Office of the Chief Investigator
Transport Safety

Marine Safety Investigation
Report No 2012/04

Fire Aboard
Fishing Charter Vessel Bluefin II
Southeast of Cape Nelson Portland
7 July 2012

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THE CHIEF INVESTIGATOR

The Chief Investigator, Transport Safety is a statutory position under Part 7 of the *Transport Integration Act 2010*. The objective of the position is to seek to improve transport safety by providing for the independent no-blame investigation of transport safety matters consistent with the vision statement and the transport system objectives.

The primary focus of an investigation is to determine what factors caused the incident, rather than apportion blame for the incident, and to identify issues that may require review, monitoring or further consideration.

The Chief Investigator is required to report the results of an investigation to the Minister for Public Transport or the Minister for Ports. However, before submitting the results of an investigation to the Minister, the Chief Investigator must consult in accordance with section 85A of the *Transport (Compliance and Miscellaneous) Act 1983*.

The Chief Investigator is not subject to the direction or control of the Minister in performing or exercising his or her functions or powers, but the Minister may direct the Chief Investigator to investigate a transport safety matter.

EXECUTIVE SUMMARY

On the afternoon of 7 July 2012 the fishing charter vessel Bluefin II was conducting fishing operations southeast of Cape Nelson, Portland, when a fire developed on the vessel. An unsuccessful attempt was made to extinguish the fire using the on-board fire extinguishers and a fixed fire suppression system.

The vessel was carrying six recreational fishermen and two crew members. The passengers and the crew members were taken aboard two fishing charter vessels that were operating in the area and had come to their assistance. There were no injuries in the incident.

The vessel was subsequently destroyed by the fire and sank while being towed back to the Port of Portland.

The investigation concluded that the fire started in the vessel's electrical system that had been modified to accommodate electric fishing reels. It was found that one of the fishing lines snagged resulting in high current that generated heat and led to the subsequent fire. The investigation was unable to determine the reason why circuit protection did not de-energise the electric circuit. The investigation concluded that the electric circuit for the electric fishing reels did not adequately protect against overcurrent either as a result of its installed configuration or the non-operation of a protective device.

In response to this incident Transport Safety Victoria has issued a 'Safety Alert' to all vessel owners and operators highlighting the need to ensure that electrical systems are designed and installed in compliance with electrical standards, and has modified its *certificate of survey renewal form*[1] to include a section for the vessel owner to identify changes made to the vessel.

[1] *Application for Renewal of a Safe Construction Certificate for Commercially Operated Vessels* dated 1 July 2012.

1. CIRCUMSTANCES

On 7 July 2012 the fishing charter vessel Bluefin II (*Bluefin*) was conducting fishing operations southeast of Cape Nelson and about seven nautical miles south of Lawrence Rocks. The vessel was crewed by a master and a deckhand and there were six recreational fishermen on board.

At about 1430, while engaged in fishing operations using electric fishing reels, smouldering of cables under the starboard gunwales was observed. The vessel's crew used the on-board portable fire extinguishers in an attempt to control the smouldering with limited success.

The master headed the vessel back to the Port of Portland and during the passage the vessel lost all power including power to its communication equipment. At this time heavy smoke and flames were observed along the forward starboard side and from behind the main control console in the wheelhouse. Smoke was also observed in the engine space.

The crew flooded the machinery space with the fixed fire suppression medium but as the fire continued to spread, decided to abandon the vessel. A passenger contacted emergency services (000) on his mobile phone and also activated the Emergency Position Indicating Radio Beacon (EPIRB). Lifejackets were donned by the passengers and the liferaft was deployed.

Two fishing charter vessels operating in the area rendered assistance and took the passengers and crew members aboard. There were no injuries.

The Australian Volunteer Coast Guard (AVCG) vessel attended and attempted to tow the *Bluefin* back to the port of Portland. The *Bluefin* was engulfed by the fire and sank about five nautical miles south of Lawrence Rocks.

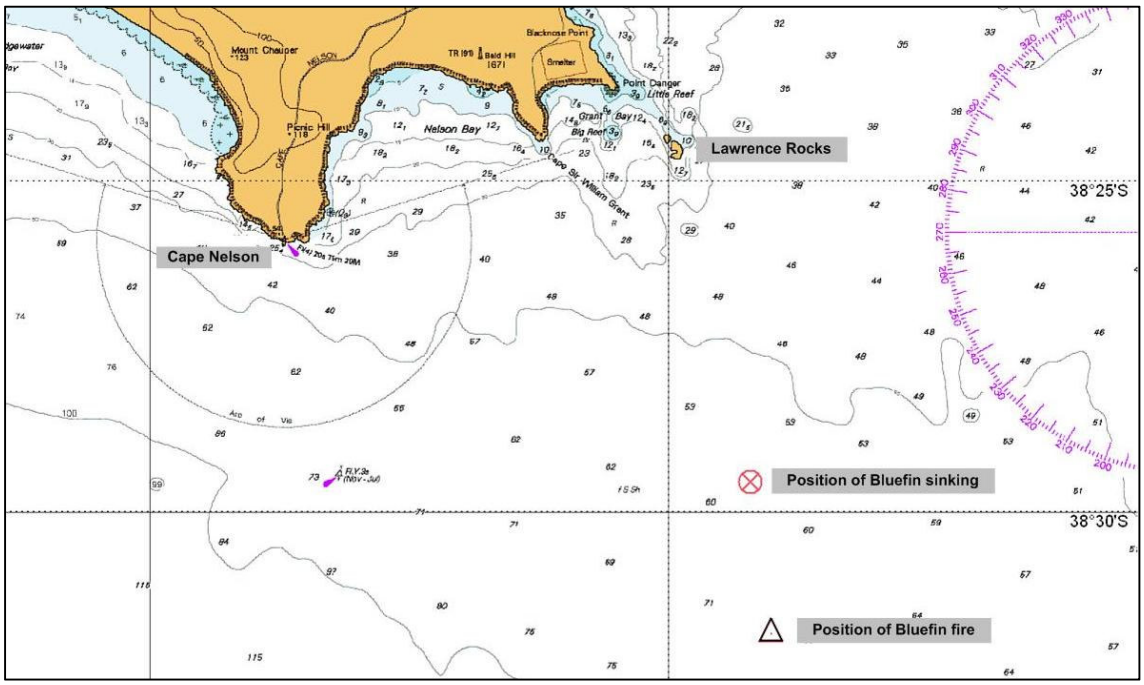

Figure 1: Positions of Bluefin fire and sinking

2. FACTUAL INFORMATION

2.1 Personnel

2.1.1 Vessel crew

The master of the *Bluefin* held current and valid Master Class 5 and Marine Engine Driver Grade 3 certificates of competency. These qualifications satisfied statutory requirements for the role he was undertaking.

The master stated that after conducting a safety briefing for the six passengers, they departed Portland for tuna fishing at about 0830. When at the fishing ground, as they were not catching fish with the mechanical reels, they decided to use the electric fishing reels. He said that the line of one of the reels snagged on the bottom and he attempted to free the reel by manoeuvring the boat around in circles. During this action a passenger alerted him to smoke emanating from under the gunwale on the starboard side. He stopped the vessel and observed electrical wires smouldering under the gunwale and attempted to extinguish it using a dry chemical powder (DCP) extinguisher. As the smouldering did not abate he also used a foam extinguisher. He stated that this too was ineffective so he covered the smouldering wires with a wet cloth and headed back to port.

After about 20 minutes the vessel engines shut down and around that time the deckhand advised him that there was smoke coming out from under the wheelhouse control console. He stated that he checked and found 'smoke pouring out from under the dash'. With the assistance of the deckhand he deployed the liferaft and ensured that all the passengers donned their lifejackets. He stated that he then discharged the fixed fire suppression medium into the machinery space as he observed smoke emanating from under the engine hatch.

The master stated that the vessel's radio systems had also lost power and could not be used. A passenger then activated the EPIRB and made a phone call to 000. Soon after, the charter vessel *Game On* came alongside and took the passengers aboard. The master was informed by the skipper of *Game On* that the coastguard vessel was on its way so he decided to stay on board the *Bluefin* with the deckhand. He stated that after a while he noticed flames emanating from the forward and sides of the vessel. They were contemplating getting into the liferaft when another charter vessel, the *Sharkman Viking III* came alongside. They disembarked onto this vessel and headed for port. On their way to port they passed the coastguard vessel that was on its way to the *Bluefin.*

The master stated that the circuit for the electric reels was installed by a certified auto electrician in January 2012. He also stated that he had not attempted to isolate the electrical reel circuit as he was not aware of the location of the circuit breaker and the battery isolation switch was located in the machinery space which was full of smoke.

The deckhand of the *Bluefin* corroborated the master's account of the events and further stated that when a passenger alerted him to the smoke, and he realised that it was emanating from the wiring to the electric reel, he immediately cut the fishing line.

2.1.2 Passengers

The investigation interviewed two of the six passengers on board the vessel.

One passenger stated that a fishing reel snagged and during attempts to free the line, he could smell smoke and observed wiring located under the starboard gunwale smouldering. He further stated that the main area of the smouldering appeared to be from a 'bundle' of wiring located in a box. He said that the deckhand then cut the snagged fishing line and the master attempted to extinguish the fire initially with water and then with the portable fire extinguishers.

The passenger stated that initially the smouldering appeared to abate but later flared up and the master covered the wiring with a wet cloth and decided to head back to port. By this time there was heavy smoke emanating from the starboard side and from inside the cabin and the passenger said that he asked the master whether he had placed a radio call for help. The master had replied that the radio was not working but did not explain why. After about 15 minutes on their way back to Portland the vessel suddenly stopped and he asked the master about life jackets and the master replied that they would deploy the liferaft. The passenger stated that he then took the EPIRB from its mounting and with the permission of the master activated it by following the instructions. He stated that he also called 000 on his mobile phone and advised the operator of the situation. He said that the master and deckhand had deployed the liferaft and while they were contemplating getting into it, another vessel came alongside and took all the passengers off the *Bluefin* and took them back to Portland.

Another passenger who was accompanying his two sons on the fishing charter had a similar recollection of the events.

2.1.3 Master of AVCG Vessel

When the AVCG vessel CG17 arrived at the site they observed the burning *Bluefin* and recovered a liferaft. The master of the CG17 advised that they hooked the anchor of their vessel to the *Bluefin* and was towing it towards Portland, when it was engulfed by the flames and sank at about 1750. CG17 reported the loss of the *Bluefin* to the Water Police and the Port of Portland and headed back to port.

2.2 Vessel – Bluefin II

The *Bluefin* was a 10.4 metre, fibre reinforced plastic (FRP), monohull vessel built by Stebercraft Pty. Ltd in New South Wales. The vessel had a planing hull form and had a large aft deck area bounded by solid bulwarks. The vessel had an enclosed wheelhouse and a fly-bridge. A bait table was mounted on the aft deck and fishing rod holders were mounted on side and stern frames on the gunwales. A padded seating area was located under the roofed-in area of the cabin, providing seating for about six passengers. Storage space was provided under the seats and the forepeak area.

Figure 2: Bluefin II (Courtesy of Bluefin II Fishing Charters)

The vessel's propulsion system consisted of a Caterpillar turbocharged engine of 224 kW driving a single propeller rated for a service speed of 16 knots. Throttle and steering controls were located in the wheelhouse and fly-bridge. The steering controls were mechanical-hydraulic and mechanical linkages provided engine throttle control.

The vessel carried a sufficient number of lifejackets for the passengers and crew of the vessel. One 10-person liferaft was mounted forward of the wheelhouse on the cabin roof and one life-ring were mounted forward of the fly-bridge. A 4.5 kg portable dry chemical powder fire extinguisher and a nine litre portable foam fire extinguisher were carried on the vessel. The vessel was also installed with a Pyrogen fixed fire suppression system in the engine room. The type and capacity of fitted safety and fire fighting equipment was compliant with the statutory requirements for this vessel.

The vessel was purchased in 1999 by the current owner, and the business operated as *Bluefin II Fishing Charters*.

2.2.1 Vessel certification

The *Transport Integration Act 2010* established the position of the Director, Transport Safety (the Director) for the regulation of transport safety in Victoria, including marine safety. Transport Safety Victoria (TSV) exists to support the Director to achieve the statutory functions. TSV verifies that the design, construction and equipment of new and existing commercial vessels meet the requirements of the Uniform Shipping Laws Code (USL Code)[2] and the National Standard for Commercial Vessels (USL/NSCV[3]).

The *Bluefin* was built by Stebercraft in 1987 and was surveyed as a fishing charter vessel by the Maritime Services Board of New South Wales (now NSW Maritime). The *Bluefin* was approved to operate as a Class 1C[4] vessel.

The vessel was brought to Victoria and underwent a major overhaul that included engine replacement and re-wiring of the vessel. These modifications were inspected by Marine Safety Victoria[5] and the vessel was surveyed as a class 2C[6] vessel.

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[2] The USL Code stipulates standards for the design, construction and operation of domestic commercial vessels. The USL Code is being superseded by the National Standard for Commercial Vessels.
[3] USL/NSCV2008, USL/NSCV2009 and USL/NSCV2010 are the referenced standards.
[4] A passenger vessel carrying over 12 passengers and allowed to operate in restricted offshore waters.
[5] Amalgamated into Transport Safety Victoria in July 2010.

After the initial issue of the Victorian Certificate of Survey in 2009, the vessel was surveyed annually by TSV, the last inspection before the incident being in May 2012. The owner informed the investigation that the electrical system of the vessel was modified to accommodate the electric reels in January 2012.

With respect to alterations to vessels, the National Marine Safety Committee[7] (NMSC) guidelines issued in 2008 and 2010 require that operators notify the authority of alterations or modifications in order to determine if risks have been increased by the changes. In this instance the vessel owner did not inform TSV of the installation of the electric reel circuit and the surveyor that undertook the survey in May 2012 did not recall becoming aware of the reel circuit.

With respect to electrical systems on commercial vessels, the NSCV requires that all electrical systems are reliable, incorporate safety protection and overcurrent protection and a means of isolating the supply.

2.3 Bluefin II electrical system

2.3.1 Electrical supply system

Two banks of batteries—one 12 volt battery and another two 12 volt batteries connected in parallel—were located in the engine compartment of the vessel. They provided for propulsion engine starting and supplied the vessel's main electrical equipment. The battery selection and isolation switch was located adjacent to the batteries in the engine compartment.

2.3.2 Communication equipment

TSV advised the investigation that when the *Bluefin* was rebuilt in 2009, the radio installation was in accordance with the 2008 version of the USL code and the main source of power to the radio equipment was from the batteries in the engine space. A battery in the fly-bridge was the reserve power supply. They also advised that the change-over switch for the power supplies is usually located on the main wheelhouse control console.

2.3.4 Electrical system modifications

In January 2012 the vessel's electrical system was modified to provide power to the electric fishing reels. The electrician engaged to carry out the installation provided a schematic of the installation and advised that a tapping off the main battery banks was used to set up the circuit. Information supplied showed a 30 ampere circuit breaker installed after the battery isolator, and four connection points for electric reels. The physical location of the circuit breaker was not clearly identified. Electric reels could be plugged into any of the four connection points using the male and female connectors (Figure 3). The supplied information indicated that six square millimetre marine two core twin sheath cable was used for the wiring of the system.

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[6] A passenger vessel carrying less than 12 passengers and allowed to operate within 30 nautical miles of the Victorian coast and within 30 nautical miles of a safe haven.

[7] The NMSC was established to improve marine safety in Australia by facilitating a co-operative and coordinated approach to the administration of marine safety within the Commonwealth, States and Territory Governments. A key function of the NMSC is to develop the National Standard for Commercial Vessels (NSCV).

2.3.5 Electric reels

The electric fishing reels that were being used on the *Bluefin* were the Tanacom Bull 1000 model manufactured by Daiwa Corporation of the USA (Daiwa). The operating manual for the unit specifies that the reel operates on 12-16.8 volts dc, has a 22 kilogram-force (kgf) nominal 'drag power' and has an instant maximum 'winding power' of 70 kgf. The unit draws a current of 3 amperes at no load, 10 amperes at stall[8] and has a specified maximum current of 30 amperes[9].

Figure 3: Electric fishing reel and connectors

The manufacturer of the electric reels does not provide any information on specific installation requirements or overcurrent protection devices required when powered by a vessel's power supply. However, the operating manual for the reels state that they are made to operate on a 12 volt dc supply and that 'power supplied by a boat can be unstable' and recommends that a battery pack provided by Daiwa is used with the reel. Further, the manual states that the reel incorporates a circuit breaker system that is designed to stop the automatic winding function should there be an excessively heavy load. Daiwa was unable to provide further information on this protection system.

[8] When the rotor is locked by an external load.
[9] Maximum current can be drawn when the rotor is forced to rotate in the opposite direction to normal operation.

3. ANALYSIS

3.1 The incident

Witness accounts indicate that smouldering and sparking was initially observed in at least two areas. The smouldering was observed at or in the vicinity of the junction box where the electric fishing reel circuit was connected. Sparking was also observed at the point where the reel connectors were plugged into the 12V reel supply circuit.

When the reel snagged, a relatively high current of around 10 amperes (stall current) would have resulted. As the vessel was being manoeuvred to free the line, the rotor of the electric reel was probably forcibly rotated in opposition to the torque generated by the motor attempting to wind in the reel. This action may have resulted in a current in excess of 10 amperes and potentially up to 30 amperes. Had the reel been cut as soon as the line snagged on the bottom, these higher currents would have been avoided.

It is probable that poor contact or corrosion at circuit connections in the presence of the high current generated sufficient heat to breakdown the cable insulation resulting in ignition. It is probable this would have then led to the short circuiting of conductors and even higher currents. These resulting high current should have tripped the protection circuit breaker. It is apparent that the short circuit current was sustained for a sufficient period for ignition to occur at multiple locations in the circuit and ignite surrounding materials including the flammable FRP hull material.

It is probable that the smouldering and the resulting fire would have been contained had the electrical circuit been isolated prior to the use of the extinguishers, either by the operation of the circuit breaker or manually. The investigation was unable to determine the reason why the circuit protection device failed to activate and clear the fault. Manual isolation was possible, at least at the battery isolation point in the machinery space, however once the space had filled with smoke, access to this isolation switch would have been limited.

It is apparent that the electrical circuit was ‘live’ when the crew utilised the on-board extinguishers. The powder of DCP extinguisher would have dispersed minimising its effect on the smouldering cables. Foam extinguishers are suited for use with flammable liquid fires (cooling and smothering) and apart from a minimal cooling effect would not have been effective in this instance.

3.2 Electrical reel circuit design

The investigation was unable to determine if all aspects of the installed electrical system met the requirements of the applicable electrical standards. Based on the information available, the wiring used was appropriately rated, however a 30 ampere circuit breaker is considered high for two reels with normal maximum current of 10 amperes. The stall current for the electric reel is rated at 10 amperes by the manufacturer and it would have been appropriate to incorporate an overcurrent protection device rated to this value. When low resistance faults occur in low voltage systems, high currents can result and the energy released can be a significant risk as an ignition source for fire.

Good electrical design practice would also dictate that the reel circuit should have been wired through the main switchboard with the appropriate protection and isolation

available at the switchboard and easily accessible. If this had been the case the circuit breaker could have been manually opened, thereby isolating the reel circuit.

3.3 Certification of vessel

Commercial vessels are required to be certified by the regulatory body and there are obligations on owners to advise the regulator of modifications to their vessel. In this instance, the electrical modifications undertaken to incorporate the electric fishing reels were probably considered by the owner to be minor and having these works undertaken by a licenced auto electrician was appropriate. However, this occurrence does highlight the need to explicitly direct owners to notify the regulatory agency of any modifications, even if considered minor. Involving the regulatory surveyor provides another opportunity for detection of heightened risk.

3.3.1 Communications system failure

The master advised that the vessel's radio communication system was inoperative during the incident. It is most probable that radio communication equipment became inoperative when the main power supply was affected by the fire. The investigation could not establish the extent to which the switch-over system and the reserve power source were affected by the fire.

4. CONCLUSIONS

4.1 Findings

1. The fire started in the vessel's electrical system.

2. Modifications were carried out to the vessel's electrical system to accommodate the use of electric fishing reels.

3. The main battery isolation that could have been used to isolate this circuit was located in the machinery space and difficult to access once smoke had filled this space.

4.2 Contributing Factors

1. The circuit for the electric fishing reels did not adequately protect against overcurrent either as a result of its installed configuration or the non-operation of a protective device.

2. The circuit for the electric fishing reels was not isolated from the battery supply when the fault first occurred.

3. The delay in cutting the fishing line to the electric reel extended the period of high current and resulted in the generation of sufficient heat to cause ignition.

5. SAFETY ACTIONS

5.1 Safety Actions taken since the event

Transport Safety Victoria issued a Safety Alert to all vessel owners and operators highlighting the need for persons installing or modifying low voltage electrical systems to ensure that the systems are designed and installed in compliance with electrical standards.

Just prior the incident but after the survey of the vessel in May 2012, Transport Safety Victoria modified its *certificate of survey renewal form* to include a section for the vessel owner to identify changes made to the vessel.