. On 16 October 2015 at about 2230, the skipper and the two crew of the fishing vessel *Jubilee* sailed from Lyttelton and headed for the fishing grounds to the southwest of Banks Peninsula (see Figure 1).

3.1.2. The journey to the fishing grounds took five or six hours. Usually two of the crew would sleep while the remaining crew member would con[3] the vessel to the fishing grounds and sleep later.

3.1.3. On arrival at the fishing grounds the *Jubilee* joined another Ocean Fisheries Limited vessel, the *Legacy*, and they fished close to each other throughout the day. The skipper of the *Jubilee* contacted the skipper of the *Legacy* and told him that as the fishing was not good he was going to head in towards the coast and fish for flatfish overnight.

3.1.4. On 18 October at about 0030, the skipper of the *Jubilee* telephoned the skipper of the *Legacy* and said that he had changed his mind, and instead of fishing for flatfish he was going to "park up for the night". The skipper on the *Legacy* said he was going to continue fishing while heading south.

3.1.5. At about 0419 someone on board the *Jubilee* tried to contact the *Legacy* using the vessel's mobile telephone; the call was not answered.

3.1.6. At 0420 the skipper of the *Jubilee* issued a distress call on very high frequency (VHF) radio channel 16 (the safety and calling channel) that the *Jubilee* was taking on water and the vessel was sinking. This call was immediately answered by Akaroa Maritime Radio, which requested information on the number of persons on board and what assistance was required. The skipper of the *Jubilee* reiterated the vessel's position and said that they were "getting off and getting in the liferaft now".

3.1.7. At 0422 Akaroa Maritime Radio issued a mayday relay call[4] on VHF channel 16. The skipper of the *Legacy* immediately answered the mayday relay message. He stated that he thought his was the only vessel in the area and that he was approximately 26 nautical miles away. He was starting to haul in his net and would be back at the mayday position in about three and a half hours.

3.1.8. It was dawn before the *Legacy* arrived at the mayday position, by which time a large container vessel had stopped to render assistance. The *Legacy*'s crew found the *Jubilee*'s liferaft that had self-deployed, an oil slick, and some flotsam. There were no survivors inside the liferaft. The float free emergency position indicating radio beacon had also self-deployed and the signal had been received by the authorities ashore. Despite an extensive air and sea search, none of the crew was found. The *Legacy* returned to Akaroa where it landed the liferaft.

3.1.9. The wreck of the *Jubilee* was discovered on the seabed later the same day by the *Frontier*, another Ocean Fisheries vessel, using its fish-finding echo sounder. The wreck was in virtually the same position as that given in the mayday call. The fishing vessels *Jubilee*, *Legacy* and *Frontier* had all been constructed by Stark Bros Limited of Lyttelton, New Zealand and were owned by wholly owned independent companies of the Stark family. The vessels were operated by Ocean Fisheries, another wholly owned Stark family company.

3.1.10. Several days later divers positively identified the wreck, and the bodies of the three crew members were recovered from the wheelhouse.

[3] To con is to have control of the speed and direction of a vessel.
[4] A mayday relay call is a distress relay call made by a vessel or coast radio station when it has heard a distress call that has not been acknowledged and is not in a position to render assistance itself.

3.2. Weather and sea conditions

3.2.1. The New Zealand MetService weather forecast issued at 0316 on 18 October 2015 for the Rangitata sea area in which the *Jubilee* was fishing was:

> *Northerly 30 knots changing southwest 30 knots this morning and easing to 20 knots for a time this afternoon and early evening. Rough sea easing for a time. Southwest swell 3 metres easing for a time. Northeast swell 2 metres developing for a time. Fair visibility in the odd morning shower.*

3.2.2. The weather and sea conditions at the time of the foundering were described by the skipper of the *Legacy* as "offshore wind of about 25 nautical miles per hour [knots] with very little swell"; he opined that there would have been no problem sleeping on board the vessel.

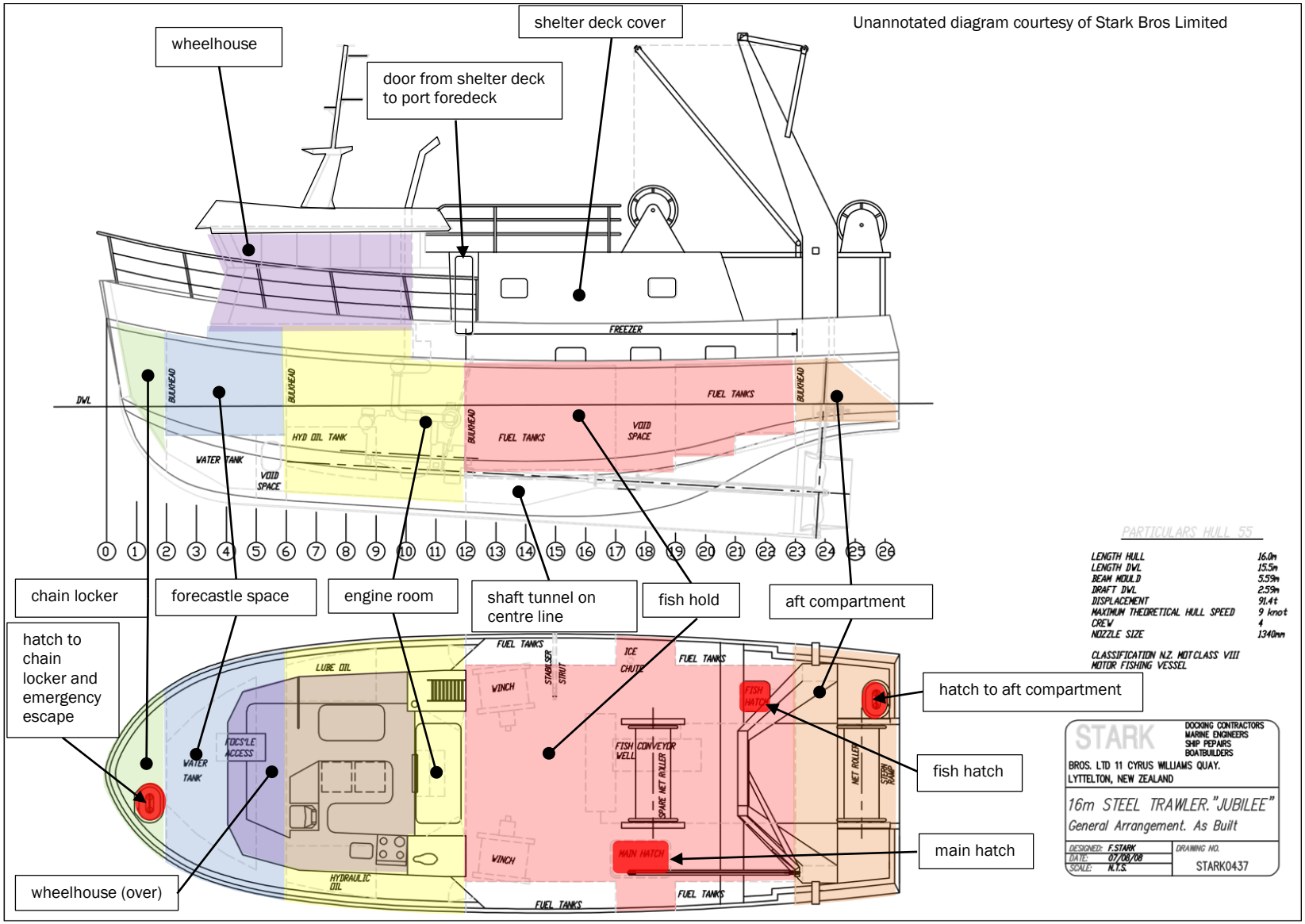


Figure 2
General arrangement plan of the *Jubilee*

3.3. Vessel information and manning

3.3.1. The *Jubilee* (Figure 2) was a steel-hulled stern-trawler built by Stark Bros Limited of Lyttelton, New Zealand in 2007/2008. The *Jubilee* had an overall length of 16 m, a breadth of 5.6 m and a maximum draught of 2.6 m. It was powered by a single diesel engine developing 257 kilowatts driving a single controllable-pitch propeller housed in a steerable duct.

3.3.2. The *Jubilee* was owned by Cressy Fishing Limited and operated by Ocean Fisheries. The *Jubilee* had received certification under safe ship management through SGS, a safe ship management provider and survey company. The safe ship management certificate was valid from 3 April 2012 until 31 March 2016, and certified the *Jubilee* as fit for purpose as a fishing vessel on 12 March 2012 to operate within the New Zealand offshore limits (see Appendix 1). At the time of the accident the *Jubilee* was operating within the inshore fishing limit.

3.3.3. The skipper of the *Jubilee* had considerable seagoing experience and held a New Zealand inshore launchmaster certificate of competency and a New Zealand certificate of competency as a Marine Engineer Class 6.

3.3.4. Both of the crew members had extensive seagoing experience on fishing vessels. One of the two crew members on board held New Zealand certificates of competency as a qualified fishing deckhand and inshore launchmaster. The other held a New Zealand certificate of competency of advanced deckhand fishing – endorsement.

3.4. Bilge pumping arrangements

3.4.1. All watertight compartments, except permanent oil and water tanks, must be capable of being pumped and drained as stated in Maritime Rules Part 40(D).28 (1) and (2) (see Appendix 3).

3.4.2. The bilge[5] pumping arrangements on the *Jubilee* are shown in Figure 3. Most of the major compartments were connected by piping to a bilge manifold[6] in the engine room. This allowed either the engine-driven bilge pump or the electrically driven bilge pump to pump water from a compartment and discharge it over the side of the vessel. A separate hand pump was provided that allowed compartments connected to the bilge manifold to be pumped if neither the engine-driven pump nor the electric pump was functioning.

3.4.3. The fish hold[7] was not connected to the bilge manifold but was fitted with an automatic, electrically operated submersible bilge pump that discharged the water over the side of the vessel through dedicated pipework.

3.4.4. In addition to this arrangement the engine room and the shaft tunnel were fitted with automatic, electrically operated submersible bilge pumps connected to their own dedicated pipework. An emergency bilge pump with flexible pipework was thought to have been stowed in the aft compartment, although this could not be confirmed.

[5] A bilge is a space at the lowest point of a compartment on a vessel where water collects.
[6] A bilge manifold is where each individual bilge suction line connects to the bilge pump. Each bilge suction line is provided with a stop valve at the manifold to enable control of which suction line the pump can draw from.
[7] The fish hold is the space on a fishing vessel where the catch is stowed; this may be refrigerated and/or rely on ice loaded into the hold.

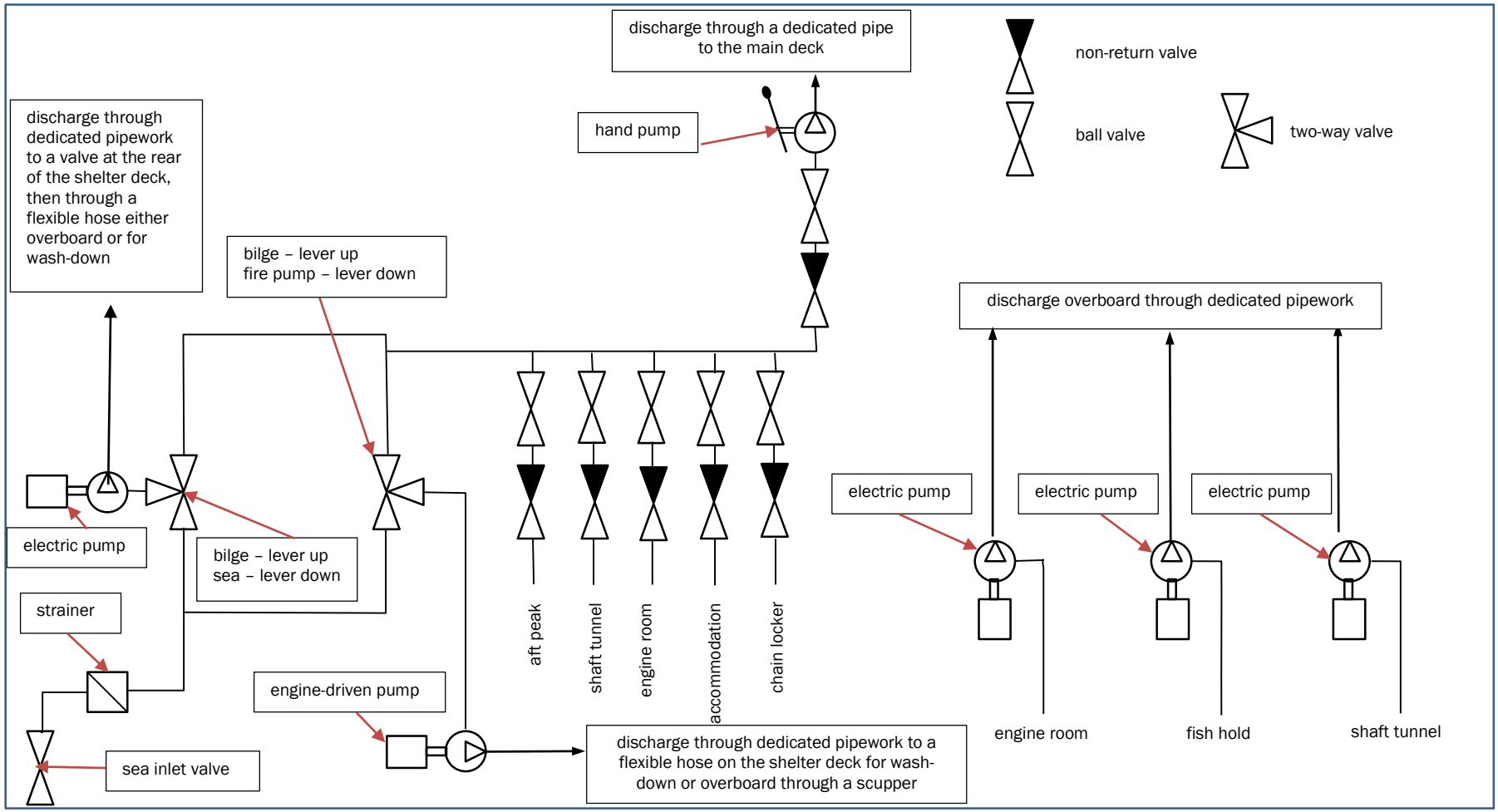


Figure 3
Diagram of bilge pumping arrangement on the *Jubilee*

4. Analysis

4.1. Introduction

4.1.1. The loss of a relatively new fishing vessel and all of its crew in moderate weather conditions is unusual and unexpected, more so considering that the crew were all experienced fishermen.

4.1.2. For a vessel to sink, or capsize and sink, water must enter the vessel in sufficient quantity that it either overcomes the natural buoyancy of the vessel or erodes the vessel's stability to a point where it capsizes.

4.1.3. The Commission considered several scenarios that could, or had been known to, cause the loss of a fishing vessel:

- the trawl net catching on an obstruction while the vessel was fishing
- the loss of the tail-shaft or a leaking stern gland (seal) on the tail-shaft
- piercing of the vessel's hull due to a collision with a submerged or semi-submerged object
- flooding of the engine room
- flooding of the fish hold.

4.1.4. The trawl net could not have been a factor because the vessel was not fishing at the time of the accident. Divers found all of the fishing equipment in a stowed condition.

4.1.5. The condition of the propeller shaft seal was also unlikely to have been a factor. Divers later found the propeller and the propeller shaft seal in place and apparently in normal condition. It is possible for propeller shafts to develop slow leaks. However, it would have taken a substantial leak to cause the vessel to founder. Any water entering the propeller shaft space would have activated a high-level alarm in the wheelhouse and would have been automatically pumped overboard via the stand-alone bilge pump located in the shaft tunnel.

4.1.6. The remaining three possible scenarios are discussed in the following sections.

4.1.7. Also discussed are the survivability of the accident and whether the design of the vessel contributed to the crew being unable to escape from the sinking vessel.

4.1.8. The Commission also identified a non-contributing safety issue with the *Jubilee*'s compliance with the Maritime Rules covering means of escape from compartments in the event of a fire.

4.2. Circumstances

4.2.1. The skipper of the *Jubilee* had informed the skipper of the *Legacy* by telephone that they "were going to park up for the night"[8]. Under Maritime Rules Part 22 there is a requirement for all vessels when underway[9] to maintain a proper lookout and a safe navigational watch (see Appendix 2).

4.2.2. The bodies of all three crew members were found in the wheelhouse. The skipper and one crew member were scantily clothed, as though they had been asleep. Neither was wearing footwear. The third crew member was fully clothed, including wearing laced footwear. It is about as likely as not that he had been the designated watchkeeper, assuming one had been appointed. It is likely that the skipper and the other crew member were sleeping as the accident sequence unfolded.

[8] From interviews this was considered to mean heave the vessel to or drift, as opposed to anchoring, so that some or all the crew could rest.
[9] A vessel that is not made fast to the shore or aground.

4.2.3. The designated watchkeeper is tasked with keeping a navigational watch and periodically checking on the general condition of the vessel. This includes monitoring any alarms and being alert to any unusual movement of the vessel as it rides the seas.

4.2.4. It was not possible to establish who, if anyone, was awake as the events unfolded. Mobile phone records showed that the phone belonging to the crew member who was found fully clothed was connected to the internet from 0030 until the approximate time the vessel sank. This is not evidence that he was actively using the mobile phone, as some mobile applications cause phones to be connected to the internet in the background.

4.2.5. Someone who was asleep or distracted by using a mobile phone would have been less likely to notice any unusual attitude or movement of the vessel as it was taking on water.

4.2.6. Something alerted the crew to the developing situation. This could have been an engine or high-level bilge alarm, or simply an extreme attitude or motion of the vessel as it took on water.

4.2.7. At least one person was awake to make an attempted mobile phone call to the sister vessel *Legacy*. Also, the skipper made a mayday radio call shortly before the vessel sank. However, it was not possible to establish which, and for how long, crew members had been awake before the vessel sank. Equally, it was not possible to establish what actions the crew took to remedy the situation before the vessel sank. This is particularly important when considering the possible causes of the sinking, as explained in the following sections.

4.2.8. The *Jubilee* had five main watertight compartments. These were the chain locker[10], the forecastle space[11], the engine room, the aft compartment and the fish hold. The fish hold was the only compartment large enough to on its own cause the vessel to sink when flooded (see Figure 2).

4.2.9. All the watertight compartments except the fish hold were connected to the vessel's bilge system by piping that led back to the engine room. These compartments each had:

- high-level bilge alarms that activated a light and an alarm in the wheelhouse
- bilges that could be pumped out by manually operated valves connecting the bilge to either an engine-driven pump or an electric pump in the engine room
- the capability of being pumped manually using a hand pump located on the port[12] side of the main deck.

[10] A chain locker is a space in the forward part of a ship, usually beneath the bow forward of the collision bulkhead, that contains the anchor chain and rope and in small vessels other ropes.
[11] The forecastle space is the forward part of a vessel containing the crew's sleeping or living quarters.
[12] Port is the left-hand side of a vessel when looking forward.

Figure 4
Video still from the remotely operated vehicle search for the *Jubilee*, showing the vessel sitting upright on the seabed

4.3. Possible or probable scenarios leading to the foundering

Collision with a submerged object

4.3.1. Hull damage was unlikely to have been the cause of the sinking.

4.3.2. For the hull to be pierced the vessel would have had to have struck or been struck by an object with considerable force and there would have been visual evidence such as a hole, scraped paint or buckling of the hull plates.

4.3.3. The *Jubilee* was constructed with a steel hull and the dive survey showed it to be in good condition. As far as could be ascertained, the hull was not damaged in any way other than:

- one of the bilge keels had been slightly crushed, most likely when the vessel came to rest on the seabed
- one of the stabilisers[13], on which the vessel was resting, was slightly bent, as was the stabiliser's strut.

4.3.4. The *Jubilee* and the other vessels in the Ocean Fisheries fleet were fitted with commercial satellite tracking systems, TracPlus, by the operator. The operator usually received hourly

[13] Stabilisers are fins mounted below the waterline and emerging laterally from the hull to reduce a vessel's roll due to wind or waves. They can usually be retracted by some means to allow the vessel to sit alongside a wharf. When extended they are held rigidly at an angle to the hull by the struts that are mounted on the vessel's main deck

position reports. They could, however, increase the data-collection rate up to every five minutes if required.

4.3.5. The position information received from the *Jubilee* preceding the sinking showed that the vessel was drifting. If the vessel had been drifting, it would have been very unlikely to strike anything with enough force to pierce the hull.

4.3.6. The dive survey carried out by the Commission did not show any significant damage (see above) to the hull other than that which occurred after the sinking. There was no indication of any other vessels nearby at the time of the foundering.

Finding

1. The *Jubilee* sinking was very unlikely to have been caused by fishing operations, collision with any object or a leaking propeller shaft seal.

Flooding of the engine room

4.3.7. Flooding of the engine room was unlikely to have been the cause of the vessel sinking.

4.3.8. Calculations showed that even if the engine room had been totally flooded with water, the vessel would not have sunk and would still have had positive stability. However, the free surface[14] effect of a partially filled engine compartment would have reduced the stability of the vessel, possibly to a point where a large wave might have caused it to capsize. Therefore, this scenario is considered further.

4.3.9. The Commission considered several possible mechanisms for water entering the engine room:

- through a leaking propeller shaft seal (discounted – see the introduction to the analysis above)
- from a damaged main engine cooling-water system
- back-flooding through the bilge system
- flooding from a damaged seawater intake or associated pipework.

4.3.10. It was unlikely that damage to the main engine cooling system caused the engine room to flood. The main engine cooling system was a closed system with keel coolers. For the engine room to flood through this system, the keel coolers would have had to be holed at two points: one outside the hull and one within the engine room.

4.3.11. The Commission was unable to determine from the surveys of the sunken vessel whether there was damage to the keel coolers or the main sea suction. However, the pipework in the engine room was in good condition, and if water had entered the engine room bilge it would have been automatically pumped out by the submersible pump in the engine room. If water had been entering the engine room from this source and the rate of ingress had exceeded the capacity of the submersible pump, the high-level bilge alarm would have sounded and alerted the crew at an early stage. Therefore, the Commission considered it very unlikely that the sinking was attributable to a damaged cooling-water system.

4.3.12. Back flooding into the engine room through the bilge system was unlikely to have caused the sinking. The engine-driven water pump ran continuously when the engine was running and

[14] Free surface effect is a change in the stability of a vessel caused by liquids moving about freely in a tank or hold. As a vessel rolls, liquids in the tanks or breached compartments accentuate the roll by moving freely from side to side of the tanks, accumulating first on one side and then the other, and may adversely affect the stability of the ship. The free service effect can be reduced by having baffles in a tank to reduce the free movement or by either emptying the tank or filling it completely (USLegal, 2016).

was normally configured to suck from the sea and discharge through a pipe and hose on the main deck that was led over-side through one of the scuppers. Divers confirmed that the engine-driven pump was set up in this normal configuration. Therefore, water could not have back flooded through this pump because it was not connected to the bilge system, nor could the water have been discharged into the fish hold (see Figure 5).

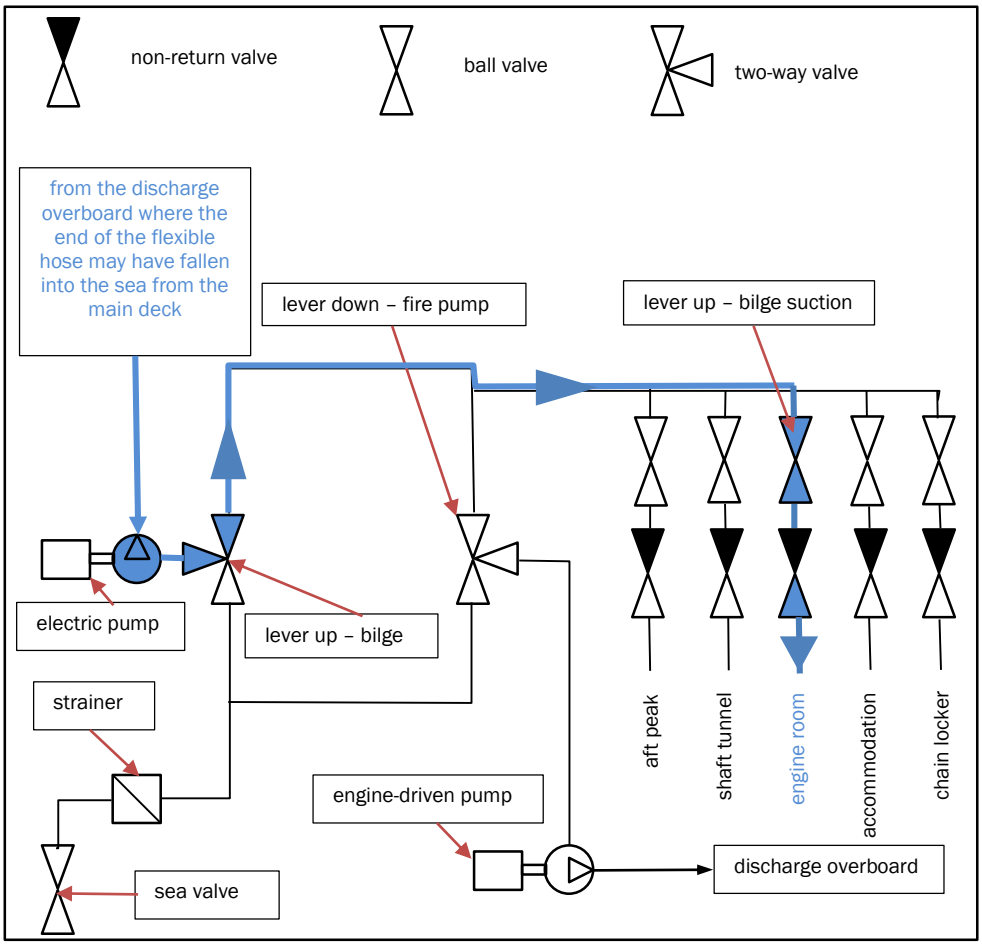


Figure 5
Diagram showing possible track of back flooding into the engine room

4.3.13. However, Figure 5 shows a potential path for water to have back-flooded through the bilge system and entered the engine room via the electric-driven pump.

4.3.14. The electrically driven water pump only ran when manually switched on. It discharged through piping that ran overhead along the roof of the weatherproof shelter to a valve and hose at the aft end. The dive surveys confirmed that:

- the pump switch was in the on position
- the inlet valve on the pump system was set to bilge suction
- the discharge valve on the pump system was set to discharge through the deck piping.
- The valve at the aft end of the weatherproof shelter was set to open
- the valve on the bilge suction manifold was set to draw (suck) from the engine room bilge.

4.3.15. If the pump had not been running and the end of the hose had been in the water, there was potential for water to siphon back into the engine room bilge. However, it would have taken a very strong siphon suction to draw water high enough and through the pipework, which ran along the roof of the deck shelter about 2.5 m above the waterline and then through a non-

return valve[15] that was designed to prevent this scenario. The engine room bilge non-return valve was recovered from the vessel. When tested it was found to leak back a small amount under mains water pressure. The amount siphoned back would have been very small due to the constriction of the non-return valve; another non-return valve was located at the end of the bilge suction pipe that would have also stopped or restricted any siphoning. Any water potentially entering the engine room would automatically have been pumped overboard and a bilge alarm sounded in the wheelhouse.

4.3.16. The setting of the electric-driven water pump to suck from the engine room bilge was unusual. Interviews with other crew who had worked on the *Jubilee* confirmed this. As already mentioned, the engine room bilge was serviced by a separate automatic submersible bilge pump with its own separate discharge pipe. Any water collecting in the bilge was automatically pumped overboard without any intervention by the crew. Why the crew set this bilge pump to draw from the engine room is unclear.

4.3.17. The activation of the engine room high-level bilge alarm would have been one reason for setting the bilge system to pump from the engine room. In the following section we describe why a flooding of the fish hold was the most likely reason for the sinking.

4.3.18. A flooded fish hold would have resulted in the vessel assuming a large trim[16] by the stern. A large stern trim would have caused any residual water lying in the engine room bilge to run to the aft end of the bilge where the high-level bilge alarm was located, which could have caused the high-level bilge alarm to sound in the wheelhouse, even if the quantity of water were small. A crew member would have naturally investigated the cause of such an alarm and made preparations to pump the bilge.

4.3.19. A crew member would have been required to enter the engine room to set the bilge system to draw from the engine room bilge. If there had been very little water in the engine room, this should have been obvious to him at the time. Nevertheless, there would have been good reason to leave the configuration of the bilge pumping arrangement to draw from the engine room. A large trim by the stern is indicative of the vessel taking water in the fish hold. The engine room bilge system could not have been used to pump out the fish hold, so it would have made good sense to leave the bilge system set to draw from the engine room in case it too started flooding.

4.3.20. Notwithstanding that the bilge arrangement was found set to draw from the engine room bilge, the main reasons for discounting engine room flooding as the cause of the sinking were:

- even with the engine room fully flooded, the vessel would not have sunk and would still have had positive stability
- the early warning that the bilge alarm would have given the crew would have given them ample time to raise the alarm and take corrective action.

Finding

2. The *Jubilee* sinking was unlikely to have been caused by flooding of the engine room, although it could not be ruled out as a contributing factor.

[15] A non-return valve is a valve that will only let a fluid pass in one direction.
[16] Trim is the difference between the draught forward and the draught aft. Draught is the depth of a hull below the water. If the aft draught is greater, the vessel is described as being trimmed by the stern; if the forward draught is greater, the vessel is trimmed by the bow. A large or excessive trim, caused by excess weight forward or aft, will reduce the freeboard forward or aft, will change the vessel's condition from the designed seagoing trim and may affect the seakeeping characteristics of the vessel.

Flooding of the fish hold

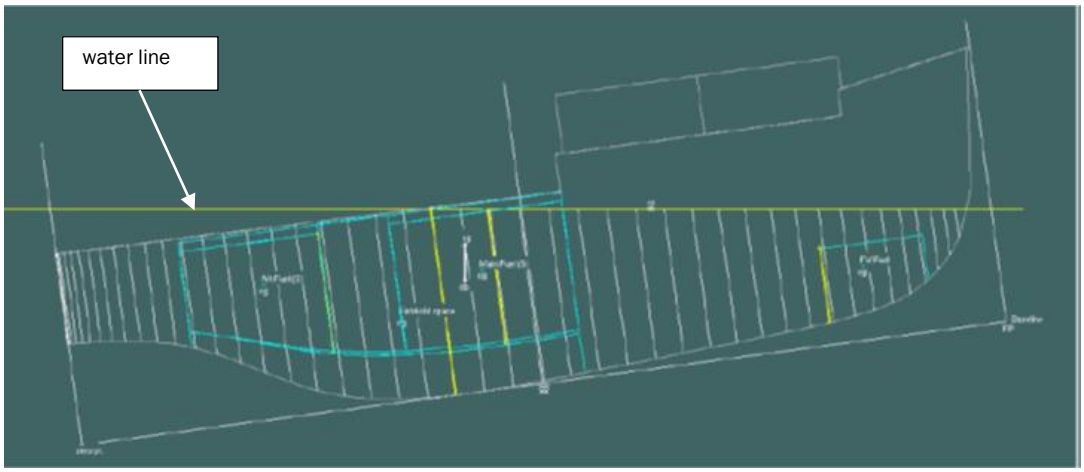


Figure 6
Fish hold 60% flooded (up to this point stability remains positive but greatly reduced)

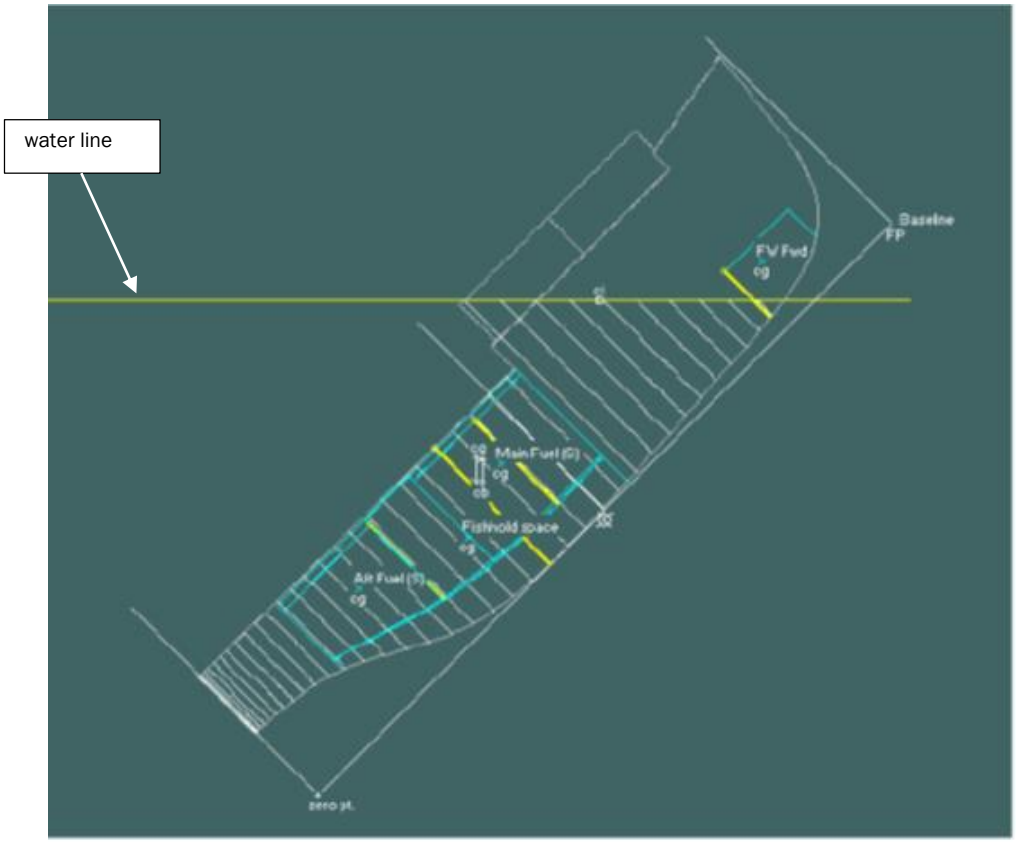


Figure 7
Fish hold 70% flooded (forward section down-flooding)

4.3.21. It was likely that the *Jubilee* sank due to the fish hold being flooded. This was the only space that could, alone, have caused the *Jubilee* to sink, even before the hold was completely full of water.

4.3.22. If the fish hold had filled with water, the stability of the vessel would have been reduced due to the effect of free surface and the raising of the virtual centre of gravity. As the stability reduced the vessel would have become more susceptible to rolling and potentially capsizing by a large wave.

4.3.23. A naval architect calculated the stability of the vessel for several operating conditions as required under Maritime Rules Part 40D. After the accident this naval architect produced a report showing possible gradual flooding scenarios for the two major spaces, the fish hold and the engine room, and the effects of the aft space being flooded with water (see Appendix 2). These flooding calculations have been verified by the Commission.

4.3.24. The calculations carried out by the naval architect showed that the fish hold only needed to be between 60% and 70% full before down-flooding[17] occurred into other compartments. Down-flooding would occur through unsecured openings in the deck or the superstructure and would cause the vessel to sink by the stern.

During the post-accident dive surveys it could not be determined whether the watertight hatch into the aft compartment (see Figure 2) was secured. If it were not secure, water would have entered this space as the vessel trimmed by the stern. In that scenario the *Jubilee* would have lost positive stability when the fish hold was only about 40% flooded (see Appendix 2).

How could water have entered the fish hold?

4.3.25. It was unlikely that seawater from wave action on deck was the main contributor to the sinking. When the *Jubilee* first entered service it was known to be 'wet on deck'. However, the freeing ports[18] had been successfully modified to reduce the amount of seawater washing onto the deck. Despite these modifications the sea conditions during the night would normally have resulted in some water on deck.

4.3.26. There were two hatches leading to the fish hold. The main and larger of the two hatches opened upwards from a raised coaming[19] that extended 300 millimetres (mm) above deck level. It was positioned further forward under the weatherproof cover. The RNZN dive team found that the main hatch (see Figure 2) was closed but not secured. As it could not be established what actions the crew took after discovering their plight, it is not possible to say whether this hatch was open during the night. Nevertheless, given its position and the height of the coaming it would have been unlikely to flood in anything but exceptional seas.

4.3.27. The smaller fish hatch was located further aft and in a position more exposed to the weather. It was not fitted with a coaming, but instead it was flush with the deck and opened downwards into the fish hold. It had a protective coaming constructed around it, but this had drain ports that allowed water to drain from or enter the coaming. When the RNZN dive team carried out the initial dives to recover the crew they found that the fish hatch (see Figures 2 and 10) appeared to be closed flush with the deck. Again, because it could not be established what actions the crew took after discovering their plight, it is not possible to say whether this hatch was open during the night.

4.3.28. The fish hatch was not fitted with a latching mechanism. It relied on hydraulic pressure in the closing ram to keep it closed and sealed. If the hydraulic pump had not been operating and the pressure in the hydraulic cylinder had reduced for whatever reason (such as a minor

[17] The entry of seawater through any opening into the hull or superstructure of an undamaged vessel due to heel, trim, or submergence of the vessel
[18] A freeing port is an opening in the bottom of a bulwark for rapid drainage of a weather deck in heavy seas.
[19] A coaming is any vertical surface on a vessel that is designed to deflect or prevent the entry of water. Usually it refers to a raised section of deck plating around an opening, such as a hatch. Coamings also provide a frame onto which a hatch cover can be fitted.

hydraulic leak), the hatch may have opened slightly, allowing ingress of water. This is a safety issue that the owner has addressed on vessels constructed after the *Jubilee*.

4.3.29. The fish hatch could be opened and closed simply by operating buttons in the wheelhouse, but it was not easily observable from the wheelhouse. In the past it had been inadvertently left open on completion of fishing. However, even if the hatch had been inadvertently left open during the night, it is unlikely that seawater from wave action on the deck alone could have entered the fish hold in sufficient quantity to overwhelm the capacity of the automatic bilge pump located in the fish hold unless it was blocked.

4.3.30. The fish hold bilge was fitted with a submersible electric pump that was controlled by a float switch. The pump discharged directly overboard through its own dedicated pipework. It is possible that water from a hose supplied by one of the vessel's fire and bilge pumps in the engine room exceeded the capacity of this pump. This had happened on the previous voyage with a different crew. The crew had been using the deck wash hose to help wash the fish into the fish hold from the chute between the fish table and the fish hatch. The deck wash hose had been left running and the fish hatch left open. The fish hold had begun to fill with water because the capacity of the deck wash pump was greater than the capacity of the bilge pump in the fish hold. The crew had identified the problem and stopped the electrically driven deck wash pump, after which the fish hold bilge pump had cleared the water.

4.3.31. The Commission received anecdotal evidence that the fish hold had flooded on another occasion for similar reasons. However, the owner and operators were unaware of this as it had not been reported to them or to the relevant authorities.

4.3.32. The electric deck wash pump was located in the engine room, close to the wheelhouse and crew sleeping quarters. It is difficult to know whether the noise it made when running would have been noticeable to the crew, or distinguishable above all the other noises associated with a fishing vessel drifting in a moderate sea with its engine running.

4.3.33. Table 1 demonstrates how the capacity of the fish hold bilge pump could have been exceeded by the capacity of the electrically driven deck wash pump. The electric deck wash pump and the submersible electric bilge pump were likely to have had a reduced capacity through age; however, as the Commission was unable to clarify the amount of loss or the actual capacity of the pumps at the time of the accident, the owner-supplied data has been used.

Capacity of submersible electric bilge pump (owner-supplied data)	16.8 tonnes per hour – output[20]
Capacity of electric deck wash pump (owner-supplied data)	27.6 tonnes per hour – input
Difference (input versus output)	10.8 tonnes per hour – input
Time between telephone call between vessels and mayday call (0030-0420)	Approximately 3.8 hours
Capacity of fish hold 77 tonnes approximately	10.8 tonnes for 3.8 hours = 40.28 tonnes (52% full)

Table 1
Approximate flooding rate of fish hold with bilge and deck wash pumps operating

[20] This refers to the stated capacity of the pump when new. The capacity could reduce with age and wear.

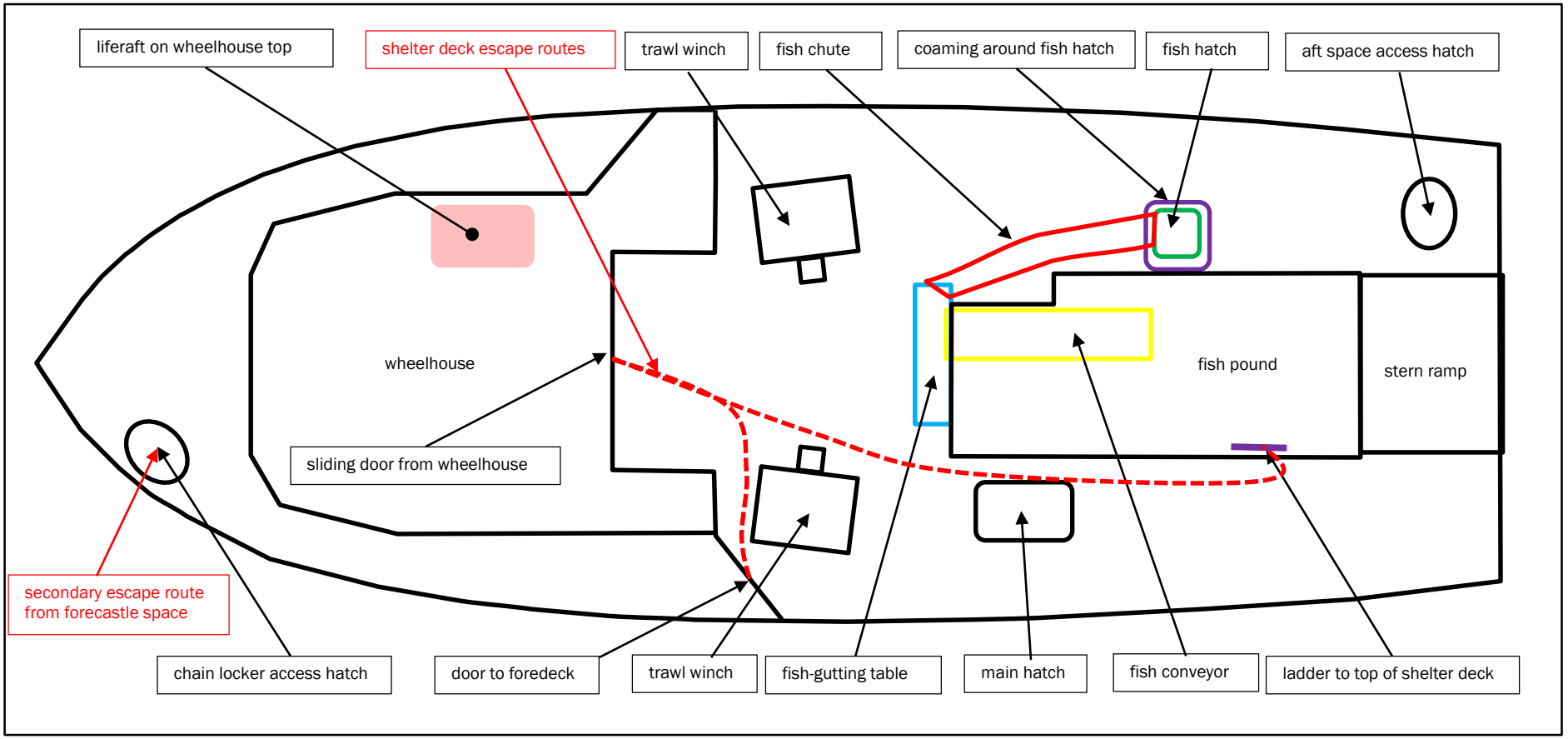


Figure 8
General layout of the main deck showing escape routes from wheelhouse

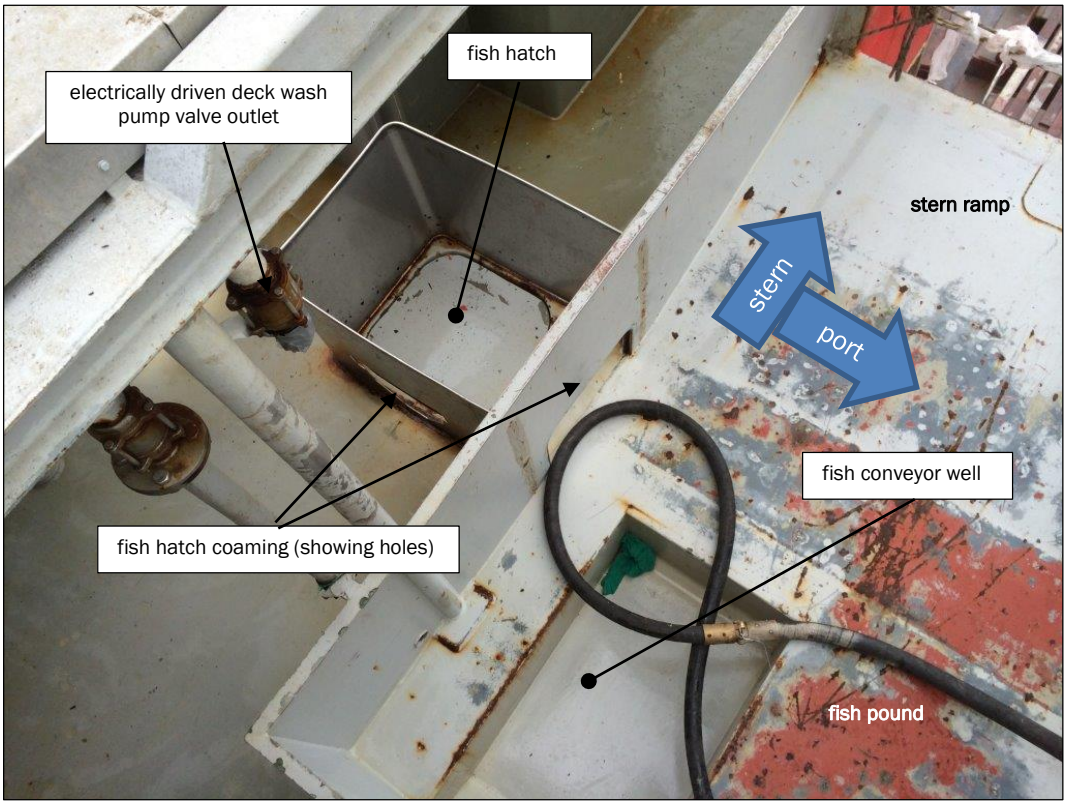


Figure 9
Fish pound and fish hatch on the *Jubilee* (photograph taken in dry-dock, from above)

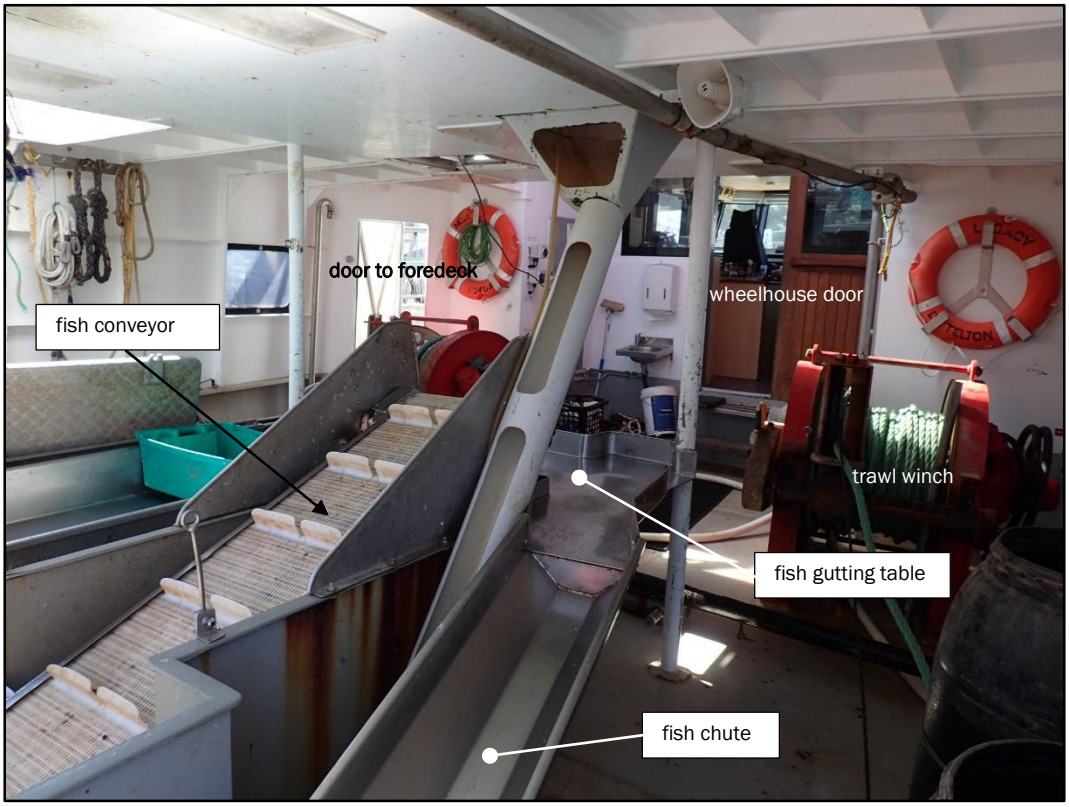


Figure 10
Deck layout on sister vessel the *Legacy*, similar to the *Jubilee*'s

4.3.34. During the dive survey the fish hold bilge pump was retrieved from the vessel for further testing. The testing (Figure 11 showed that the pump was not blocked and appeared to be in good working order. The impeller could be rotated by hand. However, it was not possible to test the fish hold bilge pipe to check if it was blocked.

4.3.35. Divers found the electrically driven deck wash pump hose end over the side of the vessel. If the hose from the electric driven pump had been left running into the fish hold, and assuming that the fish hold automatic bilge pump had been working and not blocked, the time it would have taken to fill the fish hold enough to sink the vessel corresponded closely with the time between the crew "parking up for the night" and the distress radio call being made.

4.3.36. It was about as likely as not that this was the main source of water accumulating in the fish hold. However, there are two variables or caveats to this hypothesis.

4.3.37. First, as mentioned above, the electric-driven pump in the engine room was found configured to draw from the engine room bilge – not from the main seawater suction, as it would have to have been for it to pump water into the fish hold. The crew would have to have reconfigured the pump from supplying water to the fish hold to drawing from the engine room bilge once the problem was discovered.

4.3.38. Secondly, the fish hatch was found by divers to be closed flush with the deck. Either the hatch had been open and then closed by the crew when the problem was discovered, or the hose had been left through the main fish hold hatch, which the divers found closed but not secured.

4.3.39. The fish hold bilge was not fitted with a bilge alarm and there was no visual alarm at the steering position in the wheelhouse to indicate when the pump was operating. The absence of a visual alarm was a serious safety issue and was contrary to Maritime Rules Part 40(D).28 (6)(d) (see Appendix 3).

4.3.40. Bilge alarms in spaces that frequently have water in them due to normal operations are problematic. Repetitive or 'nuisance' alarms are distracting for crew, and crew have been known to silence or bypass them. In such spaces, the installation of a second bilge alarm mounted higher in the compartment is a good defence against abnormal quantities of water accumulating in the space. Since the accident the *Jubilee*'s owner has installed such alarms in the fish holds of its other fishing vessels.

Figure 11
Shore-based examination of the recovered electric bilge pump from the fish hold

Findings

3. It was likely that flooding of the *Jubilee*'s fish hold was the main factor contributing to its sinking, or capsizing and sinking.
4. It was about as likely as not that the cause of the fish hold flooding was water from a deck wash hose that had been left running through an open hatch.
5. The rate of water from the deck wash hose exceeded the pumping rate of the automatic submersible bilge pump in the fish hold.
6. The fish hatch was susceptible to being left fully or partially open because it was hydraulically closed from the wheelhouse and could not be latched closed.
7. The bilge pumping system on the *Jubilee* was not fitted with any means of automatically alerting the crew when the water in the fish hold reached an abnormal level. If the crew had been alerted to the level of water in the fish hold, it is as likely as not that the sinking would have been prevented.
8. The absence of a visual indicator in the wheelhouse that would have alerted the crew when the bilge pump was running meant that the bilge pumping system was non-compliant with Maritime Rules. There was no other means fitted to the fish hold bilge system to alert the crew to excess water in the fish hold.

4.4. Why were the crew unable to escape from the wheelhouse?

4.4.1. The skipper and crew of the *Jubilee* were aware that they were in trouble. They tried to telephone the *Legacy* but the call was not answered. The Commission was unable to establish why the call was made. Almost immediately after this the skipper issued a distress call saying they were taking on water and then said they were "getting off and getting in the liferaft now". This was the last transmission received.

4.4.2. It could not be established when and for how long the crew were aware of their predicament. As discussed above, one of the crew was fully clothed and the other two were dressed in what was probably sleeping attire.

Means of escape

4.4.3. The majority of small New Zealand fishing vessels, especially those of older design, usually have easy exits from the wheelhouse, either through a door to the starboard[21] or port side or through an opening window.

4.4.4. On the *Jubilee* the only direct exit from the wheelhouse was aft through the sliding wheelhouse door onto the main deck. The main deck was covered for the majority of its length by a weatherproof shelter. To reach the liferaft the crew would have had to either turn hard right and go through the door on the port side leading out to the foredeck, or move aft and climb the ladder to the top of the shelter deck[22] roof.

4.4.5. It could not be established whether the *Jubilee* simply sank by the stern or capsized first and then sank. The behaviour of a sinking vessel is difficult to predict, as there are so many variables in buoyancy and stability, depending on which compartments are flooded and in what order.

4.4.6. Whatever happened occurred quickly, because all three crew members were trapped inside the wheelhouse with the sliding door leading on to the main deck shut. One panel that closed off the compartment where the lifejackets were stowed was dislodged, possibly indicative of the crew attempting to don lifejackets before abandoning the vessel. When the crew were recovered, none of them was wearing a lifejacket.

4.4.7. The design of the wheelhouse did not afford ample opportunity for escape. With the vessel sinking by the stern, the option of escape onto the roof of the shelter deck would not have been possible (see Figure 6). Even crossing to the port side to access the foredeck would have been difficult. If the vessel capsized, opening the heavy sliding door would have been difficult, if not almost impossible.

4.4.8. The other means of escape from the wheelhouse was via the emergency escape through the forecastle accommodation. Once in the forecastle accommodation the crew would have had to remove a wooden 'plug' in the forward bulkhead, which concealed a watertight hatch into the chain locker space. Once access had been gained to the chain locker space the crew would have had to open another watertight hatch to access the vessel's foredeck.

4.4.9. It was very unlikely that the crew would have succeeded in escaping a sinking vessel by this route, which was designed for escape in the event of fire.

4.4.10. Ensuring adequate means of escape in any emergency on board a small vessel is a serious safety issue. Designers need to consider as many scenarios as practicable and provide sufficient alternatives for the crew to escape in any event. The *Jubilee*'s owner, which also built the vessel, has addressed this by providing better means of escape in vessels built after the *Jubilee*.

Did the means of escape comply with the Maritime Rules?

4.4.11. As part of the inquiry the Commission considered whether the alternative means of escape through the forecastle and chain locker met the intent of the Maritime Rules.

4.4.12. The watertight hatches fitted between the forecastle accommodation and the chain locker, and the chain locker and the open deck, were of identical construction. They were of a proprietary brand and gave a clear space opening of 18 inches by 24 inches (457 mm by 610

[21] Starboard is the right-hand side of a vessel when looking forward.
[22] A shelter deck is a continuous deck of light construction above the principal deck of a vessel, usually covering a full-length superstructure or space not permanently closed against the weather.

mm) (see Appendix 4), which was 23% less than the standard clear opening area of 600 mm by 600 mm[23].

4.4.13. The discrepancy in clear opening size was noted by a naval architect of the company surveying the construction of the vessel, who in a letter to the company building the vessel said that:

> The clear opening of the door does not meet the normal standard minimum opening of at least 600 mm. The attending surveyor is to satisfy himself that the proposed opening of the hatch does not compromise the efficacy and safety of the crew in any event

The attending surveyor considered that this was satisfactory and the hatches were approved in accordance with Maritime Rules Part 40(D).14 – Hatchway openings and covers and other deck openings, section (10) (d) (see Appendix 4).

Figure 12
Watertight hatch to the chain locker as fitted to a sister vessel of the *Jubilee*. This is the same design and size as the hatches fitted to the *Jubilee* between the forecastle space and the chain locker and the chain locker and the deck.

4.4.14. Maritime Rules Part 40(D) Fire protection, paragraph 62 – Means of escape (see Appendix 3) states that:

> *(1) Where reasonable and practicable, and having regard to the number of crew utilising the space and size of space, at least two means of escape, one of which may be the normal means of access, as widely separated as possible, must be provided from each section of accommodation and service spaces…*

[23] The vessel was constructed under the original Maritime Rule, which came into force on 1 February 2001.
Maritime Rule 40D.66 Deck openings:
(2) Dimensions of access hatches must not be less than 600mm by 600mm or 600mm diameter

> *(2) Normal means of access to accommodation and service spaces below the open deck must be arranged so that it is possible to reach the open deck without passing through intervening spaces containing a potential source of fire.*
>
> *(3) The second means of escape may be through portholes, windows or hatches of adequate size and preferably leading to the open deck.*

4.4.15. Although not defined in the Maritime Rules, Maritime New Zealand stated:

> that the generally understood meaning of 'open deck' is anywhere on a vessel that is exposed and not within a weathertight or watertight area or within the shelter deck area of a vessel.

4.4.16. The means of escape from the forecastle accommodation may not have met the intent of paragraphs 62(2) and (3). The normal means of access to the accommodation space passed through the wheelhouse and living quarters where a risk of fire existed. The secondary means of escape passed through the intervening chain locker space, rather than the 'preference' of leading directly to the open deck.

4.4.17. The means of escape from the wheelhouse may not have met the intent of Maritime Rules 40(D).62, paragraphs 2 and 3. The normal means of access to the wheelhouse, through the aft sliding door, then passed through the "shelter" that covered the main deck before it was possible to gain access to the open deck, and the secondary means of escape passed through two intervening compartments before reaching the open deck.

4.4.18. Whether these means of access or escape met the intent of the Maritime Rules would depend on what was "reasonable and practicable, and having regard to the number of crew utilizing the space and the sizes of the space" as specified in paragraph (1)

4.4.19. Notwithstanding the Maritime Rules, when designing or fitting a shelter-type structure that covers an open deck, the owner should use a risk-based approach to identify suitable means of escape for the crew in an emergency.

4.4.20. It is concerning that the wheelhouse, where the crew were found, where they were most likely to gather in an emergency, and where the lifejackets were stowed, had no escape route directly to the open deck.

4.4.21. Certificates of compliance issued by safe ship management companies show that the vessels have been assessed as complying with, at least, the minimum standards required under the rules and regulations. However, the concept of safety management systems is that owners and operators should take a risk-based approach to their operations. Hazards must be identified and risks must be assessed and reduced to as low as reasonably practicable to prevent damage to property and harm to people. This means that owners and operators cannot rely solely on compliance with the minimum technical standards laid out in maritime rules for meeting their obligations under safety management systems.

4.4.22. The Maritime Rules do not give any guidance on what is, and what is not, an acceptable standard, but leave the decision of acceptability to surveyors' discretion. This creates inconsistency in application between surveyors and also between surveyors and Maritime New Zealand. What may be acceptable to one surveyor may not be acceptable to another or for that matter to Maritime New Zealand.

4.4.23. Since the construction and certification of the vessel, Maritime New Zealand has changed the safety management system from the 'old' safe ship management system to the 'new' Maritime Operators Safety System (MOSS). This has allowed Maritime New Zealand to have oversight of survey, audit and construction requirements. In the absence of guidelines, the Director of Maritime New Zealand can now give advice to ensure more consistency in acceptable standards.

4.4.24. Maritime New Zealand has also formed a surveyors advisory group to give advice to surveyors and monitor standards to achieve consistency in the application of the Maritime Rules.

Findings

9. The means of escape from the *Jubilee*'s wheelhouse in the event of an emergency afforded the crew too few options for escaping in the event of capsize or sinking.
10. The means of escape from the *Jubilee*'s wheelhouse and accommodation space may not have met the intent of the Maritime Rules for providing escape for crew in the event of fire.
11. There is a lack of advice and guidance in the Maritime Rules on what is an acceptable standard for surveyors to approve when the Maritime Rules defer to the surveyors' discretion.

5. Findings

5.1. The *Jubilee* sinking was very unlikely to have been caused by fishing operations, collision with any object or a leaking propeller shaft seal.

5.2. The *Jubilee* sinking was unlikely to have been caused by flooding of the engine room, although it could not be ruled out as a contributing factor.

5.3. It was likely that flooding of the *Jubilee*'s fish hold was the main factor contributing to its sinking, or capsizing and sinking.

5.4. It was about as likely as not that the cause of the fish hold flooding was water from a deck wash hose that had been left running through an open hatch.

5.5. The rate of water from the deck wash hose exceeded the pumping rate of the automatic submersible bilge pump in the fish hold.

5.6. The fish hatch was susceptible to being left fully or partially open because it was hydraulically closed from the wheelhouse and could not be latched closed.

5.7. The bilge pumping system on the *Jubilee* was not fitted with any means of automatically alerting the crew when the water in the fish hold reached an abnormal level. If the crew had been alerted to the level of water in the fish hold, it is as likely as not that the sinking would have been prevented.

5.8. The absence of a visual indicator in the wheelhouse that would have alerted the crew when the bilge pump was running meant that the bilge pumping system was non-compliant with Maritime Rules. There was no other means fitted to the fish hold bilge system to alert the crew to excess water in the fish hold.

5.9. The means of escape from the *Jubilee*'s wheelhouse in the event of an emergency afforded the crew too few options for escaping in the event of capsize or sinking.

5.10. The means of escape from the *Jubilee*'s wheelhouse and accommodation space may not have met the intent of the Maritime Rules for providing escape for crew in the event of fire.

5.11. There is a lack of advice and guidance in the Maritime Rules on what is an acceptable standard for surveyors to approve when the Maritime Rules defer to the surveyors' discretion.

6. Safety actions

General

6.1. The Commission classifies safety actions by two types:

(a) safety actions taken by the regulator or an operator to address safety issues identified by the Commission during an inquiry that would otherwise result in the Commission issuing a recommendation

(b) safety actions taken by the regulator or an operator to address other safety issues that would not normally result in the Commission issuing a recommendation.

Safety actions addressing safety issues identified during an inquiry

6.2. Since the accident the vessel's owner has made changes to the *Jubilee*'s sister vessels:

- fitted a proximity switch to the fish hatch so that there is now an open light (red) and a green light (closed) on the control station in the wheelhouse to indicate to skipper and crew if the hatch is not closed
- welded up the drain holes in the coaming around the fish hatch and fitted a lay-flat hose to the coaming to allow any water entrapped inside the coaming to drain out but reduce the risk of back flooding
- fitted two 2-inch [50 mm] drain pipes with non-return valves in the aft step of the fish hold to the shaft tunnel. So that if water builds up in fish hold it would drain into the shaft tunnel where there is a bilge alarm and an automatic pump
- fitted another bilge sump with pump and discharge pipework, including suction loop onto deck in the fish hold
- fitted bilge alarms (one each side) in the fish hold along with lights and buzzers on deck for bilge alarms
- installed wheelhouse glass breaking hammers and signage on both sides of the wheelhouse interior in addition to the regulation escape hatches
- fitted an access hatch in the shelter deck window screen, with a ladder from the main deck below to provide an alternative escape route
- moved the liferaft and man-overboard ladder from starboard to port on the wheelhouse top to provide better access. A 24v [24-volt] locally switched light was also fitted
- fitted an additional ladder from the foredeck to wheelhouse top on the portside.

Safety actions addressing other safety issues

6.3. Since the accident the vessel's owner has made changes to a similar vessel in its fleet:

- fitted a proximity switch to the fish hatch so that there is now an open light (red) and a green light (closed) on the control station in the wheelhouse to indicate to skipper and crew if the hatch is not closed
- raised the coaming height around the fish hatch to 600 mm from the regulation 300 mm
- installed wheelhouse glass breaking hammers and signage on both sides of the wheelhouse interior in addition to the regulation escape hatches.

7. Recommendations

General

7.1. The Commission may issue, or give notice of, recommendations to any person or organisation that it considers the most appropriate to address the identified safety issues, depending on whether these safety issues are applicable to a single operator only or to the wider transport sector. In this case, recommendations have been issued to Maritime New Zealand

7.2. In the interests of transport safety it is important that these recommendations are implemented without delay to help prevent similar accidents or incidents occurring in the future.

Recommendations

7.3. The largest-volume compartment on the vessel, the fish hold, did not have any automatic means of alerting the crew to excess water in the space, but relied on manual sighting through the main hatch to determine the amount of water in the hold.

7.4. This situation had gone undetected during the construction of the vessel, the issuance of a fit-for-purpose certificate, entry into the safe ship management system and subsequent internal and external audits, and approximately seven years of commercial use.

7.5. On 27 April 2017 the Commission recommended that the Director of Maritime New Zealand draw surveyors' and vessel owners' attention to the benefits of installing safety mechanisms designed to alert crew to any abnormal rises in water levels in compartments, particularly those compartments that compromise the reserve buoyancy or stability of fishing vessels. [016/17]

On 11 May 2017, Maritime New Zealand replied:

> A safety bulletin will be prepared to draw attention to surveyors, vessel owners and operators of the benefits of installing safety mechanisms designed to alert crew of any abnormal rises in water levels in compartments, particularly those compartments that compromise the reserve buoyancy of stability of fishing vessels.
>
> The safety bulleting will be published on the MNZ website by the end of May 2017. All surveyors will be notified when it is available. Vessel owners and operators will be advised through our normal communications process.

7.6. On the *Jubilee*, the only exits from accommodation spaces were either aft through the wheelhouse door to the enclosed shelter deck, or forward through the forecastle space then through a hatch to the chain locker space, then through another sealed hatch to the vessel's forecastle deck.

7.7. On 27 April 2017 the Commission recommended that the Director of Maritime New Zealand work with surveyors and designers of fishing vessels to ensure that fishing vessels have effective means of escape from all compartments for all reasonably foreseeable emergency situations. [014/17]

On 11 May 2017, Maritime New Zealand replied:

> Maritime New Zealand will work with surveyors and designers of fishing vessels to ensure that fishing vessels have effective means of escape from all compartments for all reasonably foreseeable emergency situations.
>
> Maritime NZ holds regular seminars with surveyors where safety matters are raised and discussed. Guidance for surveyors and designers of fishing vessels will be developed in consultation with surveyors. The guidance will be available on the MNZ website and surveyors will be notified when it is available. We anticipate this will be completed by June 2018. This matter will also be raised at the next surveyor seminar. We will also ensure owners and operators are made aware of the issue.
>
> I will send copies of the safety bulletin and guidance for surveyors to you when the documents have been completed.

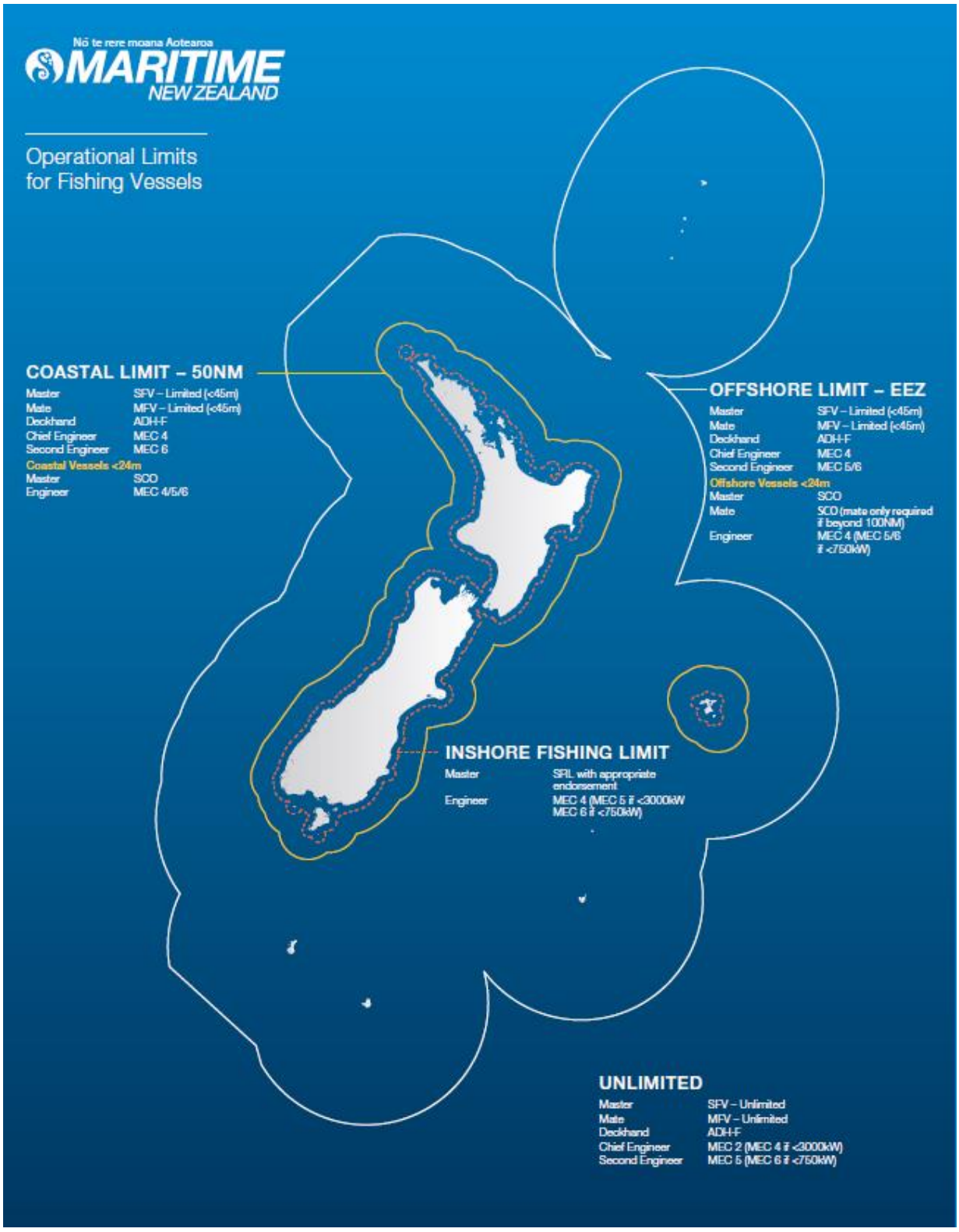
8. Key lessons

8.1. Good watchkeeping includes not only looking after the safe navigation of the vessel, but also being vigilant to the state of trim and stability of the vessel and any factors that could affect either.

8.2. Notwithstanding the minimum requirements set out in Maritime Rules, owners and designers of vessels should take a risk-based approach to designing and providing escape routes from all compartments for all foreseeable emergencies.

8.3. Crews need to assess and pre-plan escape routes from any part of their vessels for all foreseeable emergency situations.

Appendix 1: Operational limits for fishing vessels



Appendix 2: Gradual flooding scenarios

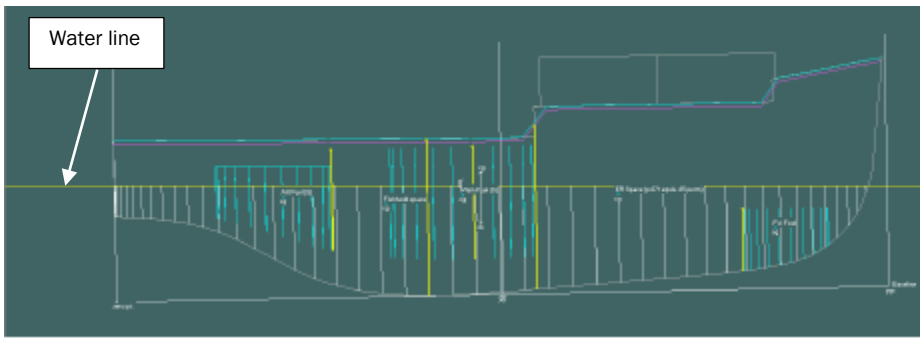
Simulated Engine Room Flooding
(Assumes fluid density of 0.871 t/m^3 equiv. to 85% permeability in 1.025t/m3 sea water).

Stability Booklet - 100% Departure Condition modified as follows:
75% aft fuel tanks
1t fish hold mass

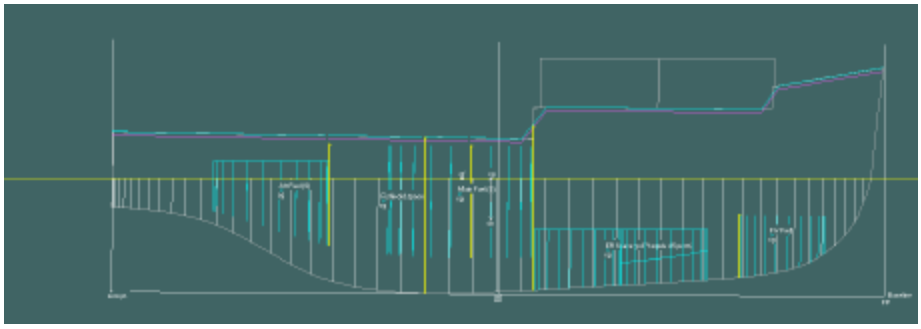
Loadcase - 2006 Possible Condition
Damage Case - Intact
Free to Trim
Relative Density (specific gravity) = 1; (Density = 1 tonne/m^3)
Fluid analysis method: Use corrected VCG

Item Name	Quantity	Weight tonne	Long.Arm m	Vert.Arm m	Trans.Arm m	FS Mom. tonne.m
Lightship	1	80.78	7.271	2.647	0.000	0.000
Ballast	1	1.250	14.000	0.700	0.000	0.000
Crew	4	0.0750	11.200	4.460	0.000	0.000
Stores	1	0.5000	11.200	4.300	0.000	0.000
Empty Fish Bins	536	0.0010	5.940	4.000	0.000	0.000
Full Fish Bins Below	0	0.0300	5.280	1.980	0.000	0.000
Full Fish Bins Deck	34	0.0300	3.100	3.531	0.000	0.000
Hyraulic Oil	1	1.040	11.220	1.360	0.000	0.000
Lub Oil	1	1.040	11.220	1.360	0.000	0.000
Aft Fuel (P)	75%	1.159	3.469	2.093	-2.362	0.028
Aft Fuel (S)	75%	1.159	3.469	2.093	2.362	0.028
Main Fuel (P)	100%	3.329	7.158	2.054	-2.439	0.000
Main Fuel (S)	100%	3.329	7.158	2.054	2.439	0.000
FW Fwd	100%	3.230	13.581	1.254	0.000	0.000
Fishhold space	0%	0.0000	5.575	1.907	0.000	0.000
ER Space	0%	0.0000	10.345	2.015	0.000	0.000
	Tot Weight=	**98.67**	**LCG=7.531**	**VCG=2.527**	**TCG=0.000**	**0.056**
				FS corr.=0.001		
				VCG fluid=2.528		

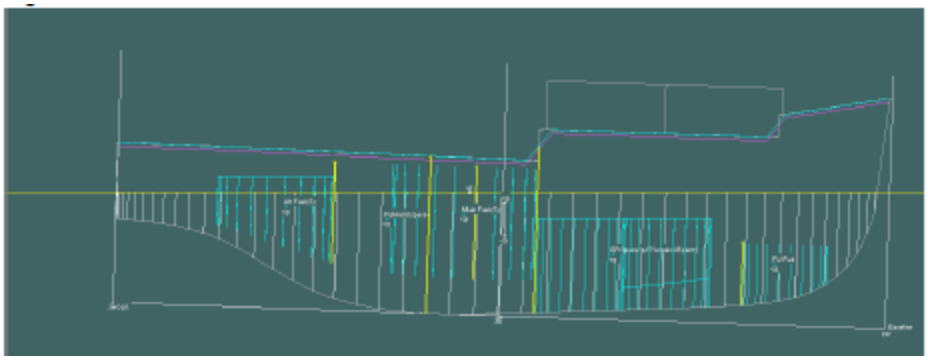
Draft Amidsh. m	2.260
Displacement tonne	98.67
Heel to Starboard degrees	0.0
Draft at FP m	2.112
Draft at AP m	2.408
Draft at LCF m	2.276
Trim (+ve by stern) m	0.297
WL Length m	15.520
WL Beam m	5.494
LCB from zero pt. m	7.512
KG fluid m	2.528
GMt corrected m	0.508
KMt m	3.036
Immersion (TPc) tonne/cm	0.727
Max deck inclination deg	1.1
Trim angle (+ve by stern) deg	1.1



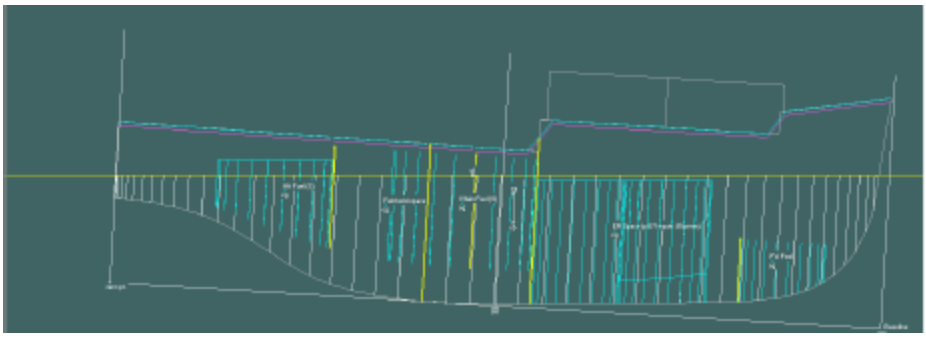
Engine room 0% flooded



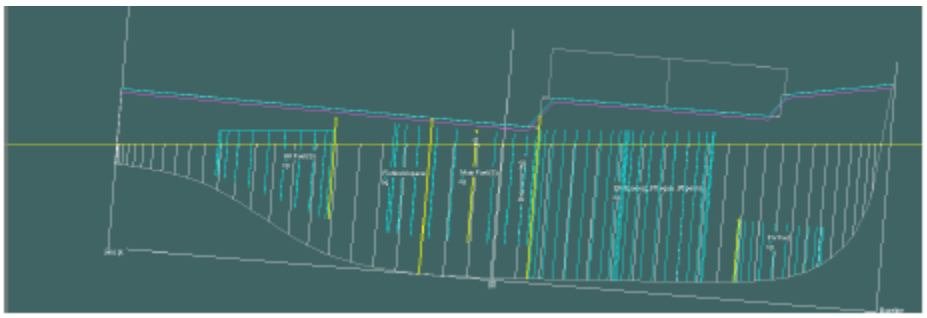
Engine room 25% flooded



Engine room 50% flooded



Engine room 75% flooded



Engine room 100% flooded

Large angle stability at 100% flooded engine room

Loadcase – 2006 Possible condition

Damage case – Intact

Free to trim

Relative density (specific gravity) = 1.025; (density = 1.0252 tonne/m^3)

Fluid analysis method: use corrected VCG

Item Name	Quantity	Weight tonne	Long.Arm m	Vert.Arm m	Trans.Arm m	FS Mom. tonne.m
Lightship	1	80.78	7.271	2.647	0.001	0.000
Ballast	1	1.250	14.000	0.700	0.000	0.000
Crew	4	0.0750	11.200	4.460	0.000	0.000
Stores	1	0.5000	11.200	4.300	0.000	0.000
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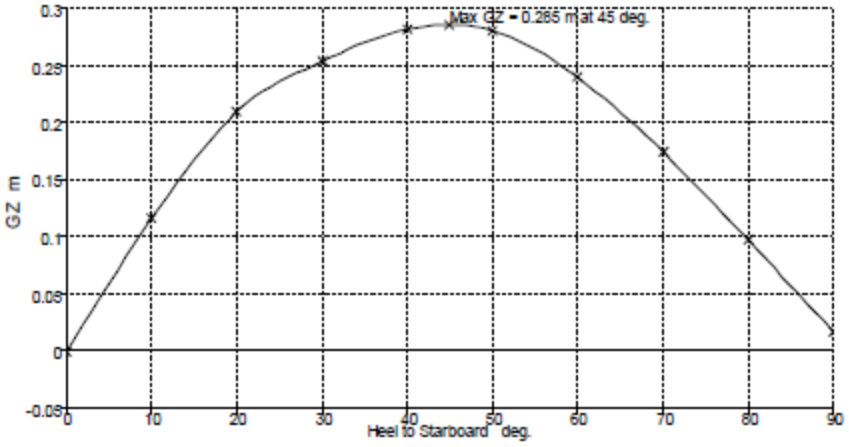
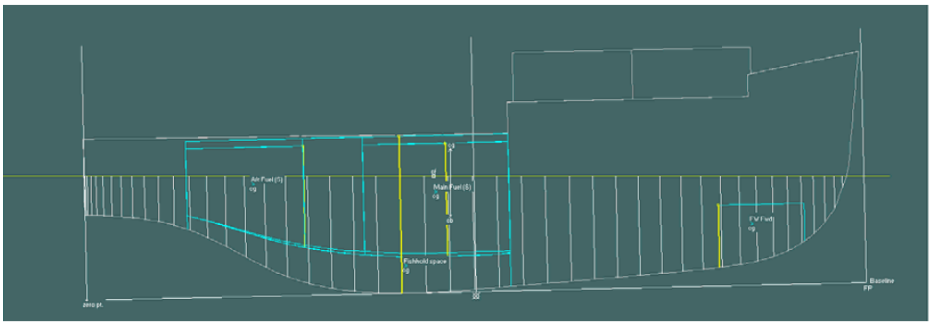
Hyraulic Oil	1	1.040	11.220	1.360	0.000	0.000
Lub Oil	1	1.040	11.220	1.360	0.000	0.000
Aft Fuel (P)	75%	1.159	3.469	2.093	-2.362	0.028
Aft Fuel (S)	75%	1.159	3.469	2.093	2.362	0.028
Main Fuel (P)	100%	3.329	7.158	2.054	-2.439	0.000
Main Fuel (S)	100%	3.329	7.158	2.054	2.439	0.000
FW Fwd	100%	3.230	13.581	1.254	0.000	0.000
Fishhold space	0%	0.0000	5.575	1.907	0.000	0.000
ER Space	100%	40.13	10.345	2.015	0.000	0.000
	Tot Weight=	**138.8**	**LCG=8.344**	**VCG=2.379**	**TCG=0.001**	**0.056**
				FS corr.=0		
				VCG fluid=2.379		



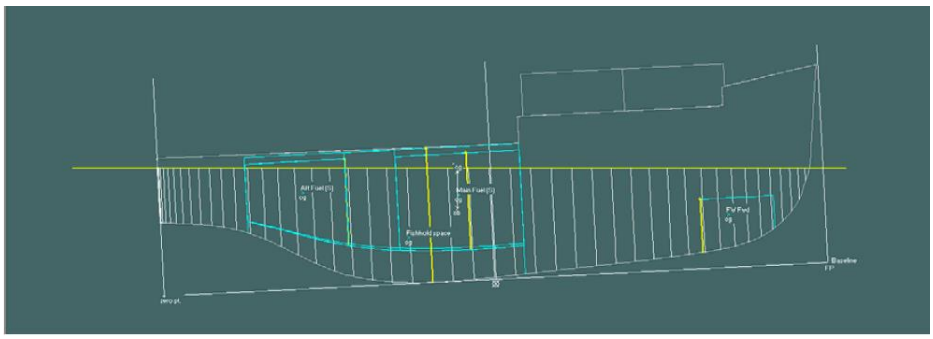
Stability booklet – 100% departure condition

Fish hold 0% flooded



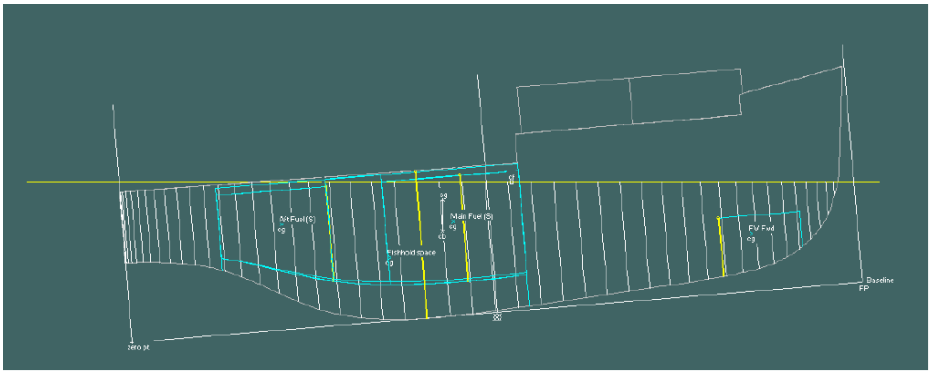
Fish hold 10% flooded

Fish hold 20% flooded

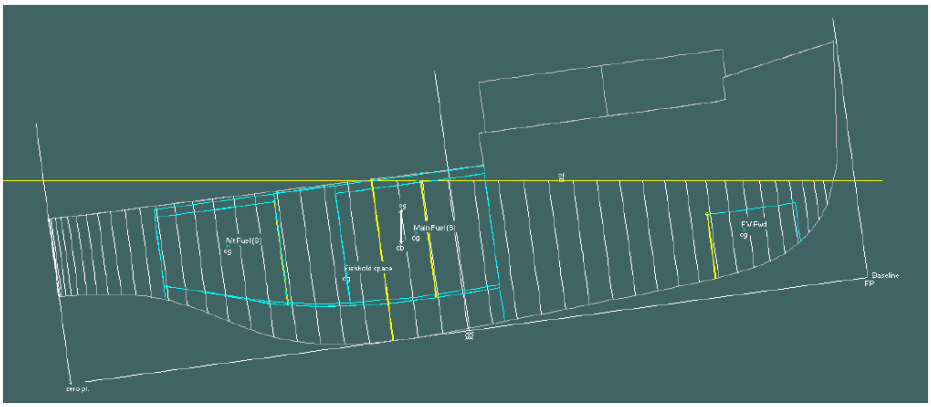


Fish hold 30% flooded

Fish hold 40% flooded



Fish hold 50% flooded



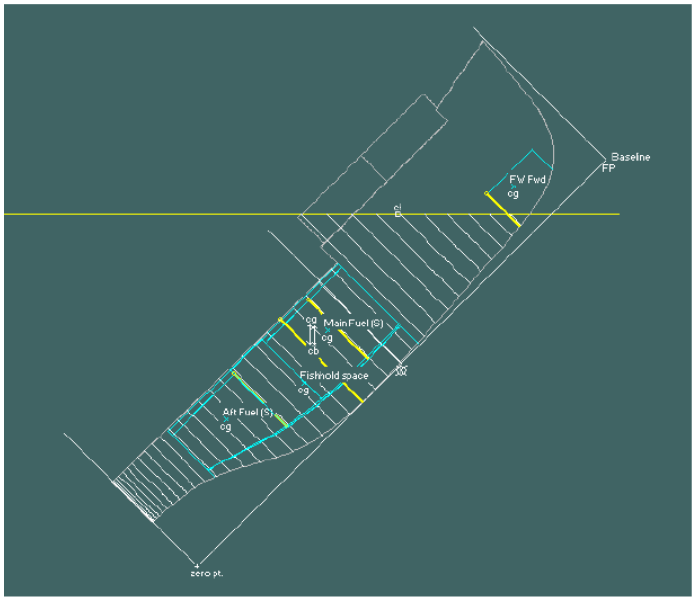
Fish hold 60% flooded (up to this point stability remains positive but greatly reduced)

Notes:

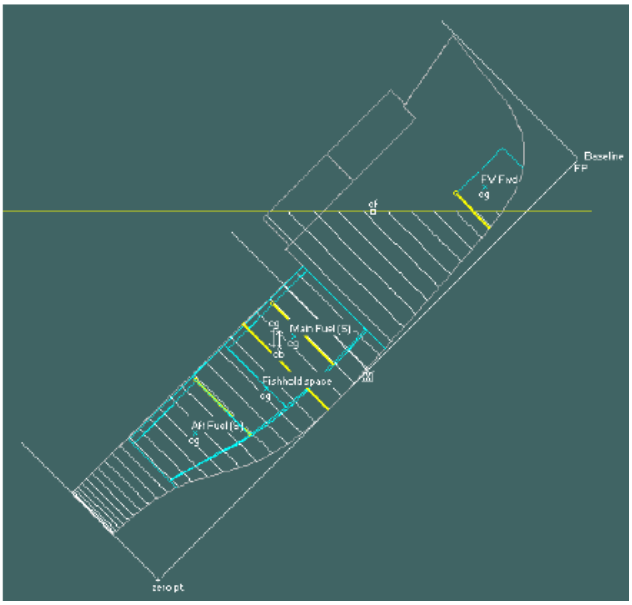
It is possible that some buoyant structure above that modelled here may have delayed the time at which negative stability occurred (currently modelled at 60-65% fish hold flooding).

All accumulated fish hold cargo is assumed to have floated free inside the compartment during flooding

Reduction in aft tank fuel (port/starboard) by say 25% would approximately result in an aft trim occurring at a delayed rate equivalent to approximately an additional 5% of fish hold flooding being required to achieve the trims shown above.



Fish hold 70% flooded (forward section down-flooding?)

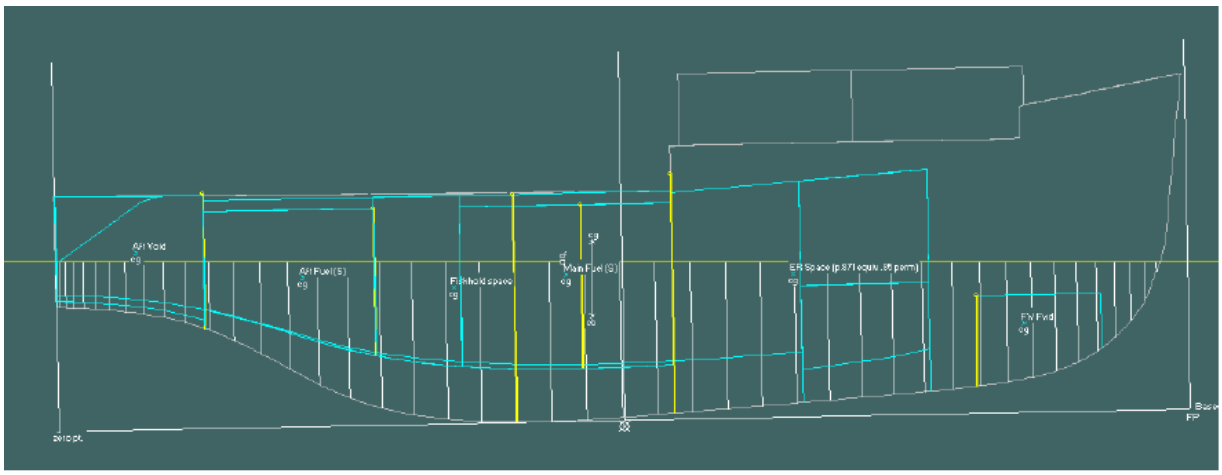


Fish hold 75% flooded; with 75% fuel in aft tanks (forward section down-flooding?)

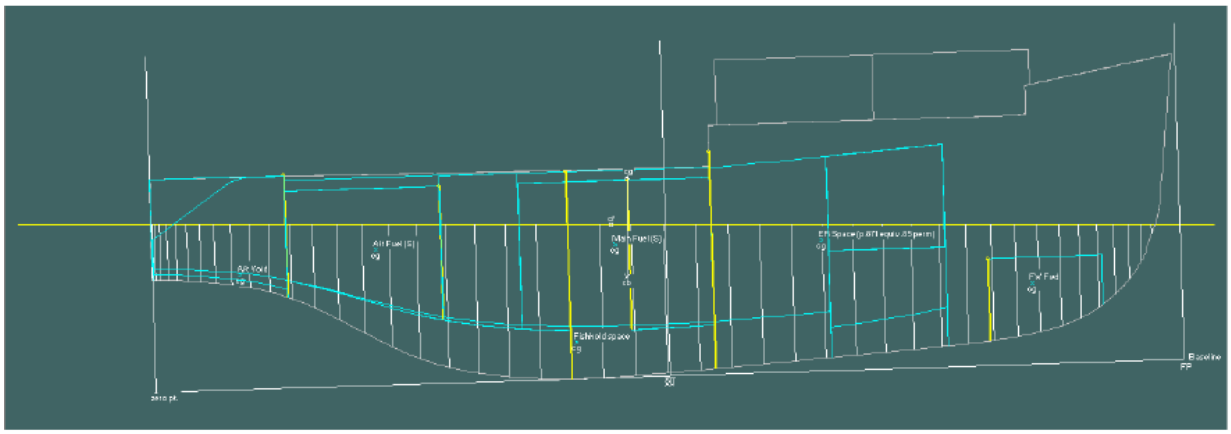
Tank Calibrations – Fishhold space

Fluid Type = Relative Density = 1.025
Permeability = 100 %
Trim = 0 m (+ve by stern)

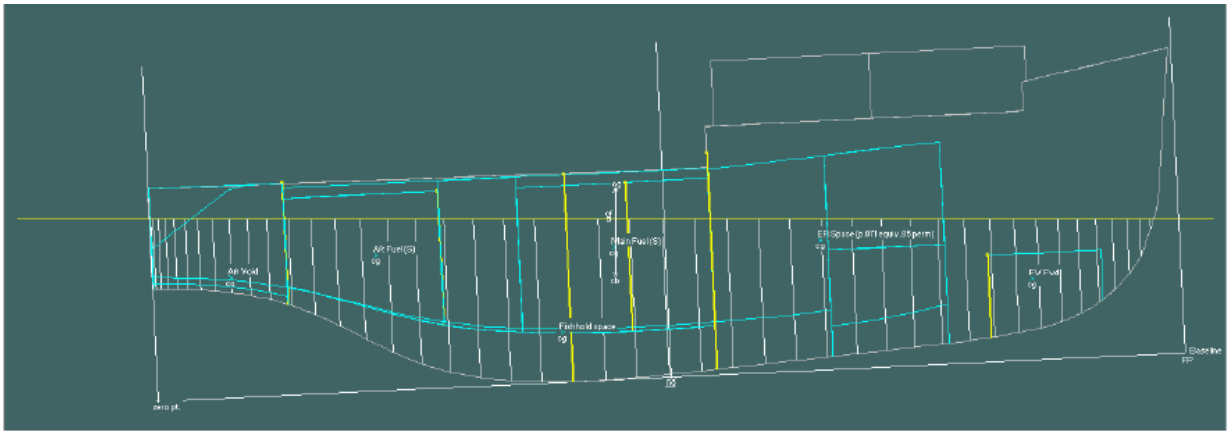
Sounding m	Ullage m	% Full	Capacity m^3	Capacity tonne	LCG m	TCG m	VCG m	FSM tonne.m
3.198	0.000	100.0	75.267	77.149	5.575	0.000	1.907	0.000
3.148	0.050	98.0	73.754	75.598	5.580	0.000	1.881	0.000
3.000	0.198	92.1	69.306	71.039	5.595	0.000	1.804	55.587
2.800	0.398	84.1	63.304	64.887	5.618	0.000	1.700	55.063
2.600	0.598	76.1	57.315	58.748	5.647	0.000	1.595	54.550
2.400	0.798	68.2	51.339	52.623	5.681	0.000	1.489	54.046
2.200	0.998	60.3	45.377	46.511	5.725	0.000	1.383	53.553
2.000	1.198	52.4	39.428	40.413	5.782	0.000	1.274	53.069
1.800	1.398	44.5	33.491	34.329	5.859	0.000	1.163	52.595
1.600	1.598	36.6	27.574	28.263	5.967	0.000	1.047	51.345
1.400	1.798	29.0	21.842	22.388	6.104	0.000	0.928	47.088
1.200	1.998	22.0	16.535	16.948	6.244	0.000	0.807	42.623
1.000	2.198	15.5	11.692	11.985	6.387	0.000	0.684	36.467
0.800	2.398	9.8	7.385	7.570	6.524	0.000	0.556	28.333
0.600	2.598	5.1	3.867	3.964	6.634	0.000	0.419	12.986
0.400	2.798	2.0	1.537	1.576	6.747	0.000	0.281	3.395
0.293	2.906	1.0	0.748	0.767	6.806	0.000	0.208	1.192
0.200	2.998	0.4	0.306	0.314	6.841	0.000	0.144	0.326



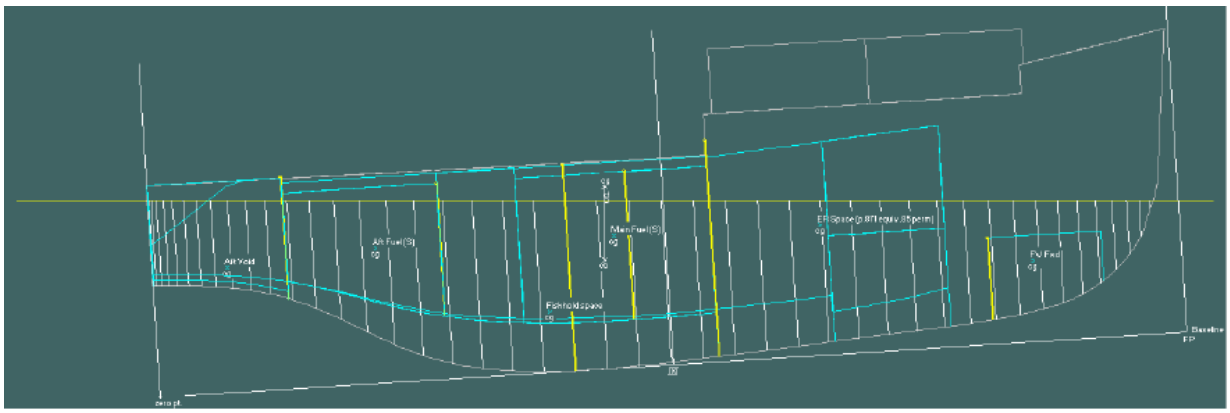
Fish Hold 0% flooded, Aft void 0% flooded



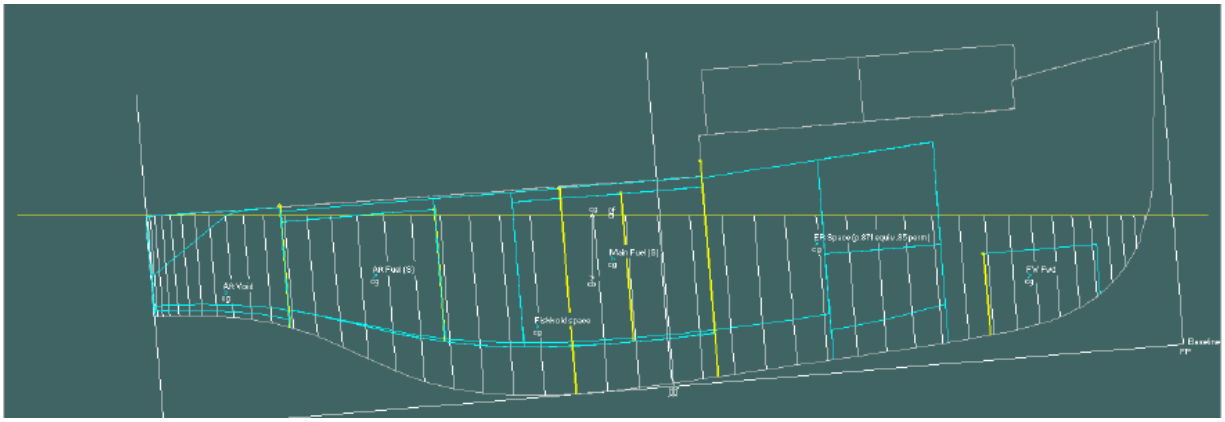
Fish hold 10 % flooded, Aft void 10% flooded



Fish hold 20% flooded, Aft void 20% flooded



Fish hold 30% flooded, aft void 30% flooded



Fish hold 40% flooded, Aft void 40% flooded (Up to this point stability remains positive but greatly reduced).*

* Notes:

It is possible that some buoyant structure above that modelled here may have delayed the time at which negative stability occurred (currently modelled at 40 – 45%

All accumulated fish hold cargo is assumed to have floated free inside the compartment during flooding

Appendix 3: Extracts from Maritime Rules Part 40(D)

Maritime Rule Part 40(D).14 – Hatchway openings and covers and other deck openings

(1) All hatchway openings—

(a) must be provided with covers; and

(b) if intended to be open during fishing operations, must be arranged near to the ship's centreline, except where other hatch positions are approved by the surveyor.

(10) The owner of a fishing ship must ensure that—

(a) every escape hatch must be capable of being opened from each side of its cover; and

(b) every hinged escape hatch cover must be protected against accidental closing; and

(c) every heavy cover on an escape hatch must be fitted with appropriate counterweights; and

(d) the dimensions and location of escape hatches must be to the satisfaction of the surveyor; and

(e) if deemed necessary by a surveyor, hand holds or other aids must be fitted to enable effective use of the escape hatch.

Maritime Rule Part 40(D).28 – Bilge pumping arrangements

(1) Except as provided in 40D.28(2), an efficient bilge pumping system must be provided that under all practicable conditions must be capable of pumping from and draining any watertight compartment that is not a permanent oil or water tank whether the ship is upright or listed.

(2) With the approval of the surveyor watertight compartments of less than 7 percent of the total under deck volume may be drained into an adjacent compartment by means of self-closing valve or cock. The valve or cock must be fitted outside the compartment being drained and be operable from a readily accessible position. Ships of less than 12 metres in length having watertight compartments filled with a buoyancy material approved by a surveyor are not required to have bilge pumping arrangements from those compartments.

(6) In ships of less than 24 metres in length. the surveyor may permit at least one fixed heavy duty electrically driven submersible pump to be fitted in an individual watertight compartment in lieu of a piped suction. Where such submersible bilge pumps are fitted -

(a) in no case is the capacity of die fitted submersible bilge pumps in any one compartment to be less than 8 metres^3/hour; and

(b) in the main machinery space there must be at least two means of bilge suction one of which may be a submersible bilge pump; and

(c) each submersible bilge pump is to be fitted with a float switch which automatically operates that pump or an audible alarm at the steering position. Any such float switch is to be protected from jamming by bilge debris; and

(d) each submersible bilge pump is to have at visual alarm at the steering position to indicate when it is running; and

(e) each submersible bilge pump must be accessible for inspection, removal or maintenance without removal of permanent ship structure; and

(f) electrically driven submersible bilge pumps rated for 12V. 24V or 32V ‘DC are to comply with the International Standard ISO 8849:1990 Small! Craft — Electrically operated bilge pumps or an equivalent standard[7]: and

(g) there must be two sources of electrical supply on the ship which are capable of running the pumps in any one compartment for 12 hours; and

(h) on ships of 12 metres or more in length emergency bilge pumping arrangements must be provided for compartments outside the main machinery space which are fitted with only one submersible bilge pump. This may be a portable submersible self-priming pump of 8 metres^3/hour capacity which is stowed with its hoses in a readily accessible location; and

(i) discharge piping arrangements are to be such that at least two automatic non- return devices are fitted between the overboard discharge and compartment being served by the submersible bilge pump. One of these devices is to be an automatic non-return valve situated at or near the shell and the other may be a pipework loop taken up to the highest practicable point below the weathertight deck.

(7) In any ship, where fish handling or processing may cause quantities of water to accumulate in enclosed spaces, adequate drainage must be provided.

Maritime Rule Part 40(D).62 – Means of escape

(1) Where reasonable and practicable, and having regard to the number of crew utilising the space and size of space, at least two means of escape, one of which may be the normal means of access, as widely separated as possible, must be provided from each section of accommodation and service spaces.

(2) Normal means of access to accommodation and service spaces below the open deck must be arranged so that it is possible to reach the open deck without passing through intervening spaces containing a potential source of fire.

(3) The second means of escape may be through portholes, windows or hatches of adequate size and preferably leading to the open deck.

(4) Where the means of escape from a machinery space is by ladder, a steel ladder must be fitted.

(5) Where the surveyor considers a machinery space to be sufficiently large, the space must have two means of escape as widely spaced as possible.

Maritime Rule Part 22 – Collision Regulations

Section 1 – Steering and Sailing

SUBSECTION 1 – CONDUCT OF VESSELS IN ANY CONDITION OF VISIBILITY

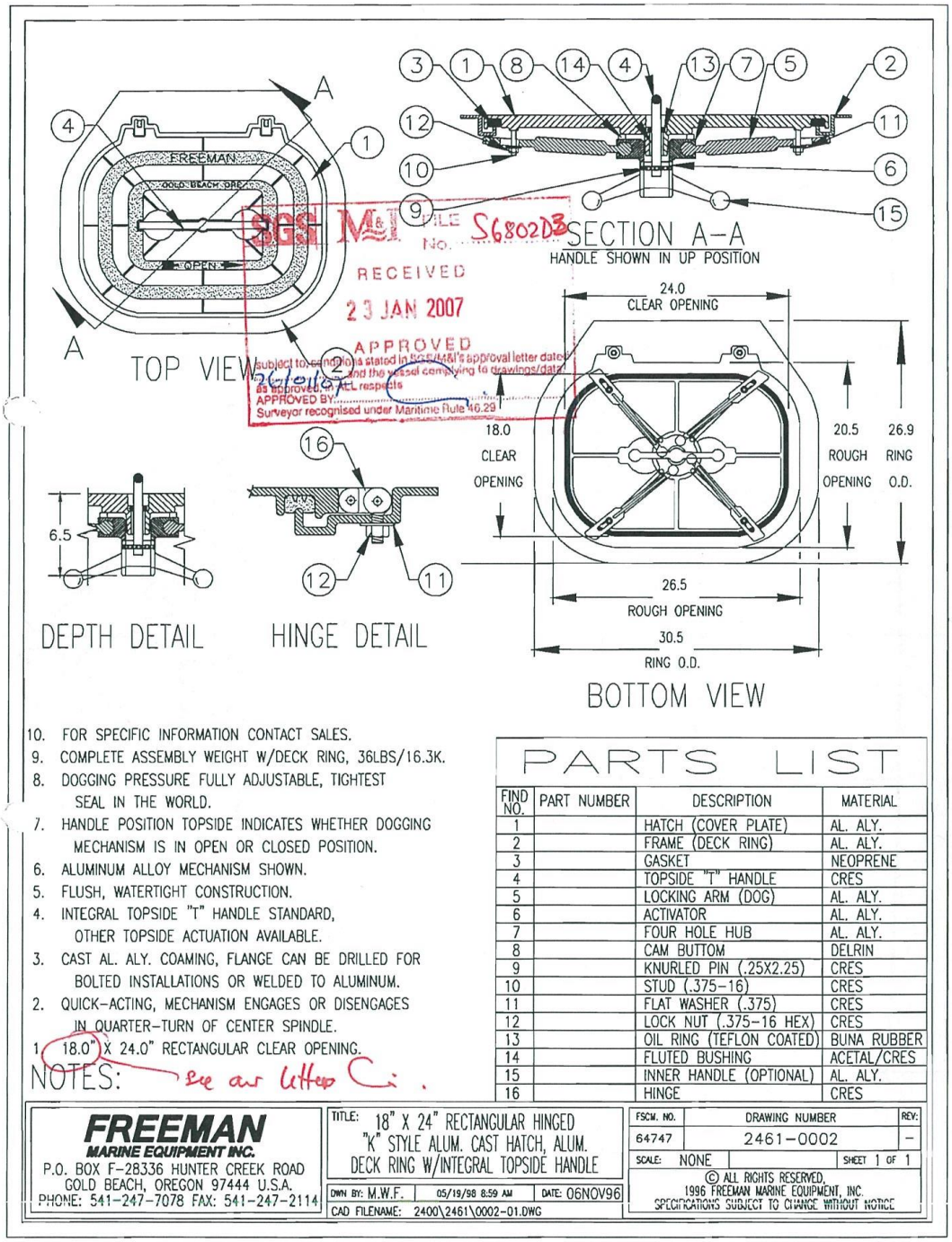
22.4 Application of Subsection 1

Rules in this subsection apply in any condition of visibility.

22.5 Look-out

Every vessel must at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions, so as to make a full appraisal of the situation and the risk of collision.

Appendix 4: Watertight escape hatch details



10. FOR SPECIFIC INFORMATION CONTACT SALES.
9. COMPLETE ASSEMBLY WEIGHT W/DECK RING, 36LBS/16.3K.
8. DOGGING PRESSURE FULLY ADJUSTABLE, TIGHTEST SEAL IN THE WORLD.
7. HANDLE POSITION TOPSIDE INDICATES WHETHER DOGGING MECHANISM IS IN OPEN OR CLOSED POSITION.
6. ALUMINUM ALLOY MECHANISM SHOWN.
5. FLUSH, WATERTIGHT CONSTRUCTION.
4. INTEGRAL TOPSIDE "T" HANDLE STANDARD, OTHER TOPSIDE ACTUATION AVAILABLE.
3. CAST AL. ALY. COAMING, FLANGE CAN BE DRILLED FOR BOLTED INSTALLATIONS OR WELDED TO ALUMINUM.
2. QUICK-ACTING, MECHANISM ENGAGES OR DISENGAGES IN QUARTER-TURN OF CENTER SPINDLE.
1. 18.0" X 24.0" RECTANGULAR CLEAR OPENING.

NOTES:

PARTS LIST

FIND NO.	PART NUMBER	DESCRIPTION	MATERIAL
1		HATCH (COVER PLATE)	AL. ALY.
2		FRAME (DECK RING)	AL. ALY.
3		GASKET	NEOPRENE
4		TOPSIDE "T" HANDLE	CRES
5		LOCKING ARM (DOG)	AL. ALY.
6		ACTIVATOR	AL. ALY.
7		FOUR HOLE HUB	AL. ALY.
8		CAM BUTTOM	DELRIN
9		KNURLED PIN (.25X2.25)	CRES
10		STUD (.375-16)	CRES
11		FLAT WASHER (.375)	CRES
12		LOCK NUT (.375-16 HEX)	CRES
13		OIL RING (TEFLON COATED)	BUNA RUBBER
14		FLUTED BUSHING	ACETAL/CRES
15		INNER HANDLE (OPTIONAL)	AL. ALY.
16		HINGE	CRES

FREEMAN
MARINE EQUIPMENT INC.
P.O. BOX F-28336 HUNTER CREEK ROAD
GOLD BEACH, OREGON 97444 U.S.A.
PHONE: 541-247-7078 FAX: 541-247-2114

TITLE: 18" X 24" RECTANGULAR HINGED "K" STYLE ALUM. CAST HATCH, ALUM. DECK RING W/INTEGRAL TOPSIDE HANDLE

DWN BY: M.W.F. | 05/19/98 8:59 AM | DATE: 06NOV96

CAD FILENAME: 2400\2461\0002-01.DWG

FSCM. NO.	DRAWING NUMBER	REV:
64747	2461-0002	-
SCALE: NONE		SHEET 1 OF 1

SGS M&I
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26 January, 2007

File Ref: S6802D3

Managing Director
Stark Bros Ltd
11 Cyrus Williams Quay
LYTTELTON
Ph: 03 328 8550
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16M TRAWL FISHING VESSEL

Dear

1. The following items/systems of the 16m Trawl Fishing Vessel are approved for a Offshore non-passenger vessel.

2. Approval is conditional upon compliance to all requirements stated below.

   a) **Modification of escape door in collision bulkhead:**

   References : *- Bulkhead Hull 55*

   - Freeman Marine Equipment

   i) The clear opening of the door does not meet the normal standard minimum opening of at least 600mm. The attending surveyor is to satisfy himself that the proposed opening of the hatch does not compromise the efficacy and safety of the crew in any event.

   ii) The door must be capable of being operated locally from either side of the door.

   iii) Permanent lettering in bold should be marked on each side "THIS DOOR TO BE KEPT CLOSED AND SECURED".

3. All materials, standard of workmanship, testing and installation shall be inspected and completed to the satisfaction of SGS M&I's surveyors.

4. The builder has the responsibility to ensure and document compliance to the approved drawings and conditions of approval.

5. When an alteration or addition to the approved design is proposed, it is the Builder's responsibility to submit plans to SGS M&I for approval. The alterations or additions are to be carried out under survey and to the Surveyor's satisfaction. SGS M&I reserves the right to rescind the entire

Recent Marine Occurrence Reports published by the Transport Accident Investigation Commission

Interim Report MO-2017-203	Burst nitrogen cylinder causing fatality on board the passenger cruise ship *Emerald Princess*, 9 February 2017
MO-2012-203	Fire on board *Amaltal Columbia*, 12 September 2012
MO-2016-203	Bulk log carrier Mount Hikurangi, Crew fatality, during cargo securing operation, 27 February 2016
MO-2014-203	Fatal injury, Purse seine fishing vessel, *Captain M. J. Souza*, 24 August 2014
MO-2015-202	Containership *Madinah*, loss of person overboard, Lyttelton Harbour entrance, 2 July 2015
MO-2016-202	Urgent recommendation: Cruise ship *Azamara Quest*, contact with Wheki Rock, Tory Channel, 27 January 2016
MO-2011-202	Roll-on-roll-off passenger ferry *Monte Stello*, contact with rock, Tory Channel, Marlborough Sounds, 4 May 2011
MO-2014-201	*Dream Weaver*, flooding due to structural failure of the hull, Hauraki Gulf, 23 February 2014
MO-2010-206	Coastal container ship *Spirit of Resolution*, grounding on Manukau Bar, Auckland, 18 September 2010
MO-2014-202	Lifting sling failure on freefall lifeboat, general cargo ship *Da Dan Xia*, Wellington, 14 April 2014
11-204	Container ship MV *Rena* grounding, on Astrolabe Reef, 5 October 2011
13-201	Accommodation fire on board the log-carrier, *Taokas Wisdom*, Nelson, 11 July 2013
13-202	Bulk carrier, *IDAS Bulker*, pilotage incident Napier, Hawke's Bay, 8 August 2013
12-202	Fishing vessel *Torea*, collision with uncharted rock, Foveaux Strait, 24 August 2012
09-210	Bulk carrier, *Taharoa Express*, cargo shift, Port Taharoa, 16 December 2009
10-204	Inquiry 10-204: Bulk carrier *Hanjin Bombay*, grounding, Mount Maunganui, 21 June 2010
10-202	*M.V. Anatoki*, grounding, off Rangihaeata Head, Golden Bay, South Island, 6 May 2010
11-204	Interim Report Marine inquiry 11-204 Containership MV *Rena* grounding on Astrolabe Reef 5 October 2011
09-202	Marine Inquiry 09-202: Passenger vessel *Oceanic Discoverer* Fatal injury, Port of Napier 19 February 2009

Price $19.00

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