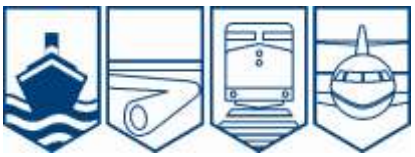
Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

# MARINE INVESTIGATION REPORT

## M11W0063



## FIRE AND SINKING
## SMALL FISHING VESSEL *NEPTUNE II*
## BROKEN ISLANDS, JOHNSTONE STRAIT,
## BRITISH COLUMBIA
## 09 MAY 2011

Canada

# Marine Investigation Report

# Fire and Sinking

# Small Fishing Vessel *Neptune II*
# Broken Islands, Johnstone Strait, British Columbia
# 09 May 2011

# Report Number M11W0063

## *Summary*

Shortly after 0400 Pacific Daylight Time on 09 May 2011, a fire broke out in the engine room of the small fishing vessel *Neptune II*. After their attempt to fight the fire was unsuccessful, the 2 crew members abandoned the vessel into their dive tender and issued a distress call. *Neptune II* burned to the waterline and subsequently sank east of the Broken Islands in Johnstone Strait, British Columbia. There were no injuries.

*Ce rapport est également disponible en français.*

# *Factual Information*

## *Particulars of the Vessel*

| Name of vessel | *Neptune II* |
|---|---|
| Official number | 155237 |
| Port of Registry | Vancouver, British Columbia |
| Flag | Canada |
| Type | Geoduck Fishing Vessel |
| Gross tonnage | 53.49 |
| Length [1] | 18.35 m |
| Built | 1929, Washington State, United States |
| Propulsion | One Caterpillar D-34, 6 cylinders diesel engine 67 kw, single fixed-propeller |
| Cargo | None |
| Crew | 2 |
| Registered owner and manager | Aldene Holdings Ltd., British Columbia |

## *Description of the Vessel*

The *Neptune II* was a small wooden fishing vessel of closed construction. The galley and master's cabin were located on the main deck with the wheelhouse located forward on a raised half deck.

The hull below the main deck was subdivided by 4 transverse bulkheads that enclosed (from forward) the crew accommodation, the engine room, the fish hold and the lazarette (See Appendix A).

**Photo 1**. The *Neptune II*

The vessel was propelled by a diesel engine with high-pressure, single-walled fuel lines. The engine was coupled to a reverse/reduction gearbox driving a single-fixed propeller. The vessel had a single-plate centreline rudder. The hydraulics on deck could be powered either by the main engine or by the auxiliary engine located in the engine room. Two alternators (one 12- and the other 24-volt), driven by either the

[1] Units of measurement in this report conform to International Maritime Organization Standards or, where there is no such standard, are expressed in the International System of units.

main or the auxiliary engine, charged a bank of batteries; an inverter then converted the DC voltage from the batteries into 110 volts AC for use on board the vessel.

The vessel was fitted with 2 engine-driven fire and bilge pumps, one powered by the main engine and the other by the auxiliary engine, which could be turned on from the engine room only by activating the power take-off and opening the sea suction.

Although the *Neptune II* was a registered fishing vessel (seiner), its primary function at the time of the occurrence was to serve as a live-aboard vessel [2] for the crew, which used it in conjunction with the12-metre, aluminium dive tender *Deep Six*, which had once been used as a herring skiff. The vessels were used together in the geoduck (clam) fishery.

## *History of the Voyage*

After the end of the geoduck fishing season in early April 2011, the *Neptune II,* along with its dive tender, *Deep Six*, were tied up in Shearwater, British Columbia(B.C.), and the crew flew home to Campbell River, B.C.

On 07 May 2011, the master and one deckhand re-boarded the vessel in Shearwater and prepared it for its transit back to Campbell River. During this work, they found that the vessel's inverter was not working, but they were not able to fix it. They also noted that the main engine-starting battery on the *Deep Six* had discharged and that the forward cabin had taken on water, soaking the thermal dive underwear stored on board. The emergency radio battery and a battery boost pack from the *Neptune II* were removed and placed on the *Deep Six*. The dive tender was pumped out and all of the dive gear, including the thermal dive underwear, was taken on board the *Neptune II*.

At 2100, [3] *Neptune II*, with the *Deep Six* in tow, departed Shearwater bound for Campbell River. The auxiliary engine on the *Deep Six* was running during this part of the passage to recharge the emergency battery which was supplying power to the electric bilge pumps on the *Deep Six*.

At 0330 on 08 May 2011, the crew anchored the *Neptune II* near Table Island and waited for daylight to cross Queen Charlotte Sound. The wet dive gear, including the thermal dive underwear, was hung up in *Neptune II*'s engine room to dry.

At 1000, the vessel got underway from the anchorage and ran south all day until 2130 when it anchored in Open Cove, near East Carcroft Island, to await a favourable tide to transit Seymour Narrows. The vessel departed the anchorage at 0330 on 09 May 2011. At 0400, the crew noticed smoke drifting past the glow emanating from the starboard running light and went to investigate. The heat-detector alarm sounded as the crew approached the door to the engine room, and when they opened the door, they saw heavy smoke and fire in the engine room. The thermal dive underwear was also on fire. Flames were as high as the engine room's door sill. The fire seemed to be most intense in the aft part of the engine room.

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[2] A dive fishery live-aboard vessel is used to accommodate crew, store catch, carry extra equipment and tow dive tenders to, from and between fishing grounds; the engine rooms are often used to dry dive gear.

[3] All times in this report are in Pacific Daylight Time (Coordinated Universal Time [UTC] minus 7 hours) unless otherwise stated.

To fight the fire, the crew used 3 dry chemical fire extinguishers: one from the bridge and 2 from the galley. The master and deckhand each emptied one extinguisher into the engine room space. The master then stuffed a plastic bag into the engine room vent located directly above the stairway down to the engine room space and closed the engine room door in an attempt to smother the fire. He went forward and emptied the third extinguisher into the forecastle via the hatch on the bow, closing the forecastle hatch as well as the port side engine room vent in a further attempt to smother the fire. Two of the 3 remaining fire extinguishers on board were not accessible because they were located inside the forecastle. The third remaining fire extinguisher was stored in the stairwell near the engine room door, but was obscured from view by rain gear that had been hung over it.

The master went to the wheelhouse and took the vessel out of gear, but the vessel did not respond.

While the crew was fighting the fire, the vessel was under power, making way, and turning slowly to starboard. As a result, the vessel was repeatedly enveloped by smoke from its continuously changing direction, forcing the crew to circle the deck to stay out of the smoke (Photos 1 and 2).

**Photo 2**. Fire fully engaged

Approximately 10 minutes after closing the door and attempting to seal the engine room, the master re-opened the engine room door to check on the status of the fire, while the deckhand stood by. The crew could hear a crackling sound from inside the engine room, but could not see any signs of the fire. The master considered entering the engine room to investigate further, but a large puff of black smoke followed by flames erupted towards the open door. He quickly closed the engine room door and decided to abandon the vessel.

The master went to the bridge to send out a distress (Mayday) call using the very high frequency (VHF) radiotelephone. However, he found that the vessel's electronics were shutting down due to damage to the power supply from the fire and as a result he could not send out the Mayday call. The master told the deckhand to pull the *Deep Six* alongside so that they could send out the Mayday call using the VHF on the dive tender, and also evacuate to it.

However, the *Neptune II* was still in gear and turning in circles, so they could not pull the *Deep Six* alongside. The master went into the galley and activated the emergency fuel shut-off for the main engine. After the engine on the *Neptune II* shut down the crew were able to pull the *Deep Six* alongside. They then boarded the tender and sent out the Mayday at 0453.

**Photo 3**. *Neptune II* sinking

At 0758, the CCGS *Point Race* arrived on scene. By this time, the vessel was fully engulfed. The vessel eventually sank at 0938

in position 50°28′12″ N, 126°09′36″ W (Photo 3). (Appendix B)

## *Vessel Certification*

The vessel was registered as a small fishing vessel (seiner) and had been issued an inspection certificate valid until 06 October 2014. The vessel also had 2 minimum safe manning documents: one minimum safe manning document listed the vessel as a day vessel and the other as a 2-watch vessel. Both were valid until 06 October 2014. For a day vessel, the minimum crew required was one master and one deckhand. As a 2-watch vessel, a mate was also required.

## *Personnel Experience and Certification*

The master had owned the *Neptune II* since 1994. He held a valid certificate of service as Master of a fishing vessel of less than 60 gross tonnage.

The deckhand held a Fishing Master, Fourth Class certificate of competency.

Both master and deckhand held valid MED A2 and radio operator certificates and were certified divers.

## *Lifesaving Equipment*

The vessel carried all required lifesaving equipment on board including one 6-person liferaft, 4 adult lifejackets, 1 EPIRB, [4] 2 lifebuoys and 18 pyrotechnic distress signals.

The vessel was equipped with an emergency battery to power a VHF radio. The battery had been removed and placed on board the dive tender *Deep Six* before the vessel's departure and had not been replaced.

## *Fire Detection and Firefighting Equipment*

The vessel was equipped with 6 five-pound ABC dry chemical extinguishers: 1 on the bridge, 2 in the galley, 1 in the engine room stairwell and 2 in the crew's accommodation in the forecastle near the entrance to the forward engine room door. It was also equipped with a fire axe and 3 fire buckets.

The vessel had 2 fire and bilge pumps, both of which were located in the engine room and could be driven by either the main or the auxiliary engine. In either case, the pumps could be started from inside the engine room only, by engaging the power take-off.

The vessel's engine room ventilation system had one fire damper. The engine room had another vent, but it was not fitted with a fire damper.

Heat detectors are not required on any fishing vessels under the *Canada Shipping Act, 2001*. However the vessel did have 2 heat detectors: 1 in the forward part of the engine room located above the main engine and 1 in the galley above the stove. The type of heat detector that was on board at the time of the occurrence is not known, but a survey of fishing vessels conducted in

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4 Emergency position-indicating radio beacon

the area indicated that the heat detectors were likely a fixed-temperature type. These were monitored via a control panel on the bridge with a local alarm. The vessel was not equipped with a fixed fire suppression system nor was one required.

## *Damage to the Vessel*

The vessel continued to burn until the arrival of the CCGS *Point Race,* whose crew attempted to fight the fire. The vessel continued to burn to the waterline and eventually sank in over 200 m of water. It was not recovered. There was no apparent pollution.

## *Weather*

On 09 May 2011 at 0400 the wind was from the northwest at 5 knots. The weather was overcast, 7°C with visibility of 10 nm.

## *Safety Practices, Procedures and Drills*

The *Canada Shipping Act, 2001* requires authorized representatives of Canadian vessels to develop procedures for the safe operation of vessels for dealing with emergencies. [5] The *Marine Personnel Regulations* under the *Canada Shipping Act, 2001* require that a vessel's master provide written instructions to crew members to ensure that they become familiar with safety equipment, operations and duties, and also require that they ensure crew members are provided with vessel-specific familiarization training. [6] However, the *Fire and Boat Drill Regulations* under the *Canada Shipping Act, 2001* do not apply to fishing vessels of 150 gross tonnage or less.

TC is developing new *Fishing Vessel Safety Regulations* under the *Canada Shipping Act, 2001,* one of the purposes of which is to make owners responsible for compliance with regulations on vessel maintenance, safe operating procedures and vessel modifications.

*WorkSafeBC* [7] requires that every fishing vessel carry documentation, readily accessible to crew members, about the vessel, including its firefighting and emergency equipment. In addition, the master must ensure that each crew member is instructed on the operational characteristics of the vessel including the location and use of safety equipment. The master must also establish procedures and assign responsibilities to each crew member to cover all emergencies including fire, man overboard, flooding, abandoning ship, and calling for help. [8]

The crew of the *Neptune II* did not conduct any drills before departing Shearwateror after they got underway. The crew rarely conducted any formal emergency exercises or drills. Furthermore, there were no written procedures in place for emergency drills or for crew familiarization of the vessel and its equipment.

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5 Transport Canada, *Canada Shipping Act, 2001,* section 106

6 Transport Canada, *Marine Personnel Regulations,* section 206

7 *WorkSafeBC* is the Workers Compensation Board responsible for occupational health and safety matters in British Columbia.

8 British Columbia - Occupational Health and Safety Regulation, Part 24

## *Dive Equipment for Geoduck Fishery*

During the geoduck fishery, the crew used the *Neptune II* as a live-aboard vessel and the *Deep Six* as their dive tender. The *Deep Six* would transport divers to the geoduck beds where they would don thermal underwear, dry suits and surface supply air, and proceed to harvest geoducks from the ocean floor. After returning to the *Neptune II,* the wet dive gear was hung at various locations in the engine room from piping on the deckhead to dry overnight for use the next day. The engine room was used to dry the dive gear because it was the warmest and driest location on board.

## *Testing Heat Detectors*

Manufacturers of the most common type of heat detectors used on local fishing vessels recommend that units should be tested only with hot air from a hair dryer or with a portable soldering iron. Testing should not be done with an open flame as it may damage the detector.

Common practice on the *Neptune II* was to test heat detectors using the open flame of a lighter.

## *Previous Occurrences*

Transportation Safety Board (TSB) statistics indicate that from February 2009 to May 2011 there were 54 fires on board fishing vessels under 150 gross tonnage, [9] 18 of which were reported to be constructive total losses. Furthermore, just as in the case of the *Neptune II* occurrence, 14 of these fires resulted in crews having to abandon their vessel. [10]

The following are examples of occurrences similar to the *Neptune II* involving fires on board fishing vessels:

- On 06 July 2009, the *Ocean Commander (*12.8 m long, 50.3 gross tonnage) declared a Mayday after discovering a fire when it was 135 nm east of Cape Freels, Newfoundland and Labrador (NL). The vessel was underway between turbot fishing grounds when the crew member on watch woke the master and reported the presence of smoke. The smoke and fire spread rapidly from the engine room. There was no time to attempt to extinguish the fire. The 7 crew abandoned the vessel into the liferaft and were later rescued by the CCGS *Hudson*. The vessel was reported to be a constructive total loss. [11]

- On 04 May 2010, the *Marine Clipper II (*16.3 m long, 66.4 gross tonnage) was reported to be on fire off Cape St. Francis, NL. The vessel was underway to the crab fishing grounds when the fire alarm sounded. The crew member on watch opened the engine room door to investigate and was forced back by "a wall of smoke." The other crew members were alerted and their attempts to put out the fire with extinguishers were unsuccessful. A

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9 Approximately 2 per month

10 TSB investigation reports numbers: M09M0011 (*Blind Road Boys 2001*), M09N0022 (*Ocean Commander*), M09N0027 (*Grey Lady 1*), M09N0030 (*Havre Aux Maisons*), M09N0039 (*Newfoundland Pearl*), M09W0187 (*Cool Change*), M10N0012 (*Marine Clipper II*), M10M0024 (*Sandra Elizabeth*), M10M0026 (*Major Kaos*), M10M0043 (*Mildred Kathleen*), M10M0044 (*N.A.S.#1*), M10N0050 (*Lady Helen*), M10N0051 (*Newfie's Dream*), and M10W0150 (*Miss T.J.*).

11 TSB investigation report number M09N0022

partial Mayday was sent and the 5 crew abandoned the vessel into the liferaft and were later rescued by the fishing vessel *Burin Sea*. The *Marine Clipper II* was reported to be a constructive total loss. [12]

- On 29 June 2010, the *Major Kaos (*11.9 m long, 14.5 gross tonnage) caught fire off Gros Nez Island, Nova Scotia. The vessel was hauling traps when the crew saw heavy black smoke coming from the engine room air intake. Shortly afterwards the engine shut down, and attempts to put out the fire with extinguishers were unsuccessful. The tide pushed the vessel on shore where the 3 crew abandoned the vessel and were later rescued by a passing speed boat. The vessel was reported to be a constructive total loss. [13]

## *Watchlist*

On 14 June 2012 the TSB released its updated Watchlist identifying 9 critical safety issues that pose the greatest risks to Canadians, one of which is the loss of life on fishing vessels. With an average of 13 fatalities per year between 1999 and 2010, the TSB remains concerned about vessel modifications and their impact on stability; the use and availability of lifesaving equipment; regulatory oversight; the impact of fishing resource management plans and practices and the lack of both a safety culture and a code of best practices. The Watchlist also highlights the need for the industry to adopt and promote safe management procedures and practices to increase the safety knowledge of fishing vessel operators.

12 TSB investigation report number M10N0012

13 TSB investigation report number M10M0026

## *List of Available Reports*

The following TSB Laboratory report was completed:

LP074/2011 – Heat Detector Examination, Fishing Vessel, *Neptune II*

The report is available from the Transportation Safety Board of Canada upon request.

# *Analysis*

## *Cause of the Fire*

The investigation did not determine the exact cause of the fire on board the *Neptune II* because the vessel burned to the waterline, sank, and was not recovered. However, information obtained by the TSB during the investigation indicated that the fire was most intense at the aft end of the engine room. As a result, 2 scenarios [14] will be discussed to explain the likely cause of the fire.

The *Neptune II* was a wooden hulled vessel built in 1929. The engine room was always a very warm space even during normal operating conditions. The main engine high-pressure fuel lines were single wall, operating at 600 to 800 psi. The fuel lines for engine cylinders 5 and 6 were located close to the turbo charger on the aft part of the engine. Both the turbo charger as well as the exhaust had a high surface temperature and could have been potential sources of ignition.

At the time of the fire, dive gear, including thermal dive underwear, had been hanging on pipes in the engine room for over 24 hours. Although the dive gear was hung throughout the engine room, some was hung close to the location where the fire was noted to be most intense.

Based on this information, the investigation has identified 2 most likely scenarios to explain the cause of the fire. First, a ruptured fuel line on the aft end of the engine may have allowed high pressure fuel to spray either onto the turbo charger or the exhaust, which would have then ignited. Subsequently, the dive gear hanging near the source of the fire may have ignited also, increasing the spread of the fire.

The second scenario is that the very dry thermal dive underwear hanging in the engine room came into contact with the hot turbo charger or the exhaust after the vessel got underway. The radiant heat emanating from these hot surfaces could have ignited the clothing. The fire would have spread rapidly through the wood structure of the warm and dry engine room.

In both scenarios the fire most likely started in the aft end of the engine room and spread rapidly, making it impossible for crew members to enter the engine room and fight the fire.

## *Heat Detection*

The investigation could not determine with certainty the exact model of heat detector on board the *Neptune II.* However, maximum fixed-temperature type alarms were found to be those most commonly used on most BC fishing vessels and were most likely used on the *Neptune II.*

Heat detectors are not required for any fishing vessels under the *Canada Shipping Act, 2001* or its applicable regulations. However, *WorkSafeBC* regulations require that fishing vessels have heat detectors installed in both the engine room and the galley. These regulations do not specify the type of heat detector to be installed.

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[14] As the electrical inverter had not been working, it was considered as a possible cause of the fire but it was rejected because of its location compared with the location where the fire appears to have started.

Although heat detectors currently used on most fishing vessels are of a maximum fixed-temperature type, a dual-action heat detector has the advantage of 2 features: a fixed-temperature feature that activates an alarm when a set temperature limit is reached, and a rate-of-rise feature that activates an alarm when a rapid change in temperature occurs.

In this occurrence, only the smoke of the fire alerted the crew members. The heat detector in the engine room sounded only as they reached the door, and by this time the fire was fully engaged. The heat detector on the *Neptune II* was most likely not equipped with the rate-of-rise function, likely resulting in the delay in the detection of the fire. The delay in the crew being alerted to the fire by the heat detector hampered their ability to start fighting it in time to be able to control it effectively. As a result, the firefighting equipment on board was not sufficient to manage the fire.

## *Firefighting Equipment*

Once alerted to the fire, the crew of the *Neptune II* could only access limited firefighting equipment.

By the time the crew became aware of the fire in the engine room it was already fully enveloped, with flames seen rising as high as the engine room door. This meant that entering the engine room to use the firefighting equipment located therein was not a feasible option. This was critical because to turn on either of the fire pumps in the engine room, a crew member would have had to go into the engine room, open the sea suction and then engage the power take-off for either the main engine or the auxiliary engine. This inability to access the engine room rendered the fire hoses useless.

Once the 3 accessible fire extinguishers were used up and attempts to seal the engine room and forecastle were not successful, the crew were limited in the alternate equipment available to fight/contain the fire. The vessel was equipped with the 3 fire buckets on board which could have been used to get a very limited amount of water into the engine room to fight the fire. With no access to a fire hose, the fire buckets would have been their only tool in getting water into the engine room; they were not used. The fire continued unabated until the vessel burnt to the waterline and sank.

Fishing vessels between 15 and 150 gross tonnage are not required to carry firefighting equipment as are vessels greater than 150 gross tonnage. Section 26 of the *Large Fishing Vessel Inspection Regulations* requires all fishing vessels built after May 31, 1974 and over 24.4 meters in length or 150 gross tonnage to have a carbon dioxide ($CO_2$) smothering system in the engine room. The *Neptune II* was not equipped with a fire suppression system, nor was it required to by regulation.

## *Firefighting Drills and Emergency Preparedness*

To effectively respond to a fire on board a vessel, it is essential that crew members be familiar with their vessel. It is also important that the firefighting equipment be in good working order and that crew members be trained in or have practiced its use. This is particularly important because during a fire there is little time to learn how to use firefighting equipment. Furthermore, under duress, it is more difficult to remember the procedures or techniques to fight fire with equipment.

On small vessels, emergencies such as a fire can occur very rapidly. The regular practice of carrying out emergency drills not only provides an opportunity to ensure that firefighting equipment is in working order but it gives the crew an opportunity to become more familiar with its use. The more often drills are carried out, the more the crucial actions needed in an emergency become reinforced, potentially saving critical seconds.

The investigation found that the master and other crew members had not taken part in any emergency drills on a regular basis, nor did they have any written procedures for emergency circumstances as was required by regulation. Mitigating actions that could have been taken on the *Neptune II* such as closing off fire dampers, identifying the location of available firefighting equipment, and understanding the need to close the engine fuel shut off as soon as possible should have become standard practice through regular emergency drills.

Emergency drills not routinely practiced or evaluated can leave crew members at risk of being unprepared in case of emergency.

## *Safe Shipboard Practices*

To ensure the safe operation of a vessel, the *Canada Shipping Act, 2001* requires the development of procedures that would set out the best practices for a variety of critical shipboard operations and emergency management. [15] Prudent seamanship would also dictate the development of these procedures. Such procedures should include, among other things, the day-to-day operational activities of the vessel.

In this occurrence, the dive gear was left unattended, hanging on pipes in the engine room for over 24 hours while exposed in close proximity to hot surfaces. While the investigation was unable to identify the definitive source of the fire, it is possible that the hanging dive gear in close proximity to heat radiating surfaces could have acted as a point of ignition or was an additional fuel source for the fire.

In addition one of the fire extinguishers that was easily accessible and could have been additionally used to fight the fire, was obscured from view as clothing hung over it.

In the absence of established safety practices and procedures, there is a risk that unsafe conditions will remain unidentified and unaddressed, thereby placing crew and the vessel at risk.

## *Testing of Heat Detectors*

The appropriate testing of heat detectors, conforming to the procedures recommended by manufacturers is crucial for their continuing designed operation.

The investigation found that the common practice in the industry to test heat detectors is to use the open flame of a lighter. The ship's crew practiced this method, including during vessel inspections. This method was used on the heat detector on the *Neptune II* and it does not conform to the procedures recommended by manufacturers.

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15 Subsection 106(1) of the *Canada Shipping Act*, *2001*

The TSB has tested various models of the heat detectors using an environmental chamber. The chamber was programmed to slowly increase the heat until a temperature just above the thermostat's rated temperature was reached. Testing was also done using an open flame.

It is common practice for the heat detectors on fishing vessels such as the *Neptune II* to have undergone numerous open flame tests. The TSB determined that the older 88°C heat detector tested took an average of 7 seconds more to activate than did all of the other tested detectors. It was not possible to determine if this result was due to repeated exposure to the excessive heat of an open flame, measured as high as 1053°C, or the result of natural aging of the thermostat's components caused by repeated activation and deactivation cycles during testing.

Repeated testing of heat detectors on a vessel using the open flame of a lighter can damage the heat detectors and put the vessel and its crew at increased risk in the event of a fire.

## *Crew Perception of Risk*

During an emergency, it is vital that all emergency equipment perform as intended. To this end, emergency equipment should be used only for its intended purpose, tested regularly, and the crew should be kept familiarized with its use.

The purpose of an emergency very high frequency (VHF) radiotelephone and battery on board a vessel is to provide the vessel with an alternate source of power for a VHF radio during an emergency in which all of the electrical systems on the bridge fail due to unforeseen circumstances.

In this occurrence, the master transferred the emergency radio battery from the *Neptune II* to replace the dead battery on the dive tender. During the occurrence, as the fire spread and engulfed the engine room, all of the electrical systems on the bridge failed. When the master prepared to abandon the vessel, he tried to use the emergency VHF to broadcast a Mayday. However, he was unable to do so as the emergency battery had been transferred to the dive tender, rendering the emergency VHF non-operational. Eventually, when the master did abandon into the dive tender, he was able to broadcast the Mayday using the VHF on the *Deep Six*.

In the past, the master had never experienced such an emergency resulting in the failure of all electrical systems on the bridge. When the master transferred the emergency battery to the dive tender, he did not consider the potential consequences of this action and the ensuing risk.

Crews who have not experienced an emergency in the past may have a lower perception of risk.

# *Conclusions*

## *Findings as to Causes and Contributing Factors*

1. The fire most likely started in the aft end of the engine room as a result of either a ruptured fuel line allowing fuel to spray either onto the turbo charger or the exhaust, or radiant heat from the main engine igniting the hanging clothing.

2. The heat detector did not provide a timely warning of a presence of fire in the engine room.

3. The ability of the crew to effectively fight the fire was hampered due to lack of emergency drill preparedness and the inability to enter the engine room to access additional firefighting equipment which allowed the fire to continue unabated until the vessel burned to the waterline and sank.

## *Findings as to Risk*

1. In the absence of established safety practices and procedures, there is a risk that unsafe conditions will remain unidentified and unaddressed, thereby placing the crew and the vessel at risk.

2. Not practicing or evaluating emergency drills routinely can leave crew members at risk of being unprepared in the event of an emergency.

3. Crews who have not experienced an emergency in the past may have a lower perception of risk.

4. Repeated testing of heat detectors on a vessel using an open flame from a lighter can damage the heat detectors and put the vessel and its crew at increased risk in the event of a fire.

## *Other Findings*

1. Fishing vessels between 15 and 150 gross tonnage are not required to carry the same firefighting equipment as are vessels greater than 150 gross tonnage.

2. Dual action heat detectors that measure both maximum fixed temperature as well as the rate of temperature rise are more effective in early detection of fires.

# *Safety Action*

## *Action Taken*

*Transportation Safety Board*

On 12 October 2011 the Transportation Safety Board of Canada (TSB) sent Marine Safety Advisory Letter (MSA) 03/11 to Transport Canada (TC) with a copy to the Canadian Board of Marine Underwriters regarding the practice of testing heat detectors. The investigation had determined that it is common practice among fishermen to test the functionality of heat detectors by using an open flame from a cigarette lighter. This method of testing may result in damage to the detector and possible malfunction. It is specifically recommended by the manufacturers that heat detectors not to be tested with an open flame because this may damage the heat detector and/or affect its operational efficiency.

On 12 October 2011 the Transportation Safety Board of Canada (TSB) sent Marine Safety Advisory Letter (MSA) 04/11 to the Canadian Board of Marine Underwriters with a copy to Transport Canada (TC) regarding dual action engine room heat detectors. The "dual action" heat detector is advantageous in that it measures both "maximum fixed temperature" as well as the "rate-of-rise" function. Timely and early fire detection is critical to the success of any firefighting efforts in an emergency. Fishing vessel owners should be made aware of the advantages of installing "dual action" heat detectors on their vessels.

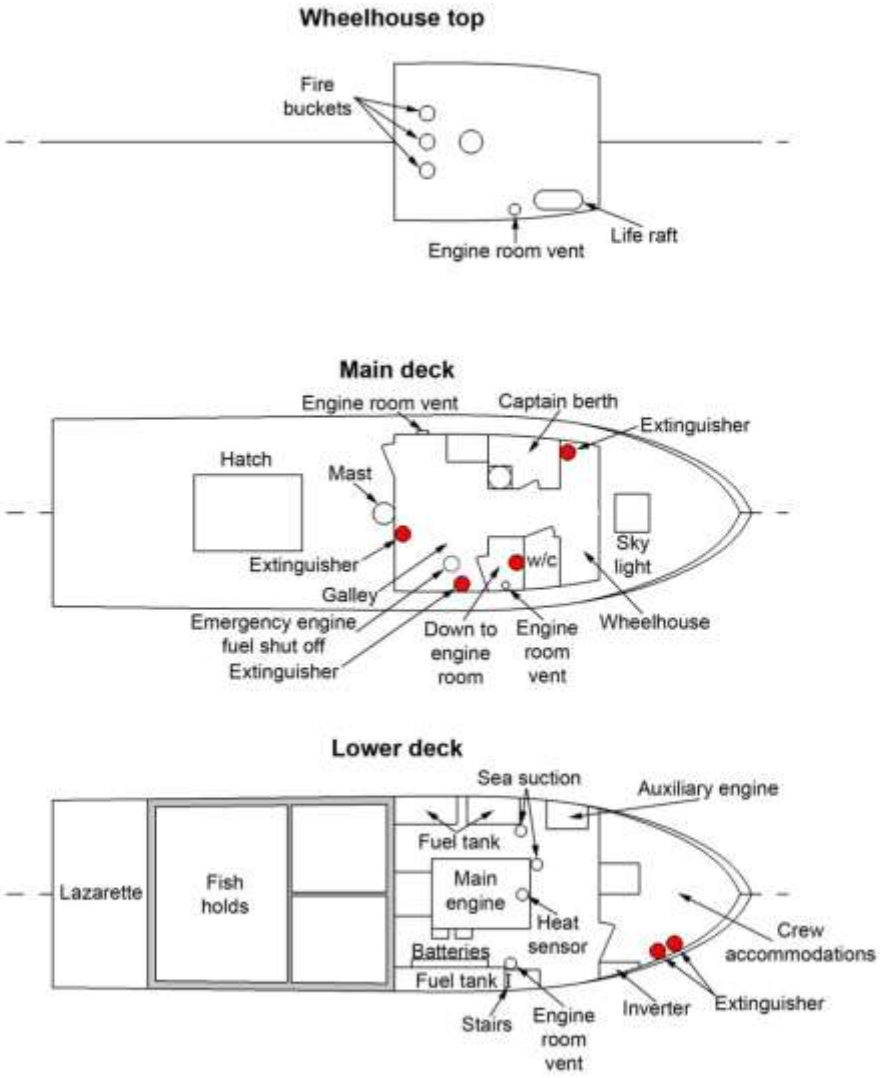
*Transport Canada*

TC prepared a message that has been sent to all TC marine safety inspectors across Canada advising them not to witness or request open flame heat detector activation during inspections but instead to request or encourage the vessel's crew to follow the manufacturer recommended methods for testing.

*This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 04 July 2012. It was officially released on 24 July 2012.*

*Visit the Transportation Safety Board's website (www.bst-tsb.gc.ca) for information about the Transportation Safety Board and its products and services. You will also find the Watchlist, which identifies the transportation safety issues that pose the greatest risk to Canadians. In each case, the TSB has found that actions taken to date are inadequate, and that industry and regulators need to take additional concrete measures to eliminate the risks.*

# *Appendix A – General arrangement of the Neptune II (diagram not to scale)*



# *Appendix B – Area of occurrence*