



A U S T R A L I A N T R A N S P O R T S A F E T Y B U R E A U

MARINE SAFETY INVESTIGATION
REPORT 151

Independent investigation into the collision involving
the Liberian woodchip carrier,

Craig The Pioneer

and the fishing vessel

May Bell II



east of Newcastle
on 9 October 1999



**Department of Transport and Regional Services
Australian Transport Safety Bureau**

Report No 151

Navigation (Marine Casualty) Regulations
investigation into the collision involving
the Liberian woodchip carrier,
Craig The Pioneer and the fishing vessel *May Bell II*
east of Newcastle
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FIGURE 1
Craig The Pioneer



Summary

At 0155 on 9 October 1999, the prawn trawler *May Bell II* was about 50 miles east of Newcastle, NSW, heading slowly west. The skipper and the deckhand were recovering their nets when the deckhand heard the sound of a ship's wash just forward of the trawler. He ran to the wheelhouse where he put the engine full astern but, a few seconds later, the two vessels came into contact.

The deckhand sounded the trawler's horn, leaving it on, but there was no answering signal from the ship. He was unable to make out a stern light or the ship's name on the stern as the ship continued on towards the northeast.

The bow of the trawler was holed by the impact, but there was no ingress of water. The skipper called Sydney Radio on VHF (very high frequency radio) to say that the trawler had been struck by a ship, informing the station of the position and time of the collision and adding that he was returning to Sydney.

The trawler returned to Sydney that afternoon, whereupon the Australian

Transport Safety Bureau (ATSB) interviewed the crew and obtained samples of paint deposited, as a result of the collision, on the stem of the trawler.

AusSAR, the Australian search and rescue organisation, provided the ATSB with a surface picture (surpic) of ships in the area at the time of the collision. Positions were obtained from certain ships on the surpic and a woodchip carrier, *Craig The Pioneer*, was close enough to the position of the collision to warrant further investigation.

When *Craig The Pioneer* arrived at Bell Bay in Tasmania in November 1999, interviews were conducted with the master, deck officers and the AB (able-bodied seaman) who had been on watch with the 2nd mate. The 2nd mate and AB, who had been on the navigation watch at the time, denied all knowledge of the incident stating that they had not seen the trawler either visually or by radar.

The ATSB also obtained paint samples from the ship. Paint samples from both vessels were analysed by the Scientific Unit, Forensic Services, of the Australian Federal Police at Canberra, the report concluding that there was strong evidence that the ship and fishing vessel had come into contact.

Sources of Information

Skipper and deckhand of *May Bell II*

Master, officers and lookout aboard *Craig The Pioneer*

Sydney Radio

The Manager of the coast radio stations

Acknowledgement

Portion of chart Aus 362 reproduced by permission of the Hydrographic Office, RAN

The Rescue Coordination Centre, Australian Search and Rescue (AusSAR)

Scientific Unit, Forensic Services, Australian Federal Police

Professor Drew Dawson, Centre for Sleep Research, University of South Australia

Dr Jeff Brock, Specialist in Aviation Medicine

FIGURE 2
May Bell II at the Timber Wharf in Sydney



FIGURE 3
May Bell II, bow damage



Narrative

The fishing vessel

The fishing vessel *May Bell II* operates out of Sydney and Nelson Bay as a prawn trawler. At the time of the incident the vessel was registered with NSW Waterways and was jointly owned by two brothers, the skipper and his deckhand. Both were on board on 9 October.

The vessel was built in 1971 by Wynne Brothers, Fern Bay, NSW. It has a registered length of 17.3 m, a beam of 5.28 m and a depth of 2.54 m. The timber hull, upperworks and steel mast are painted white. It has one deck and 5 bulkheads including a collision bulkhead. The vessel has a raked stem and a transom stern.

There is a single deckhouse located forward, housing a wheelhouse, galley and messroom. The crew sleeping quarters are forward of, and below, the wheelhouse, accessed from a hatch in the deck of the wheelhouse. The fishing deck is aft. The main engine is a Cummins diesel engine, type NTA 855M of 261 kW driving a single screw.

Navigation equipment includes a magnetic compass, autopilot, a Furuno radar with a range of 100 miles, GPS, a navigation plotter and two echo sounders.

The skipper has a Master Class 5 certificate and had been at sea with *May Bell II* since 1978. He also has a speedboat licence and a personal watercraft licence.

The deckhand had been at sea for about 25 years. He also has a Master Class 5 certificate, a speedboat licence and a personal watercraft licence.

The ship

Craig The Pioneer is a six hold, self-discharging woodchip carrier registered in Liberia. It has a deadweight of 42 986 tonnes at a summer draught of 10.516 m. It has a length overall of 194.90 m, a moulded breadth of 32.2 m and a moulded depth of 21.20 m. The vessel was built at the Nippon Kokan K.K. yard at Tsu in Japan in 1986 and is owned by Cygnet Bulk Carriers, S.A. of Monrovia, Liberia. At the time of the incident, the vessel was chartered by Mitsui OSK Line of Japan.

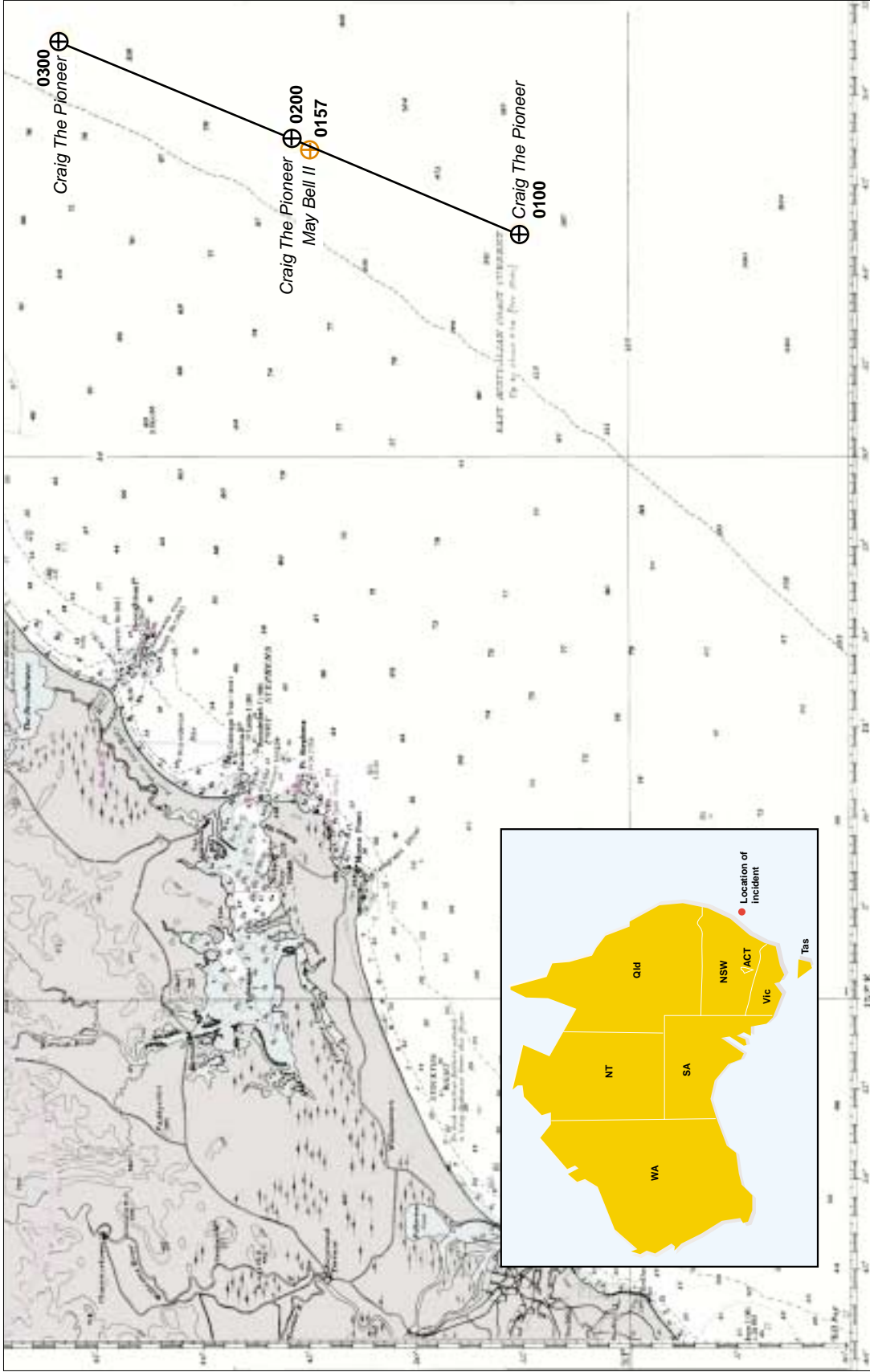
Craig The Pioneer is powered by a single, 6-cylinder, Sulzer diesel engine of 5 994 kW and has a service speed of about 12 knots. The bridge, engine room and accommodation are located aft. The ship is equipped with the normal range of navigation equipment including 3 cm and 10 cm radars, the latter fitted with an automatic radar plotting aid (ARPA).

The ship had a complement of 21, all Filipino nationals.

The 2nd mate had a Second Mate's certificate issued in the Philippines, endorsed under the provisions of the STCW Convention 1978, the endorsement being valid until 31 January 2002. He had been at sea since 1983 as a cadet, ordinary seaman (OS) and able-bodied seaman (AB). He obtained a 3rd mate's certificate in 1991 and was promoted to 3rd mate in 1993. He obtained a 2nd mate's certificate in 1997, sailing as 2nd mate since that time.

The lookout on duty with the 2nd mate had been at sea since 1978 as a cadet before he was promoted to AB. He obtained a 3rd mate's licence in 1982 and had sailed as 3rd mate on a supply vessel in the Arabian Gulf in 1983 and 1984 but, since then, he had sailed as AB. During this voyage, he also

FIGURE 4
Chart of the area with position of fishing boat and track of ship on 9 October, (AEST)



performed duties as quartermaster and lookout.

At sea, the mate kept the 4-8 watch, the 2nd mate kept the 12-4 watch and the 3rd mate kept the 8-12 watch. Each officer had a lookout on duty with him at night.

The incident

May Bell II

May Bell II sailed from Nelson Bay at 0130 on Friday 8 October 1999 to trawl for prawns. It took about three hours to get to the area east of the 100 fathom line where the skipper intended trawling and they started the first trawl or 'shot' at about 0500, heading north.

The fishing vessel carried out a total of four shots. Shooting the nets took about half an hour and the trawl took about 3 hours. During the trawl, either the skipper or the deckhand would rest while the other person took the shot. It took about an hour and a half to recover the nets with the catch after each shot. The prawns went in bulk into brine tanks. Any fish went into boxes and into the freezer.

In evidence given by the skipper and deckhand, *May Bell II* had its lights on from sunset. The lights displayed were the trawl lights (green over white all round lights), the port and starboard navigation lights and the stern light. There were also six deck lights on to illuminate the working area, totalling 4,500 watts. The radar was on stand-by when they started the last shot at about 2030 that day.

The last shot ended at about 0030 on 9 October, when the skipper and deckhand started recovering the nets. It took about two hours to winch the nets in, to empty them and to clean the catch. As they winched up the gear the trawler was making

about half a knot on a westerly heading and the wind was from the northwest at about 10 knots. It was a moonless night with clear visibility. The skipper was on the starboard side lifting the net with tackle driven by a winch operated by the deckhand.

Having emptied the contents of the net on deck, the deckhand went aft to recover the slack of the net. While recovering the slack, he heard the sound of a ship's wash just ahead of the boat. He ran to the wheelhouse where he put the engine to full speed astern. There was no warning whistle from the ship, neither was there any sound from the ship's engine. There seemed to be a large black wall going past and, seconds later, the two vessels came into contact.

The deckhand sounded the trawler's horn, leaving it on until the ship was past, but there was no answering signal from the ship. The skipper and deckhand saw some lights as the ship went past, but they seemed to be cabin lights and neither of them could see the other vessel's stern light. It was too dark for them to read the name of the ship, which continued on its course without stopping.

After the collision, the skipper and deckhand checked the trawler for damage. The top of the stem post was broken and bent to starboard. There was a hole, about 20 cm in diameter, just below the main deck, visible from the deck forward and also from the interior of the boat. There was, however, no ingress of water. A steel plate at the top of the stem post, about 20 cm high and 10 cm across, had foreign paint, apparently from the ship, deposited on it.

The skipper did not attempt to call the ship on the VHF. He informed Sydney Radio on VHF channel 16 of the incident, giving the station the vessel's position and time of the collision. The position was 32° 45.04' S, 152° 47.08' E and the time of the collision

was 1557 UTC on 8 October (0157 on 9 October AEST). He informed Sydney Radio that there had been no pollution as a result of the incident and that the colour of the ship that had collided with the trawler appeared to be pitch black.

After the collision, they put the radar on and the deckhand saw the echo of the ship proceeding away from them, some distance off. The skipper thought that the ship could have been about 4 or 5 miles off at that time. He called a trawler to the north of *May Bell II* to tell them what had happened but that trawler, the *Lord Howe Island Trader*, did not see the ship.

Once the nets were on board, they decided to return to Sydney. Though there was no ingress of water from the damaged bow, the skipper could feel the inrush of air when he checked the inside of the damaged compartment. He also checked the engine room and found that it was dry. There was a northerly breeze blowing and, with the wind from abaft the beam as they headed back, they did not encounter any head seas that might have flooded the bow.

They returned directly to Sydney, reporting their progress every two hours to Sydney Radio.

Ships in the area, the surface picture (surpic)

After the collision was reported, the Australian search and rescue organisation (AusSAR) provided the ATSB with a surpic of ships within a radius of 100 miles of the position of the incident. Certain ships were asked by the ATSB to verify their positions at the reported time of the collision. The ships included *Craig The Pioneer* which gave a reported position within half a mile of the incident.

Craig The Pioneer

Craig The Pioneer had berthed at Geelong at 0830 on 4 October to load a cargo of woodchips and had sailed at 1405 on 6 October. The vessel loaded 32 894.33 tonnes of cargo for Akita in Japan, sailing with draughts of 8.07 m forward and 9.78 m aft.

After sailing from Geelong, normal sea watches were maintained. Steering was changed from manual to autopilot shortly after the pilot disembarked off Port Phillip Heads at 1850 on 6 October. Weather conditions that night were fine and the visibility was good.

Subsequent log entries indicated that the wind strength and wave and swell heights had increased over the next 36 hours. At noon on 8 October, the log recorded partly cloudy skies, a strong breeze, rough seas, moderate swell and good visibility.

At midnight on 8 October, the 2nd mate took over the watch from the 3rd mate. The log indicated that the wind was from the NNE, force 7 on the Beaufort scale. The entries stated that the visibility was very good, in excess of 12 miles, that there were very rough seas from the NNE with wave heights of 4 to 6 metres and a moderate, short ENE swell with heights varying from 2 to 4 m. The course was 024°(T) and the vessel's speed was about 12 knots.

The 2nd mate stated that he was well rested when he went up to the bridge, five or ten minutes before midnight. He had a short conversation with the 3rd mate, which included the handover of the watch.

The 3rd mate had seen some ships during his watch from 2000 until midnight, but they had been distant and he had not had to alter course for them.

One of the two radars was running throughout the period 2000-0400. During the 3rd mate's watch, no. 2 radar (3 cm) was used and during the 2nd mate's watch, no. 1 radar (10 cm) with ARPA was used.

The lookout on duty with the 2nd mate got to the bridge about five minutes before his watch. He was rested and relaxed and he kept a lookout from inside as well as outside the wheelhouse, moving around to the bridge wings to be able to see without the ship's cranes obstructing his view. He recalled that the visibility was good and, while he could not recall whether or not it was a moonless night, he did remember that there were lots of stars visible. He did not have to leave the bridge other than when he needed to call the next lookout for his watch. There was no traffic during the watch from 0000 to 0400 on 9 October. He did not see a fishing vessel that night, neither could he recall being able to see any shore lights.

The 2nd mate could not remember seeing any traffic when he took over the watch at midnight, although he did remember that the visibility was very good. He, neither, could recall seeing a fishing vessel that night. He maintained that he kept a good lookout without being distracted by other duties, such as chart corrections. He recorded

positions from the GPS every hour, as did the other officers.

One of the two VHF sets was switched to channel 16 and the digital selective calling (DSC) channel 70 was being monitored.

A log entry for the 2nd mate's watch from 0000 until 0400 on 9 October records that, at 0000, the steering was changed to no. 1 steering motor. An entry at 0330 notes that Sugarloaf Point was observed bearing 275° (T), 20 miles off and that the course was altered to 012°. At 0400 the 2nd mate logged the skies as being blue, the breeze as northerly and strong and that seas were rough with a moderate swell. There was a further entry to the effect that bridge checklist no. 8 (for taking over the watch) had been carried out, that the mate had taken over the watch and that all was well. There was no other entry in the logbook for that watch.

When the mate took over the watch from the 2nd mate at 0400 on 9 October, the 2nd mate showed him the course on the chart. There was no course alteration due, the radar was on and, though there were other ships in the area, they were distant and he did not remember having to alter course at any time during his watch for other traffic.

Comment and analysis

Evidence

After the collision, the skipper of *May Bell II* reported the trawler's position by GPS and the time of the collision. He added that an unlit vessel had crossed his bow, removing some of it in the process. He also reported that the ship was large and that it was heading northeast.

The collision caused paint from the ship to be deposited on a steel plate on the stempost of the trawler.

When the trawler returned to Sydney after the collision, the skipper and deckhand were interviewed by an investigator from the ATSB, who also collected samples of paint deposited on the stempost for analysis.

An AusSAR surpic for 081557 UTC October 1999 listed sixteen ships that might have been within 100 miles of the position of the collision, including *Craig The Pioneer* about 15 miles west of the trawler.

After eliminating other ships on the surpic, the ATSB obtained positions from *Craig the Pioneer* and decided to investigate further. The vessel was on a voyage from Geelong to Japan at the time of the incident and was calculated to have been within half a mile of the trawler at the time of the incident.

The charterers of *Craig The Pioneer* and the master were informed that the ATSB would further investigate the collision when the vessel returned to Australia.

When the vessel arrived at Bell Bay in Tasmania on 17 November 1999, paint

samples from the hull were obtained from a point where scrape marks indicated a possible area of contact. The master, deck officers and the lookout on duty were interviewed, and copies of the ship's course recorder trace, deck and radar logs and other relevant documentation were obtained.

Neither the 2nd mate nor the lookout had seen a fishing vessel during the watch from midnight to 0400 on 9 October 1999. They agreed that the visibility had been good. When the trawler was described to the 2nd mate, his opinion was that, under those conditions, the trawler would have been visible more than 15 miles away with the naked eye.

Vessels' positions early morning 9 October

GPS positions for the ship were recorded hourly on board. Three positions for 9 October for *Craig The Pioneer* were:

0100 AEST (1500 UTC on 8 October),
32° 54.9' S, 152° 42.4' E

0200 AEST (1600 UTC on 8 October),
32° 44.2' S, 152° 47.6' E

0300 AEST (1700 UTC on 8 October),
32° 33.3' S, 152° 53.1' E.

The ship's average speed over the ground from these positions was 11.5 knots.

The position for the trawler at 0157 AEST, the time of the collision on 9 October was 32° 45.04' S, 152° 47.08' E.

From the position of *Craig The Pioneer* at 0200 local time on 9 October, its position at 0157 was calculated to be 32° 44.74' S, 152° 47.44' E, 4.2 cables (just under 800 m) north east of the trawler.

With respect to the accuracy of a GPS system, the Australian Maritime Safety

Authority's Marine Notice No. 9 of 1995 states that the US Government declared in December 1993 that the GPS system was providing to all civil users, a horizontal position accuracy (with 95% probability) of 100 m.

Craig The Pioneer was the only ship known to have been close enough to the fishing vessel to have been involved in the collision.

Analysis of paint samples

Paint samples from the steel plate on the stempost of the fishing vessel and from the hull of the ship were handed to the Scientific Unit, Forensic Services, Australian Federal Police at Canberra for analysis. Marks on the ship's side indicated that contact might have taken place just abaft the ship's bridge front and the samples were obtained from this area.

There were four samples submitted for examination, comprising:

- A sample from the fishing vessel (item 1)
- A sample from a scraped area on the ship (item 2)
- A further sample from a scraped area on the ship (item 3)
- A sample of black hull paint from the ship (item 4)

The samples were examined under white light using a stereo microscope operating at magnifications up to 40x. Subsamples were then selected for further analysis by infrared and X-ray fluorescence spectrometry, these analyses providing information on the chemical composition of the material.

The summary and conclusions of the report were:

1. The sample of paint (item 1) said to have been taken from the fishing vessel *May Bell II* contained a quantity of dark grey/ black paint chips. These chips were multi-layered in structure with alternating layers of black, silver and silver-brown layers. The layer structure was highly irregular in nature.
2. The sample (item 4) said to have been taken from the black hull of the ship *Craig The Pioneer* contained a quantity of dark grey/black paint chips that were similar in appearance, colour, layer structure and chemical composition to those contained in the sample said to be from the fishing vessel.
3. The dark grey/black paint chips contained in items 1 and 4 could have come from the same source.
4. Particles of wood fibre were found in items 2 and 3, being samples said to have been collected from chafed areas of the hull of *Craig The Pioneer*.
5. The evidence strongly supports the proposition that the ship and fishing vessel have come into contact.

Based on the analysis and other evidence, the Inspector is satisfied that the paint samples taken from *May Bell II* had come from *Craig The Pioneer* and that the ship had collided with the fishing vessel.

Responsibilities of both vessels

Under Rule 5 of the International Regulations for Preventing Collisions at Sea, 1972, as amended (the Colregs), (reference Annex 1 to this report), both vessels were obliged to keep a proper lookout (by sight, hearing and by all available appropriate means).

Under Rule 7 of the Colregs (ref Annex 1), every vessel is obliged to use all available means to determine if risk of collision exists including proper use of radar.

Evidence given by the skipper was that the trawler had the appropriate navigation lights on as well as the lights for a vessel engaged in trawling. The trawler also had its deck lights on. Under Rule 18 of the Colregs (ref Annex 1), the ship was obliged to keep out of the way of the trawler.

The skipper of the trawler and the deckhand were on deck recovering and emptying nets. Their work, however, was intensive and was carried out under bright lights which would have interfered with their ability to keep a lookout.

In a submission received from the skipper of the trawler, he stated that he and the deckhand had conducted a visual watch prior to winching up the nets and, when they saw no lights at all, they did not check the radar to see if there was another vessel nearby. Under the conditions at the time, they expected to be able to see other vessels at least 5 to 6 nautical miles away.

Night vision

The skipper submitted that, despite the deck of his vessel being extensively illuminated, his vision (see Attachment) and that of the deckhand was not impeded.

Advice was sought from a specialist in aviation medicine, whose comments follow.

May Bell II crew members

Given their working environment under high intensity lighting on the night of the collision, it is highly probable that both crew would have been significantly night vision impaired due to the combined effects of retinal bleaching (causing complete loss of dark adaptation) and working close-in on the back of their trawler. By

working under bright lights, the photo-chemicals essential for night vision (and which are used by the 'rod' receptors of the eye) would have been totally inactivated. To be re-activated so that the rods would function in the dark, several hours of 'dark adaptation' in a completely dark or very low-light environment must elapse to enable regeneration of the rod photo-chemicals. This is not possible for this crew whilst working under the floodlighting on the back of the boat. These lights would need to be extinguished completely (and remain so) to enable the dark adaptation process to begin.

It would not be possible for a crewman working under floodlighting on the back of the trawler, to walk to the side of the vessel and then look into the darkness and expect to safely detect a poorly illuminated object quickly. To think otherwise is a myth, but nevertheless, is a commonly held view by many. Given that this crew probably kept no lookout at all or a very meagre one at best, they had no chance of seeing this on-coming vessel unless they had kept a vigilant all round watch with all bright lighting extinguished.

It is also likely that the close-in nature of the work on the back of the trawler would have caused a degree of 'accommodation' fixation to the crew. This means that when they did walk to the side of the vessel and looked out into the darkness where there was no point of fixation, then the eye's natural tendency to accommodate to a point in space about 1-2 metres away ('empty field myopia'; a form of induced short sightedness) would have occurred. This form of myopia (short sightedness) would seriously reduce the likelihood of a crewman acquiring a night target quickly unless he had been on watch for some time in darkness and had been forcefully looking for objects in the distance.

In essence, this crew had minimal chance of detecting *Craig The Pioneer* on the night of the collision.

Craig The Pioneer watchkeepers

As mentioned above in the discussion of 'empty field myopia', there is a related condition called 'night myopia' which can cause the same problem as occurs with empty field myopia. On this particular night, if there was a featureless horizon or nothing for the watchkeepers to physically focus on in the distance, it is possible

that their eyes would automatically accommodate to a point of fixation only 1-2 metres away. Even though they might feel that they were looking in the distance, their eyes were only fixing on objects in the very immediate foreground. Had a brightly illuminated target entered their field of view (such as the illuminated trawler), it is likely that they would have seen it against the featureless background of the ocean/horizon interface. It is possible that both would suffer from this whilst on duty, but improbable that both would have missed seeing the vessel as they approached it.

The other feature of importance in night vision degradation is the known presence of the two 'blind spots'. These are the physiological (blind spot over area of optic nerve head as it enters the back of the retina) and the night (blind spot from the macula) blind spots.

They can both contribute to the failure to see an object at night but are of less significance in the low-speed environment of marine operations than in the high-speed aviation environment where closure rates for a collision are high. Their presence can only be compensated for by regular scanning of the near, middle and distance field of view. Both are caused by the anatomical construction of the eye and are well described in the physiology of vision.

It is not possible to comment on the possible effects of vibration transmission to the bridge, without more information, but if there were low frequency vibrations transmitted to the watchkeepers, it is possible that this would have further degraded their vision.

Lights on *Craig The Pioneer*

The skipper and deckhand of the trawler stated that they were only able to see cabin lights aboard the ship that hit them. They were unable to see a stern light and they concluded that the ship did not have its navigation lights on.

Neither of them saw the ship until the fishing vessel was passing down the side of the woodchip carrier. It is doubtful if, being so close to the hull, they would have seen a sidelight or a mastlight. Sternlights are notoriously difficult to differentiate from

other lights at the after end of a ship's accommodation.

Watchkeepers, when taking over a watch at night, allow for a period of adjustment to dim conditions before attempting to keep a lookout. In the case of *Maybell II*, at the time of the incident, the skipper and deckhand of the trawler were on deck recovering nets. The deck lights were on and the skipper stated that there were six lights of 4 500 watts in use to illuminate the deck. It would have been difficult to look up without being blinded or partially blinded by the deck lights and it could well have been difficult to pick out a stern light as the ship went past.

The 3rd mate of *Craig The Pioneer* stated that the ship's navigation lights were on and, if there had been a malfunction with one of the lights, there would have been an alarm from the navigation light panel.

Weather

The trawler reported 10 knot winds at the time of the incident whereas the ship reported 30 knot winds at the time. The difference in wind speeds reported by the two vessels required to be resolved.

The skipper of the trawler stated that the weather conditions were good at the time of the incident. His evidence was that the wind was from the northwest at about 10 knots, there was not much sea, neither was there much swell.

Information obtained from the Bureau of Meteorology for the date and time of the collision indicated that the weather conditions reported by the skipper of the trawler more accurately represented the actual weather at the time. The Bureau's summary of the weather at 0200 Eastern Standard Time (EST) for 9 October was for winds from the north at 10 knots, good

visibility, fine weather and scattered cloud. The wind would have eased and backed to the northwest after 0200 EST. According to the Bureau, there were wind waves of about 0.5 metres from the north and a swell from the east-southeast of about 2.5 metres with a 10 second period.

At that time, the ship's estimate of the wind speed was about three times the actual wind speed. The ship's estimate of wind waves was that they were between 2 and 4 metres in height, although the Bureau of Meteorology estimated that wind waves would only have been about 0.5 m. The ship's weather and sea conditions were vastly over-estimated.

The ship's log of weather conditions from the time that it sailed from Geelong until 2100 on 8 October was checked against weather conditions reported by the Bureau of Meteorology's Special Services Unit in Melbourne.

The ship had logged NE winds of force 6, rough seas and low swell at 0400 on 7 October. At noon that day the wind was logged at force 3 from the NNE and the seas were described as slight with a low swell. By midnight that night the wind was logged as force 7 from the north and the seas were described as very rough with a moderate swell.

The next day, 8 October, the wind was logged for the watches from 0400 until 2000 as varying between force 5 and 6 from directions between N and NE. The seas were described as rough with moderate swells.

Data from the Special Services Unit of the Bureau of Meteorology indicated that the weather that would have been experienced by the ship was very different from that it

had logged from 0400 on 7 October until about 2000 the next day. For the most part the winds were stated to have been between force 3 and 4 from a northerly direction and the seas would have been slight to moderate with low swells.

For some reason, the ship was logging winds and seas almost twice as severe as the Bureau of Meteorology estimated.

Radar

The trawler had its radar on stand by, but the ship was using radar throughout the 2nd mate's watch.

Using IMO performance standards for radar equipment (ref Annex 2), the ship's radar should have detected the fishing vessel at a distance of at least three miles. The fishing vessel was 17 metres in length, but it was of timber construction and this might have had some effect on its radar echo. IMO performance standards do not distinguish between wooden and steel hulls when mentioning detection ranges for small vessels. Resolution A.384 (X) 1977, however, states that Member States should require vessels of less than 100 grt to carry radar reflectors with an equivalent echoing area of at least 10 m².

The 2nd mate on *Craig The Pioneer* stated that he did not see the echo of the fishing vessel on the radar screen.

A number of marine incidents seem to be caused by watchkeepers relying on radar to assist with keeping of lookout. The collision regulations require vessels to maintain a proper lookout at all times by sight and hearing as well as by all available appropriate means to assist with making a full appraisal of the situation and the risk of collision.

Radar should not be depended on to detect small targets at sea where clutter could mask the returns from such targets at close range, or where the size or aspect of such targets might make them difficult to detect.

In addition to the target size and shape affecting radar returns, watchkeepers should be aware of other radar limitations.

Radar sets require to be operated correctly and the screen brilliance and gain control should be adjusted for optimum performance. If the gain is too high, a poor picture masked by excessive noise will result. If the gain is too low there will be a loss of weak targets and a reduction of the detection range.

With reference to sea clutter controls, retaining some sea speckle is good practice for optimum target detection.

Radar sets should be correctly tuned and the performance monitor, where fitted, should be used to determine the performance of the transmitter and, where possible, the receiver. One radar manufacturer states that a decrement of more than 20% in the transmitter or receiver performance indicates a need for maintenance.

Some shipping companies and navies require that the magnetrons on radar sets on their fleets be replaced every year. While a drop in magnetron power of 50% is not considered to affect short-range radar target detection, the magnetron, as it ages, may become unstable. Should this happen, the transmitted frequency may deviate from specification possibly resulting in the automatic frequency control becoming unlocked and affecting target detection.

In submission, the skipper of the trawler stated that there was more than 2000 kg of metal about 2 metres above the deck and

that other fishing vessels had reported that *May Bell II* was easy to identify on radar.

However, for detecting small vessels, both X-band (3 cm wavelength) and S-band (10 cm wavelength) radar sets have limitations involving multiple reflector targets and multipath propagation.

Vessels constructed of timber, or other non-metallic materials, are difficult to detect as these materials have poor radar reflectivity with little or no signal return to the radar receiver. Detection of such vessels is reliant on radar echoes from their generally large number of separate metallic reflectors such as the masts, booms and other fittings. None of these items may be large enough to provide a constant radar return. The close proximity of metallic fittings acting as reflectors on a small vessel moving in a seaway can cause multiple reflections. This characteristic can result in either an enhanced echo or in the return echoes cancelling each other out. A very small change in relative distance from the radar antenna can make the difference between a small vessel returning a strong signal 'in phase' - or returning a weak or nil signal - 'out of phase'. Similarly, the phase of the radar signal can be affected by multipath signals as a result of reflections off the sea surface, resulting in signals that may be out of phase.

Depending upon how well the radar is set up and the amount of sea and rain clutter, small vessels will usually be detected at five or six miles, but their return signal will often be intermittent and of varying strength.

Fatigue

Fatigue can have a marked effect on crew performance in areas such as attention, reaction time, memory and decision making. Fatigue also affects the ability of crew to judge distance, speed and time. Vigilance

tasks are particularly susceptible to the effects of fatigue and tests involving sustained attention are routinely used by psychologists to measure the onset of sleepiness. During long watches at night, reduced vigilance caused by fatigue combined with normal circadian cycles, can result in a degraded visual scan during lookout.

Individuals suffering from moderate levels of fatigue tend not to be aware that their performance has been affected. This might increase the likelihood that reduced performance leads to an accident or incident. The effect of fatigue on decision making may lead to a crewmember failing to anticipate danger or to recognise the severity of a situation.

To investigate the possibility of fatigue as a factor in this incident the hours of work of the crews of both vessels were examined using fatigue analysis software developed at the University of South Australia's Centre for Sleep Research. The results of these analyses indicated that the second mate and the lookout on watch on *Craig The Pioneer* at the time of the incident might have been subject to the effects of moderate to high levels of fatigue.

Both the 2nd mate and the lookout had worked for a total of 60 hours during the six days prior to the incident.

The hours worked by the second mate and lookout were comparable to the hours worked by other similar crew in the industry. However, results from the fatigue analyses suggest that some rosters typically worked in the industry could be expected to produce high to very high levels of fatigue.

No evidence was found to suggest that the crew of *May Bell II* were likely to have been fatigued at the time of the incident.

Communications from the fishing vessel to Sydney radio

Craig The Pioneer was maintaining a VHF watch on Channel 16, but neither the 2nd mate nor the lookout heard any messages from the trawler.

The trawler called Sydney Radio on VHF channel 16 to inform the station about the collision but the message was intercepted by coastal patrol Port Stephens and passed to AusSAR from Sydney Radio.

Subsequently, messages were received by Sydney Radio from the trawler to the effect that there was no pollution after the collision and that its ETA at Sydney was approximately 1630 local time that day.

The last message from the trawler to Sydney Radio was at 1250 AEST (0250 UTC) with an update to say that all was well on board and the ETA at Sydney Heads was 1430.

Collisions and causal factors

In the last four years, the MIIU (later the ATSB) has investigated fourteen other collisions involving ships and Australian fishing vessels and, despite reports of the incidents being widely circulated within the industry, it appears that proper lookouts are not being kept. Seafarers must appreciate the need to maintain a proper lookout at all times and should understand that there are certain factors that must be taken into account when using radar. Radar is a valuable aid, but it has its limitations. Smaller targets, such as fishing vessels, can be difficult to detect, and echoes of such targets are liable to be lost in sea or rain clutter.

Anything that enhances the chances of such vessels being detected should be used, including radar reflectors.

Conclusions

These conclusions identify the different factors contributing to the incident and should not be read as apportioning blame or liability to any particular organisation or individual.

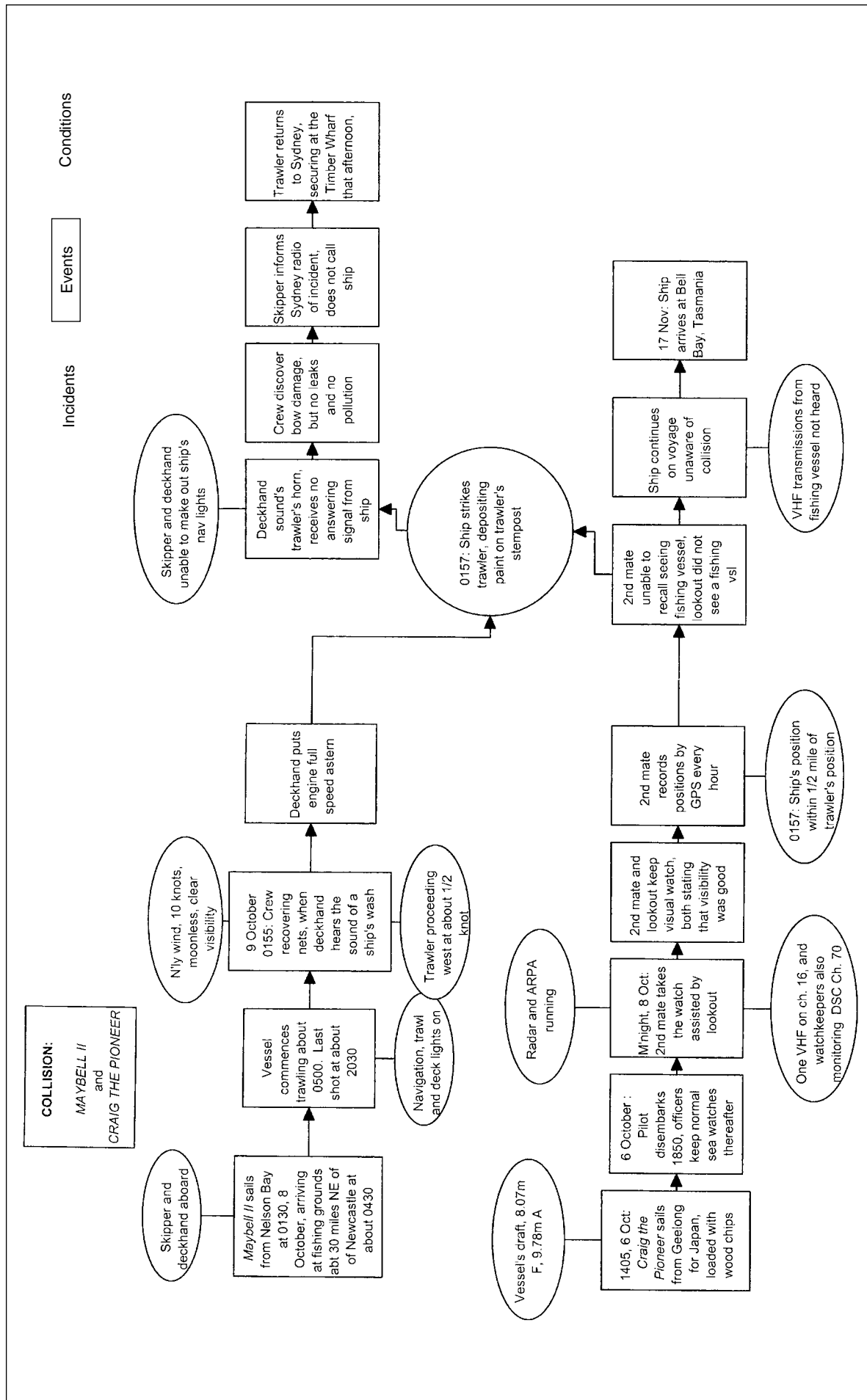
- On the basis of the positions of both vessels and the analysis of paint samples from the fishing vessel and the ship, the Inspector is satisfied that *Craig The Pioneer* collided with *May Bell II*.
- Those on watch on the bridge of *Craig The Pioneer* did not maintain a proper lookout either by sight or by radar. Under the conditions of optimum visibility at the time of the incident, the

lookout being maintained on board the ship would have to be considered seriously deficient to miss seeing the trawler prior to the collision.

- The skipper and deckhand of the trawler were on deck, concentrating on retrieving nets, when the collision occurred and were not keeping a proper lookout.
- The vision of both the skipper and deckhand of the trawler was significantly impaired from working under bright lights.

It is also considered that the fitting of a radar reflector or similar device to the fishing vessel to enhance its radar returns would have increased the likelihood of it being detected by a ship.

FIGURE 5
Events and causal factors chart



Submissions

Under sub-regulation 16(3) of the Navigation (Marine Casualty) Regulations, if a report, or part of a report, relates to a person's affairs to a material extent, the Inspector must, if it is reasonable to do so, give that person a copy of the report or the relevant part of the report. Sub-regulation 16(4) provides that such a person may provide written comments or information relating to the report.

The final draft of the report, or parts of the report, was sent to the following:

The skipper and deckhand of *May Bell II* as joint owners

The master, 2nd mate and lookout of the ship *Craig The Pioneer*

Solicitors for the owners of the ship.

A submission was received from the skipper of *May Bell II* and the report was amended where necessary.

Rule 5 of the International Regulations for Preventing Collisions at Sea, 1972, as amended (the Colregs), on lookout, states that:

Every vessel shall 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 of the risk of collision.

Rule 7(a) states that:

Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists

Rule 7(b) states that:

Proper use shall be made of radar equipment if fitted and operational to obtain early warning of risk of collision

Rule 18, on responsibilities between vessels states that:

Except where Rules 9, 10 and 13 otherwise require:

(a) A power driven vessel underway shall keep out of the way of:

(iii) a vessel engaged in fishing

Rule 3 (d) states that:

The term 'vessel engaged in fishing' means any vessel fishing with nets, lines, trawls or other fishing apparatus which restrict manoeuvrability, but does not include a vessel fishing with trolling lines or other apparatus which do not restrict manoeuvrability.

IMO Resolution A. 477(XII) contains performance standards for radar equipment and states, in the annex to the resolution, that the:

Radar should provide an indication, in relation to the ship, of the position of other surface craft and obstructions and of buoys, shorelines and navigational marks in a manner which will assist in navigation and in avoiding collision.

The same Resolution states that all radar installations should comply with the following minimum requirements:

Range performance: The operational requirement under normal propagation conditions, when the radar antenna is mounted at a height of 15 metres above sea level, is that the equipment should, in the absence of clutter, give a clear indication of;

Coastlines- At 20 nautical miles when the ground rises to 60 metres and at 7 nautical miles when the ground rises to 6 metres.

Surface objects- At 7 nautical miles a ship of 5000 tons gross tonnage, whatever her aspect and at 3 nautical miles, a small vessel of 10 metres in length.

Physiology of Vision

There are two types of receptor cells within the eye. These are known as the rods and the cones. They derive these names because of the shape of each of the cells. Each of the different types of cells has different purposes when related to vision.

The rods are located away from the centre of the eye and are used for vision in dim lighting conditions. There are approximately 125 million rods in each eye. They can only perceive in black and white and shades of grey.

Cones are located towards the centre of the eye and are used for colour vision and fine detail. There are about 6.5 million cones in each eye. There are very large concentrations of cones in the fovea (centre) of the eye. Because of the large concentration of cones in the fovea, this location is 'blind' in low light conditions because there are no rods.

There is also an anatomical blind spot located in each eye. This is the location of the optic nerve and in this location there are no rods or cones.

Details of *Craig The Pioneer*

| | |
|------------------------|-------------------------------------|
| IMO No. | 8519370 |
| Flag | Liberian |
| Classification Society | Class NK |
| Ship type | Woodchip carrier |
| Owner | Cygnets Bulk Carriers S.A., Liberia |
| Year of build | 1986 |
| Builder | Nippon Kokan K.K., Tsu, Japan |
| Gross tonnage | 36 152 |
| Net tonnage | 17 149 |
| Summer Deadweight | 42 986 tonnes |
| Length overall | 194.90 m |
| Beam | 32.2 m |
| Draught | 10.516 m |
| Main engine | 6 cylinder Sulzer diesel, 6RTA58 |
| Engine power | 5 994 kW |
| Crew | 21 Filipino |

Details of *May Bell II*

| | |
|----------------|---|
| Registered No. | LFB 11725 |
| Flag | Australian |
| Owner | George and Andrew Christoforidis, Marrickville, NSW. |
| Length overall | 17.3m |
| Beam | 5.28m |
| Construction | Timber |
| Engines | Cummins diesel engine, NTA 855M of 261 kW. |
| Crew | 2 Australian |