ATSB
Australian Transport Safety Bureau

AUSTRALIAN TRANSPORT SAFETY BUREAU

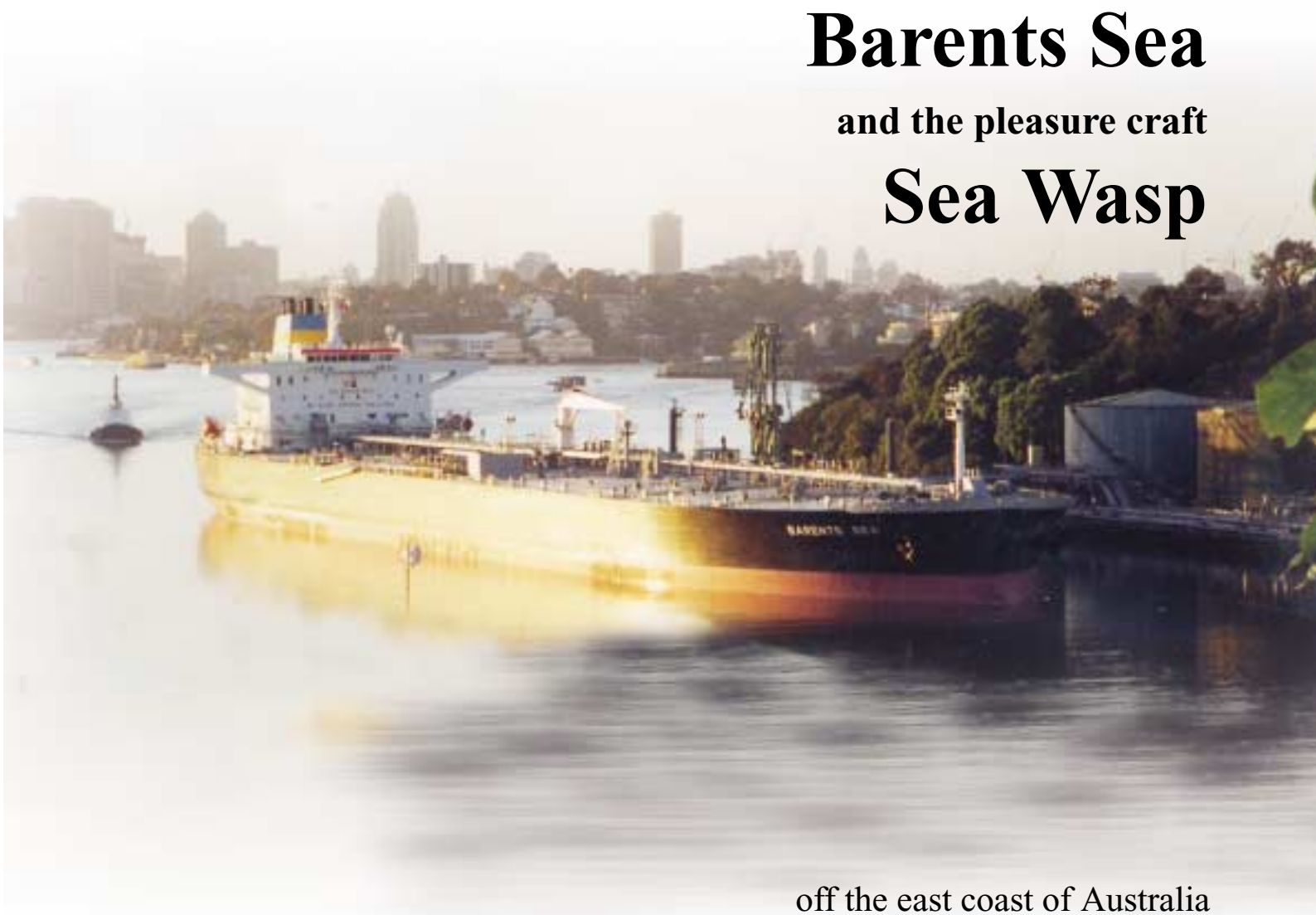
MARINE SAFETY INVESTIGATION
REPORT 154

Independent investigation into the collision
between the Panama flag motor tanker

Barents Sea

and the pleasure craft

Sea Wasp



off the east coast of Australia
on 9 February 2000

COMMONWEALTH DEPARTMENT OF TRANSPORT AND REGIONAL SERVICES

Report No 154

Navigation Act 1912
Navigation (Marine Casualty) Regulations
investigation into the collision
between the Panama flag motor tanker
Barents Sea and the pleasure craft *Sea Wasp*
off the east coast of Australia
on 9 February 2000

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Investigations into marine casualties occurring within the Commonwealth's jurisdiction are conducted under the provisions of the Navigation (Marine Casualty) Regulations, made pursuant to subsections 425 (1) (ea) and 425 (1AAA) of the *Navigation Act 1912*. The Regulations provide discretionary powers to the Inspector to investigate incidents as defined by the Regulations. Where an investigation is undertaken, the Inspector must submit a report to the Executive Director of the Australian Transport Safety Bureau (ATSB).

It is ATSB policy to publish such reports in full as an educational tool to increase awareness of the causes of marine incidents so as to improve safety at sea and enhance the protection of the marine enviroment.

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***Barents Sea* (Gore Bay)**

Figure 2:
***Sea Wasp* showing damage to cabin and windscreen**

Summary

At 0630 on the morning of 9 February 2000, two men launched the 4.5 m fibreglass pleasure craft *Sea Wasp*, at the Kyeemagh boat ramp in Botany Bay, and headed out to sea for a mornings fishing. The owner of the boat was acting as coxswain with his friend as passenger. Their destination was a fishing place called The Peak approximately 6 miles offshore. The weather was good with north to north-easterly winds at 10–15 knots and a 1–1.5 m swell. The day was also clear with excellent visibility. By approximately 0800 *Sea Wasp* had arrived at The Peak and the two men were fishing with the boat drifting south. The men had streamed a sea anchor and the bow of the boat was pointing in a westerly direction. Both men were fishing over the starboard side.

The same morning the crude oil tanker *Barents Sea* was northbound off the central coast of New South Wales. The vessel was bound for the Shell oil terminal at Gore Bay in Port Jackson. The third mate and master were the only crew on the bridge. They were conducting the navigation and keeping a look-out, the vessel was averaging a speed of 14–15 knots. Both of the vessel's radars were on and set to 6 mile[1] range.

At 0929, *Barents Sea* altered course, in a position east of Botany Bay, from 015° to 000°. This was the final course alteration approaching the pilot boarding ground off Sydney heads some 10 miles to the north.

At 0934¾, *Sea Wasp*'s coxswain was using the boat's 27 MHz radio to contact the local Australian Volunteer Coast Guard radio station to 'check in'. While using the radio he looked up and saw a large ship 50 m away on a collision course. He managed to send a quick 'mayday' signal, at the same time starting the boat's outboard motor. The coxswain turned *Sea Wasp* to port but, with the sea anchor still streaming, the boat was slow to respond. With the ship 10 m away, and a collision imminent, both men dived out of the boat and into the water.

At 0935, the ship's starboard bow struck *Sea Wasp* causing structural damage to the starboard side of the boat's cabin, and damage to the windscreen and depth sounder.

The two men surfaced to find themselves on the starboard side of the ship with *Sea Wasp* still afloat 10 m away and the outboard motor stopped. The men swam to *Sea Wasp* and re-boarded over the stern. Neither man had sustained injury. They rang 000 on a mobile telephone to request assistance and, during this conversation, identified *Barents Sea* as the ship they had collided with. The ship had not stopped and the coxswain used his camera to take some photographs as it steamed away. They then let off an orange smoke flare. *Sea Wasp*'s motor was restarted and the two fishermen made their way back towards Botany Bay. A Sydney Water Police rescue boat met *Sea Wasp* 2 miles out from Botany Bay and escorted the boat back to their base at Sans Souci where the coxswain and his friend made statements. The coxswain was breathalysed and found to have a zero blood alcohol reading.

By 1312, *Barents Sea* was all fast alongside at Gore Bay. The first indication the crew had of the collision was when the ship's agent arrived on board. They reported that they had seen neither *Sea Wasp* nor the flare and the ship was found to have sustained no damage.

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[1] Miles referred as nautical mile = 1852 m

Sources of information

The master and crew of *Barents Sea*

The coxswain and passenger of *Sea Wasp*

Sydney Ports Corporation

Australian Federal Police Forensic Division

Sans Souci Water Police

Australian Maritime Safety Authority

Australian Volunteer Coast Guard, N.S.W. Squadron

Royal Volunteer Coastal Patrol, Terry Hills Division

Telstra Corporation Ltd

Narrative

Sea Wasp

Sea Wasp (fig.2) is a 4.5 m, fibreglass, half cabin pleasure craft registered FJ234N with the New South Wales Waterways Authority. The boat has a yellow hull with white topsides and cabin. *Sea Wasp* is powered by a 70 horsepower, 2 stroke, outboard motor.

The coxswain of *Sea Wasp* had owned the vessel since 1995 and held a current coxswain's certificate. He had gained additional experience handling small boats, by attending a Sydney Water Police training course 2 days per month for the previous 2 years. His fishing companion, at the time of the incident, also held a coxswains certificate.

Barents Sea

Barents Sea (fig.1) is a Panama flag crude oil tanker of 105 588 deadweight tonnes at its summer draught of 14.219 m. The vessel is owned by the Fairell Shipping Corporation, of Monrovia, and managed by Tanker Pacific Management Pvt. Lte., of Singapore. It is classed with Det Norske Veritas as a ✠1A1, Tanker for oil ESP[2] with CSA-1[3], E0[4], LCS(DIS)[5], and VCS-2[6] notations.

Barents Sea was built in 1999 by Hyundai Heavy Industries, Ulsan, South Korea. The vessel has an overall length of 248.21 m, a moulded breadth of 43.00 m and a moulded depth of 20.236 m. The vessel is powered by a 7-cylinder B&W 7S 60MC single acting, direct reversing, 2-stroke diesel engine, of 12 500 kW. The main engine drives a single fixed pitch propeller giving a service speed of 15.4 knots.

The vessel is of double hull design, with 12 cargo tanks, numbered from forward to aft, and with port and starboard tanks separated by a centre line bulkhead. The accommodation block is located aft with a keel to masthead distance of 47.4 m. The bridge is located in the usual position at the top of the accommodation block. The hull is painted black with red 'boot-topping', and the accommodation block is painted white.

Barents Sea's bridge is equipped with all of the required navigation aids including two Kelvin Hughes Nucleus 2-6000A version 4.00 radars (Radio Detection and Ranging equipment). Both, X (3 cm) and S band (10 cm), radars are equipped with Automatic Radar Plotting Aid (ARPA) software.

Barents Sea has a crew of 26 with a master and 3 mates, radio officer, deck cadet, chief and 5 engineers, bosun, pumpman and 5 deck ratings, 3 engineroom ratings, 3 catering staff and a technical officer. The mates maintain a traditional 4 on, 8 off watchkeeping routine at sea with the third mate keeping the 8–12 watch under the direct supervision of the master.

The master held a foreign-going master's certificate of competency and had 26 years experience at sea, the last four in command. He had been into Sydney harbour regularly on his previous ship.

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2 Tanker with enhanced survey programme.

3 Structural scantlings based on extended calculation procedure covering loads and structural response analysis. Extended design life 25 or 30 years.

4 Vessel with machinery spaces for unattended operation during normal service at sea as well as alongside quay.

5 Vessel equipped with loading computer certified for damage stability, intact stability and longitudinal strength control.

6 Vessel equipped with system for control of vapour emission from cargo tanks.

The third mate held a foreign going second mate's certificate of competency and had been a company cadet for the previous 27 months.

The incident

Sea Wasp

At 0545 on 9 February 2000 the owner and coxswain of *Sea Wasp* met a friend to go fishing for the morning off Botany Bay, New South Wales. The two men travelled to the boat ramp at Kyeemagh, in Botany Bay, and, at approximately 0630, launched the boat. The coxswain had recently purchased a handheld GPS (Global Positioning System) and had programmed into the unit the position of some productive fishing areas ('hotspots') off Sydney. They proceeded out of Botany Bay on their way to fish one of these 'hotspots' called The Peak, an underwater sea mount approximately 6 miles due east of Long Bay.

On the way they stopped for approximately half an hour to fish at another spot about half way to The Peak. Having no success, in this position, the two men decided to press on, arriving at The Peak at approximately 0800. The weather at the time was good, with a light north to north-easterly wind at 10–15 knots. The seas were slight on a low swell of 1–1.5 m. The visibility was excellent and estimated at 20 km by the coxswain's friend.

At 0815 the coxswain of *Sea Wasp* contacted the Royal Volunteer Coastal Patrol, using his 27 MHz radio on channel 88. He was told to go to channel 91 where he reported their position and estimated time back at the boat ramp. He agreed to 'check in' again in 1 hour.

The two men continued fishing and caught fish periodically as they drifted over The Peak. The men had streamed a sea anchor from the bow of *Sea Wasp* to slow their rate of drift. The two men indicated, with the sea anchor out, the bow of *Sea Wasp* was pointing to the west or west-north-west as they drifted south. Both men were fishing over the starboard side with their fishing lines running in a northerly direction. They were both wearing sunglasses and had a radio on but, reportedly, at low volume. Neither man was wearing a lifejacket.

During the morning the coxswain had noticed three ships in the anchorage off Sydney heads, one tanker that came out of Port Botany and steamed north, and one vessel which was steaming south. His fishing companion did not recall seeing any ships in the anchorage, but noticed one steaming south.

At 0919, the coxswain was busy re-rigging his fishing line and consequently missed the time for the radio 'check in' call to the Royal Volunteer Coastal Patrol. As the radio 'silence' period was coming up he decided to wait until after 0933 (the silence period is for three minutes after the hour and half hour) to make their 'check in' radio call.

At 0934$^{3}/_{4}$, the coxswain called (who he thought were) the Royal Volunteer Coastal Patrol on 27 MHz channel 90. The call was actually answered by the Australian Volunteer Coast Guard station at South Head. While he was using the radio, he looked up and saw the hull of a large ship approximately 50 m away rapidly closing on their position. He said words to the effect of 'shit look at that …' and managed to transmit three 'mayday calls'. At the same time he started the outboard motor, and turned the helm to port. The 'mayday' was received by the Coast Guard radio operator but he did not hear the name of the vessel. The Mayday was logged at 0935. *Sea Wasp*'s 'mayday' was also received by another pleasure craft off Sydney heads, (*Shy Cat*),

which contacted the Coast Guard to let them know that they were standing by if required.

Collision

After the coxswain had turned the helm to port, *Sea Wasp* turned slowly to port, with the sea anchor still streaming to starboard. With the ship quickly closing the boat, and its bow only 10 m away, it became apparent to the two men in the boat that a collision was inevitable. The coxswain said 'let's get out of here', or words to that effect, and both men dived over the side of the boat. The coxswain dived over the starboard side and his friend dived over the port side. Neither man had time to don a lifejacket. Both men dived deep, and when the ship passed overhead they felt that they were pushed even further under the water.

After 15–20 seconds both men surfaced to find that they were both approximately 3–6 m away from, and midway along, the starboard side of the moving ship. Miraculously, *Sea Wasp* was still afloat and about 10 m away. The outboard motor had stopped. Both men swam back to the boat and re-boarded through the stern, using the outboard motor 'leg' as a ladder. Neither man was injured.

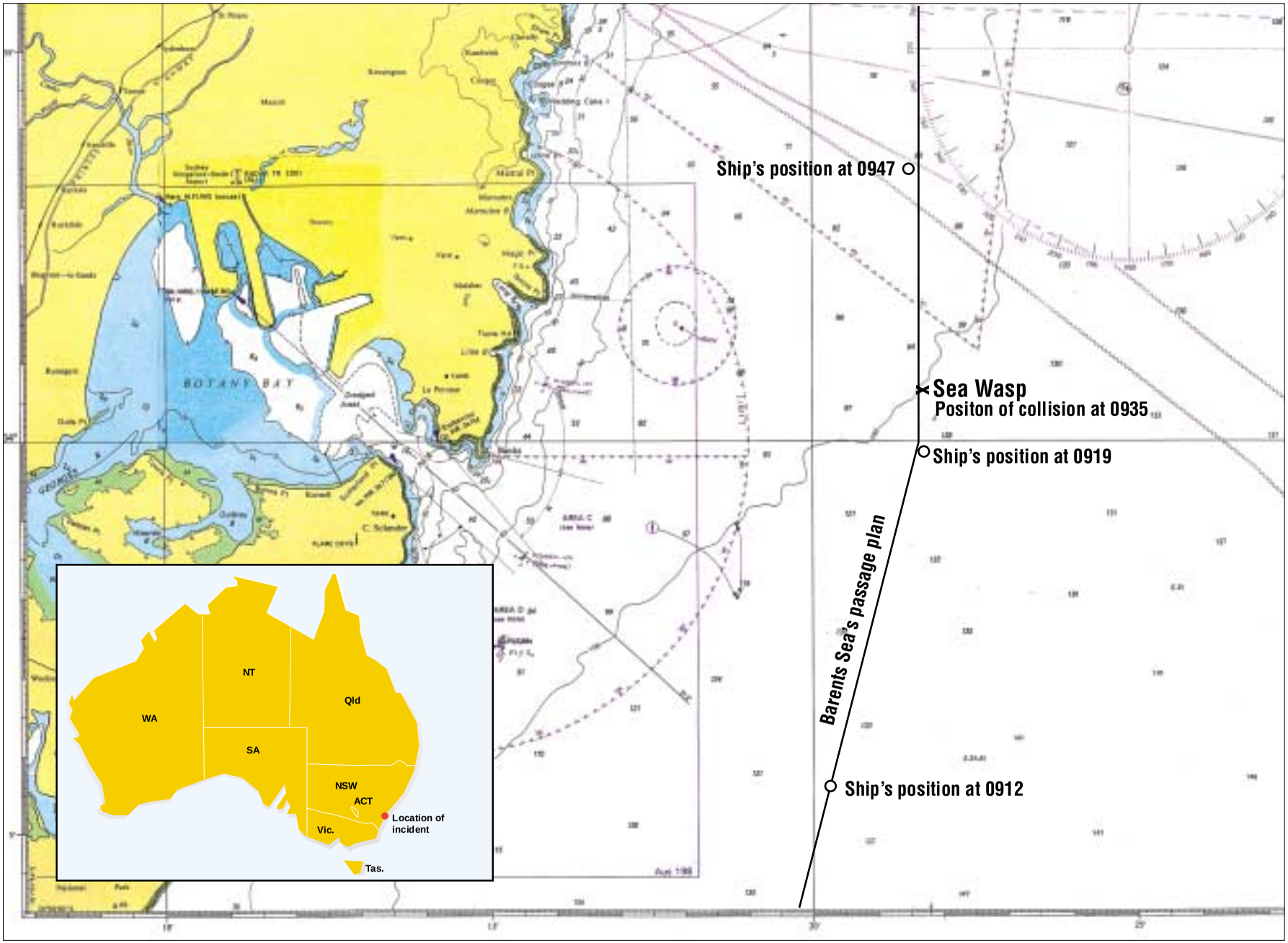
The ship continued to Sydney its crew apparently unaware of the collision.

The aftermath

After re-boarding *Sea Wasp*, the coxswain called 000 on his friend's mobile telephone to report the incident and request assistance. The 000 call was logged at 0937:40 seconds. During his opening statement to the 000 operator, the coxswain identified himself, stated *Sea Wasp*'s general position and named the ship involved in the collision as *Barents Sea*. The operator took his details and transferred the call through to Sydney Water Police. The coxswain's friend stayed on the telephone while the coxswain took some photographs of the receding ship as it continued north to Sydney heads (fig.3). The coxswain then set off an orange smoke

Figure 3:
Coxswain's photograph of *Barents Sea*.

Figure 4:
Chart of *Barents Sea*'s passage plan and position of collision



flare and read their GPS position of 33° 59’20"S, 151° 21’49"E, which was passed on to police by his friend.

The coxswain and his friend inspected *Sea Wasp* and found that the boat had sustained structural damage to the upper cabin on the starboard side, and that the windscreen and depth sounder, had also been damaged in the collision. The boat had also taken about 40–50 litres of water into the cockpit. The two men were unsure if the boat had been damaged below the waterline as the cockpit floor forms a sealed compartment with the bottom of the boat and is not directly accessible for inspection. The men were also concerned that the motor had sustained damage as it had stopped in the collision.

Sydney Water Police launches were dispatched from Port Botany and Port Jackson to assist *Sea Wasp*. In the meantime, the coxswain checked *Sea Wasp*’s outboard motor for damage and then managed to re-start it. After he had rechecked and found the motor running satisfactorily, he turned *Sea Wasp* towards Botany Bay and motored in to meet the police launch.

Sea Wasp was met by the Water Police about 2 miles outside Botany Bay and was then escorted back to the police base at Sans Souci. The boat was inspected on arrival and no damage was found below the waterline. The coxswain and his friend, both made statements to the Water Police and the coxswain was breathalysed, recording a 0% blood alcohol content.

Barents Sea

Barents Sea was delivered to her owners on 4 January 2000 and started her maiden voyage from the shipyard in Korea to load parcels of crude oil in Singapore, Sungai Udang and Melaka in Malaysia. The vessel then sailed for Sydney, with draughts of 12.8 m forward and aft.

On the morning of 9 February 2000 the master came onto the bridge at about 0740 followed, at 0745, by the third mate. The master assumed charge of the watch after arriving on the bridge, the third mate commenced taking over the watch from the mate. During the handover he talked with the mate about the vessel’s course and speed, the weather, compass error and traffic. At 0815 the mate left the bridge and went below to prepare for the arrival in Sydney.

The third mate periodically fixed the ship’s position and maintained a plot of traffic on the radar. The master checked the position and plot from time to time. Both men maintained a visual lookout. On a course of 015° and a speed of 14–15 knots *Barents Sea* approached Sydney (fig.4). The pilot had been booked for 1100 and they were ahead of schedule with an estimated time of arrival at the pilot boarding ground of 1030. Both X and S band (3 cm and 10 cm) radars were working, set on the 6 mile range, and all targets were plotted as the watch progressed. VHF channels 13 and 16 were being monitored continuously.

Positions were taken and recorded by the third mate at, 0912, 0929, 0947 and 1008, and cross-checked by the master. The third mate was also ‘parallel indexing’[7] on one of the radars to maintain the vessel’s track to the pilot boarding ground. At 0910 the engine room was given ‘1 hours notice’ and at 0920 they passed the gas carrier *Havfru*, approximately 1 mile to port, which was on its way into Port Botany. The two men did not note any other traffic in their immediate area from 0920 to 0940.

[7] Place indexing lines either side of the ship’s ‘track’ line on the radar monitor.

At 0929 *Barents Sea* made a planned course alteration from 015° to 000°. The course alteration was executed by switching the steering over to 'hand'. The ship was brought around to the new course and then the automatic pilot was re-engaged. This was the last planned course alteration prior to arriving at the pilot boarding ground off Sydney Heads.

'Stand-by' was rung at 1006, and the vessel arrived at the pilot boarding ground at 1030. Contact was made with the pilot at 1030 and, at 1100, the pilot boarded the vessel. *Barents Sea* then entered Port Jackson and proceeded to the Shell terminal at Gore Bay, the vessel being alongside and 'all fast' at 1312.

The crew of *Barents Sea* stated that the first indication that they had of the collision was when the agent came aboard in Gore Bay. They did not detect *Sea Wasp*, either visually or on radar, before or after the collision, nor did they see the orange smoke flare.

Comment and analysis

Evidence

An investigator from the Australian Transport Safety Bureau attended *Barents Sea* in Gore Bay on the evening of 9 February 2000. The master and third mate were interviewed and various evidence was obtained including copies of the navigation chart, log books, movement book and course recorder for arrival Sydney.

A surveyor from the Australian Maritime Safety Authority (AMSA) inspected *Barents Sea*'s hull adjacent to the waterline on the ship's starboard side forward. He reported that there were no obvious score marks or paint damage to indicate a possible point of impact. A sample of the ship's hull paint and 'boot topping' was taken during the inspection for later analysis.

Investigators attended the homes of the coxswain and his fishing friend on 10 February. *Sea Wasp* was inspected at the home of the coxswain and presented as a well maintained and well equipped standard design half-cabin runabout. Damage was noted to the starboard side of the cabin, the windscreen mounted on top of the cabin, and the depth sounder mounted behind the windscreen on the top of the cabin. The boat's cabin showed some areas on which some dark material had been deposited and a sample was obtained for analysis. Copies of statements taken by Sydney Water Police were obtained, and the coxswain and his friend were interviewed by the investigators.

The coxswain also provided copies of the photographs he took of the ship immediately after re-boarding *Sea Wasp* and showing *Barents Sea* steaming away with the ship's name and port of registry clearly discernable on the stern.

A recording of the 000 emergency services call made by the coxswain was obtained from Telstra and provided corroborative evidence for some events and times.

Sydney Ports Corporation provided the investigation with video capture of radar plots of the shipping in the Sydney area on the morning of 9 February.

Sydney Ports Corporation also provided the investigation with offshore wave data for Port Botany between 0750 and 1010 on 9 February 2000. This data indicated peak wave heights of 2.15–3.15 m and significant wave heights of 1.36–1.67 m during this period of time.

Copies of the radio communication logs from the Royal Volunteer Coastal Patrol, Terrey Hills Division, and the Australian Volunteer Coast Guard, South Head Signal Station, were obtained and verified the times that the coxswain made check-in and Mayday calls.

A portion of the events and causal factor chart for the incident is reproduced in figure 5.

Lead up events

'A morning's fishing'

The coxswain and his friend had adequately planned and were well prepared for their fishing trip off Sydney on the morning of 9 February 2000. The coxswain was appropriately qualified and experienced and had owned *Sea Wasp* for 5 years, fishing often around Maroubra. This trip was the first time the two men had fished together, the coxswain usually being accompanied by his daughter or father.

The coxswain checked the weather forecast while planning the trip, and intended to fish during the morning until 1130 or 1200 and be back at the Kyeemagh boat ramp before the forecast north-easterly sea breeze became too strong. *Sea Wasp* was equipped with all of the required safety equipment including lifejackets, with additional equipment in the form of a 27 MHz marine band radio, the coxswain's GPS unit and a depth sounder. It did not carry a radar reflector. The fishing preparations and launching of the boat in the morning had gone to plan and the weather looked good for their fishing trip. As the two men made their way out to sea to go fishing, Botany Bay 'was like glass' and neither man donned the available lifejackets.

After locating The Peak, the coxswain followed good practice by reporting his position and intended time back at the boat ramp to the Royal Volunteer Coastal Patrol. The two men then started fishing allowing *Sea Wasp* to drift south under the influence of the north-easterly breeze in addition to a southerly current and swell from the north. The men were 'bottom' fishing in approximately 80 m of water. The coxswain was well aware of the problems of keeping a bait on the bottom in deep water when drifting too quickly and had streamed a sea anchor (drogue) from the bow to slow the boat's rate of wind drift.

Immediately before the collision, both men were fishing over the starboard side of the boat and, when interviewed indicated that the boat was drifting south with its bow pointing in a westerly direction. This observation is somewhat confusing given that under normal circumstances a boat steaming a drogue from a bow line will tend to lie with the bow pointing into the wind.

'First discharge port'

There was a heightened level of concern on board *Barents Sea* on the morning of 9 February 2000. The ship was on its maiden voyage and arriving in Sydney for its first discharge. The discharge was to take place at the Shell terminal at Gore Bay, in the heart of Sydney, where there had been a large, well publicised, oil spill just 7 months previously (incident report 149 *Laura D'Amato*). The master and crew were eager to see the discharge go smoothly as this was the first time that some of the cargo equipment was to be used operationally.

The third mate came to the bridge to start the forenoon watch (8–12) at 0745. He then received a watch hand-over from the mate, in the presence of the master, which included information on the vessel's course, speed, position, and the traffic in the area at the time. At this point everything was proceeding smoothly for the arrival at Sydney with the ship ahead of schedule.

During the approach to the pilot boarding ground off Sydney, the third mate was making use of both radars, GPS, and cross-checking soundings to navigate the ship. He had also set up one of the radars to 'parallel index' the ship's course to the pilot boarding ground. He was marking the ship's positions, which were being checked by the master, on the chart every 20–30 minutes. At this time both men were actively engaged in the navigation of the ship. The master was also somewhat preoccupied with preparations for taking the pilot, and the arrival in Sydney. He indicated that they had three radio conversations between 0740 and 1100, two with Sydney harbour control and one with the pilot.

The third mate and master both indicated that the weather conditions were good with

very good visibility. They were the only crew members on the bridge around the time of the incident and indicated that they were plotting all targets on radar in addition to keeping a visual look-out. The rating normally performing 'look-out' duties on the 8–12 watch was out on deck preparing for the Sydney arrival. Usually, he would have been on the bridge maintaining a constant visual look-out.

Traffic

There were a number of shipping movements in the Sydney area on the morning of 9 February around the time of the collision. Information from Sydney Ports Corporation shows that, as *Barents Sea* approached Port Botany, there was a ship leaving the port heading north, and the gas carrier *Havfru* waiting to take a pilot just outside the port limits. Further north off Port Jackson, there was a ship stopped to the north of the port limits, and two vessels outbound, one heading north, and another heading south. In addition, there was a ship heading toward Port Botany approximately 11 miles south of *Barents Sea*.

At approximately 0830, *Havfru* was on a southerly course 4–5 miles to the north of *Barents Sea*. A short time after 0830, the gas carrier executed a slow 180° turn to pick up a pilot. This manoeuvre took place ahead of *Barents Sea* and would have been the focus of the master's and third mate's attention at this time. The third mate indicated that at 0920 they overtook *Havfru* at a distance of 1 mile. The Sydney Ports Corporation radar records confirm this time and also the closest point of approach.

At 0929, shortly after passing *Havfru*, (now on the way into Port Botany), the third mate made the planned course alteration from 015° to 000°. The Ports Corporation radar plots show this course alteration but no evidence of another vessel in the immediate area at the time.

Shortly after the collision when *Barents Sea* had passed Port Botany, another ship sailed from the port and headed south.

The collision

Analysis of the evidence

Barents Sea's crew indicated that they did not see *Sea Wasp* before, during, or after the collision, or the flare and expressed concern and some disbelief that they had collided with *Sea Wasp*. In addition, the AMSA surveyor reported that he had not found any paint scoring or damage to the ship's hull to indicate a point of impact.

Paint is usually exchanged when two vessels collide. In cases where a collision is being investigated and there is some dispute as to the identity of one or the other of the parties, it is routine to obtain paint samples for forensic analysis. Comparing and matching samples of 'deposited' paint from one or both vessels provides objective verification that a collision occurred and positive identification of the vessels involved.

The paint samples collected from *Barents Sea* and the material collected from *Sea Wasp*'s cabin were submitted to the Forensic Services Division of the Australian Federal Police for analysis and cross matching. No match was obtained after several samples from each vessel were tested and compared using x-ray fluorescent spectrum analysis techniques to compare their elemental composition.

Despite the statements of *Barents Sea*'s crew and the negative results of the paint sample analysis, there is strong evidence to indicate that *Barents Sea* collided with *Sea Wasp* on the morning of 9 February 2000.

Both the coxswain and his friend identified the ship and named it during the 000 telephone call. The photographs taken by the coxswain after re-boarding the boat show *Barents Sea* steaming away from *Sea Wasp*'s position. Additionally, the GPS position the coxswain provided to Sydney Water Police during the 000 telephone call lies almost exactly on the ship's charted track. This position is within 150 m of the ship's calculated position at 0935. The Ports Corporation radar records provide confirmation of *Barents Sea*'s charted track and the position of the ship at the time of the collision. They also show that there was no other ship in the immediate vicinity of *Sea Wasp's* position at the time of the collision.

The times independently recorded by the Volunteer Coast Guard of the coxswain's Mayday call and the 000 call are consistent with the coxswain's and his friend's account of these events.

Considering all the evidence, the inspector is satisfied that *Barents Sea* and *Sea Wasp* collided at approximately 0935 on 9 February 2000.

In submission *Barents Sea*'s managers stated:

> The AMSA surveyor's investigations revealed that there was no obvious marks or paint damage on the hull of *Barents Sea*. Trust you agree, that had there been any contact with the *Barents Sea*, there should have been some scratch marks or paint damage on the hull of *Barents Sea*. There weren't any.

Closing distance

When the coxswain first saw *Barents Sea* bearing down on *Sea Wasp*, he estimated a closing distance of 50 m. At this time *Barents Sea*'s speed over the ground, from the positions marked on their navigation chart, was approximately 15 knots or 7.7 m/s. If the coxswain's estimation of 50 m was correct, this would have meant that the time between the initial sighting and the collision would have been in the order of 6.5 seconds. Probably not long enough to make three Mayday calls, start the out-board motor, turn the wheel to port and jump over the side with 10 m to spare. It is likely that the distance was somewhat greater than 50 m.

The impact

There were no witnesses to the actual impact when *Barents Sea* and *Sea Wasp* collided as, by this time, both the coxswain and his friend had abandoned the boat and were under water. The lack of obvious score marks on the hull paint of *Barents Sea* indicating a point of impact also makes it difficult to analyse the collision.

At the time of the collision, *Barents Sea* would have been pushing a significant bow wave given the design of the ship's bow, its speed through the water and draught of 12.8 m forward. The coxswain stated that when he and his friend abandoned *Sea Wasp,* the motor was still running and the boat was headed directly toward *Barents Sea*'s starboard shoulder. From the location and nature of the damage to *Sea Wasp*, it would appear that the boat was probably rolled towards the ship at the time of impact causing the damage to the windscreen and top of the cabin on the starboard side. *Barents Sea*'s bow wave would then have tended to push the boat away from the ship after the initial impact, which would account for why the boat was more than 10 m away from the starboard side of ship by the time the coxswain and his friend surfaced.

Sea Wasp's outboard motor had stopped by the time the coxswain and his friend surfaced. Had it continued to run, the boat would probably have motored away leaving the men in the water without any ready

assistance or any floatation aids as they were not wearing lifejackets. It is only possible to speculate as to why the motor stopped at this time.

The flare

At 0942½, while his friend was still talking on the telephone to Sydney Water Police, the coxswain set off a hand-held orange smoke flare. The men indicated that the flare emitted dense orange smoke for the prescribed time of 1 minute or more. At this time, *Barents Sea* was only 1.8 miles to the north with two other ships 8–9 miles further north, two ships 4.5 and 7 miles west, and a ship 9 miles south. At least three of these ship's, not including *Barents Sea*, were heading in the general direction of *Sea Wasp* and would have been in a position to identify the distress signal given their distance away and the visibility at the time. Despite this fact, there was no report of the flare being sighted and no vessel came to the assistance of *Sea Wasp* as a result of the flare.

In submission the managers of *Barents Sea* stated:

> Although the *Sea Wasp* claims that they had fired a smoke flare, this was not seen by the *Barents Sea* nor reported by anyone else in the vicinity. Furthermore, the water police did not contact the vessel or pilot upon receiving the alleged collision information from the *Sea Wasp*.

Keeping a look-out

The International Regulations for Preventing Collisions at Sea, 1972 are 'the rules of the road' for marine navigation and '…apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels.' They contain specific requirements for keeping a look-out and actions to avoid collisions. With regard to keeping a look-out Rule 5 states:

> 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 the risk of collision.

In the case of the collision between *Sea Wasp* and *Barents Sea* crew on both vessels were obliged to maintain a proper look-out by all available means and thereby avoid a collision. The coxswain and his friend should have maintained an effective look-out by sight and hearing on board *Sea Wasp*. The master and third mate on *Barents Sea* should have maintained an effective visual and radar look-out. The fact that the collision occurred at all, given the circumstances and prevailing conditions, means that both parties failed to maintain an effective look-out.

Visual

Neither the crew of *Barents Sea*, nor the coxswain and his friend on *Sea Wasp*, made visual contact with the other vessel in time to avoid a collision. There was sufficient time, in good visual conditions, for both crews to see the other vessel and take evasive action.

Sea Wasp's perspective

On the morning of the collision, the two men aboard *Sea Wasp* would have had an effective 'height of eye' of approximately 0.5–3.5 m given the peak wave heights at the time. This would have meant their 'horizon' would have varied between 1.5 and 3.9 miles. *Barents Sea*'s wheelhouse was approximately 25 m above the water and at sea level would have been visible 10.5 miles away. When combining this with the

coxswain and his friend's maximum 'height of eye' and unlimited visibility, *Barents Sea* could have been theoretically visible for a distance of
14.4 miles.

However, the coxswain's friend estimated the visibility at 20 km on the morning of the collision. This estimation would have been reasonably accurate as the coxswain's friend was a professional aviator and thus had some experience in estimating visibility. Working on a visibility of 20 km, *Barents Sea* would have been visible to the two men on *Sea Wasp* from about 0900 given the ship's speed and the time of the collision. At first, the coxswain and his friend would have been able to see *Barents Sea*'s wheelhouse mast, funnel and the top of the ship's accommodation with more of the ship coming over the horizon as it got nearer to their position.

In the 30 minutes or so before the collision the coxswain and his friend were preoccupied with fishing with the radio on and they were both wearing sunglasses. The fishing had been reasonably good and the two men had caught three fish prior to the collision. Both men indicated that they were fishing over the starboard side on the boat, with the bow pointing west, and so had their backs to the ship approaching from the south. The coxswain's friend was feeling a little seasick at this time. For whatever reason, neither man was aware of what was going on around them.

At the time *Barents Sea* changed course at 0929 it was approximately 1800 m south of *Sea Wasp*'s position and clearly visible with even a cursory glance. Up to this time, if the two men aboard *Sea Wasp* had seen the ship on its previous course of 015°, they may have concluded that the ship was probably not on a collision course and therefore would have taken no action. The critical time for the men to observe the approach of the ship, and take evasive action, was the 5 minutes or so after 0929 when the ship was on the course of 000°.

In the minutes just prior to the collision, the coxswain's friend hooked a fish and was in the process of reeling in his fishing line when the coxswain sighted the ship. In the critical minutes before the collision his full attention, and at least some of the coxswain's, would have been focused on landing the fish over the starboard side of the boat. The coxswain was also intent on making the 'check in' call after the radio silence period, and this activity would have further diverted his attention at this time. The sunglasses both men were wearing would have limited their peripheral vision. The music from *Sea Wasp*'s radio, although reportedly not loud, would also have effectively masked any sound of the ship approaching from downwind.

In submission the managers of *Barents Sea* stated:

> It was alleged by the coxswain of *Sea Wasp* that he saw the *Barents Sea* about 50 metres away. It is hard to believe that when *Barents Sea* was so close, no noise or sound was heard by him.

Barents Sea's perspective

Allowing for a 'height of eye' of 24 m for the master and third mate on *Barents Sea*'s bridge, their 'horizon' would have been approximately 10.3 miles. By about 0900, *Sea Wasp* would have been intermittently visible, on the crest of the swells, to the master and third mate on the bridge of *Barents Sea.* From 0900 to about 0920 both men were probably preoccupied with the manoeuvres of *Havfru* ahead and on their port side. Between 0920 and 0929, *Sea Wasp* would have been increasingly visible approximately one point (11.25°) off

Barents Sea's port bow up to the time of the course alteration at 0929. The position of the sun at this time, with an azimuth[8] of 84° and altitude[9] of 35°, was not in a position which would have adversely affected the master and third mate's sight in the general direction of *Sea Wasp*. However, the 10–15 knot north-easterly breeze at that time in the morning meant the sea was choppy and there were frequent 'white caps' around. Under such circumstances small vessels are difficult to see and from a distance, *Sea Wasp* with its white topsides and cabin may have been mistaken for a 'white cap' if the master's and third mate's visual watch had been cursory.

At 0929 the third mate completed the course alteration and marked a position on the chart. The master checked this position shortly afterwards. After the alteration of course *Sea Wasp* was dead ahead at a distance of approximately one mile. A reasonable visual watch should have identified the boat, which was now continuously visible, and the likelihood of a collision. Exactly why the master and third mate did not see the boat or identify the risk of collision at this time is a matter for some conjecture. Neither man could recollect exactly what they were doing at this time. One possibility may be that *Barents Sea*'s white forecastle structure and foremast may have been partially obscuring *Sea Wasp* from their view if they were standing close to the centerline of the wheelhouse. Just prior to the collision, *Sea Wasp* would have been totally obscured from the men on the bridge as a result of *Barents Sea*'s blind zone forward. At its arrival draught of 12.8 m the ship's blind spot could have extended for up to 140 m forward of the bow.

The time between the ship's course alteration at 0929 and the collision at 0935 was the critical time for both the master and third mate aboard *Barents Sea*, and the two men aboard *Sea Wasp* to identify the risk of collision and take evasive action. Five minutes of preoccupation with other tasks at this time meant that the crews of both vessels were not keeping an effective visual look-out and this resulted in the collision.

In submission, managers of *Barents Sea* stated:

> You suggest that both vessels failed to maintain an effective lookout. The size, colour and bearing of the *Sea Wasp*, vis-à-vis, the *Barents Sea*, made it intrinsically difficult for the tanker to detect the fishing boat either visually or by radar. The fishermen, however, allegedly found themselves suddenly at close quarters with a large tanker, which we imagine must have been easier for the smaller vessel to detect. There is a disparity here, which we find a little difficult to understand.

Radar

The master and third mate aboard *Barents Sea* were plotting all targets on their radar on their arrival in Sydney on the morning of 9 February. Neither man identified *Sea Wasp* on either of their radar monitors before, during, or after the collision. Additionally, *Sea Wasp* did not appear on any of the Sydney Ports Corporation radar plots. The master and third mate indicated that both of *Barents Sea*'s radar sets were being used prior to the collision and were set on the 6-mile range. On the morning after the collision, an Australian Maritime Safety Authority surveyor checked *Barents Sea*'s radar equipment. The surveyor found no

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8 Azimuth is the clockwise angle from a bearing of true north.

9 Altitude is the vertical angle from an ideal horizon.

problem with either the X or S band radar sets.

The fact that the master and third mate were operating both of *Barents Sea*'s new, late model and recently tuned radar sets in good weather conditions probably contributed to some over-reliance in this equipment. They assumed that all targets were being identified and plotted and, with the latest ARPA software analysing the speeds and courses of these targets and calculating closest distances of approach (among other things), any risk of collision was being minimised. The coxswain's friend also expressed some disbelief that the ship's radar had not detected them prior to the collision with his experience of aviation radar. This over reliance on the efficacy of marine radar, often to the detriment of an effective visual look-out, has led to a significant number of collisions in recent years.

Marine radar has limitations when it comes to detecting small, or weak targets even in good conditions. Vessels constructed of timber, or other non-metallic materials, are particularly difficult to detect as these materials have poor radar reflectivity with little or no signal return to the radar receiver. In the worst case, glass reinforced plastic (fibreglass) is effectively invisible to radar. Detection of these vessels is thus reliant on their generally large number of separate metallic reflectors (masts, booms, engine and other fittings). None of these items is large enough to provide a constant echo (radar return). The close proximity of metallic fittings, rigging, engine etc, acting as reflectors on a small vessel moving in the swell causes multiple reflections. This characteristic can result in either an enhanced echo or in the return echoes canceling 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 multi-path signals due to reflection off the sea surface, resulting in signals that are 'out of phase'.

In the case of *Sea Wasp*, being of fibreglass construction, the hull and topsides of the boat would have been invisible to *Barents Sea*'s and the Sydney Ports Corporation radar. The only reasonable reflector on the boat would have been the outboard motor. The motor would have presented a maximum reflective area of less than 0.5 m^2 and probably much less depending on the effective aspect the motor presented to the radar antennas on *Barents Sea*. The motor was also close to the water and so only intermittently 'visible' to radar in the sea conditions existing at the time of the collision. Such a small intermittent target could have easily been lost in the 'sea clutter' or by the automatic signal correlation[10] function of the ship's radar monitors. A properly mounted radar reflector would have increased the likelihood of the boat being detected.

It is a requirement on ships to have the radar display set up to show a heading line or marker. This line is an electronically generated graphical representation of the ship's heading on the radar screen and extends from the ship's position (which may be either the center of the display or offset) to the edge of the display. After the change

[10] *Barents Sea*'s radars are fitted with selectable video signal correlation to reduce the amount of radar interference and to reduce clutter. The normal (and factory) setting of this function means that consecutive transmissions are compared and only signals present on both transmissions are 'painted' on the radar screen. This means that an intermittent target may not appear on the radar screen at all.

of course at 0929, *Sea Wasp* was in a position directly ahead of *Barents Sea* and on their 'track' to Sydney. Any radar echo from *Sea Wasp* at this time may have been obscured by the heading lines on the ship's radar displays. Although it is usual radar operating practice to regularly 'suppress' the heading line to check for any targets that may be obscured, there is a good possibility that the master and third mate may not have performed this operation in the 5 minutes between the course change and the collision.

Sea Wasp would have presented as a poor radar target given the sea conditions on the day. The master and third mate on *Barents Sea* would have had difficulty identifying the boat on their radar displays with any faint echo at least partially obscured by the electronic heading lines after the change of course at 0929.

There have been a number of collisions involving ships and smaller vessels around the Australian coast in recent times. In nearly all cases the crews of the smaller vessels expressed disbelief that they had not been identified by the ship equipped with a multitude of navigation aids including the 'all seeing eyes' of radar. Even with a modern, properly tuned, competently operated and well maintained marine radar set being used in perfect weather conditions there is a real risk that a small, weak and/or close-to-the-water target will be missed. Proper use of such radar does not mean that an effective visual look-out can be degraded or neglected by the crews of the smaller vessels or, indeed by the bridge watch-keepers on the ships.

Included at the end of this report are two safety bulletins produced by the ATSB. These bulletins were distributed to commercial fishing vessels and merchant shipping last year. They refer to the large number of collisions between ships and fishing vessels around the Australian coast in recent years and provide some practical advice with regard to maintaining an effective lookout.

Conclusions

Certain aspects of this investigation are unsatisfactory. The fact that there was no match in the paint samples and that a sighting of the flare was not reported by any other vessel or anybody on the land six miles away, must lead to some doubt as to the account of the men on *Sea Wasp*. However, considering the damage to the boat, the radar, telephone and radio records, the coxswain's photographs and the initial accounts and evidence collected by the Police, the inspector is satisfied that the account offered by the coxswain and his friend is substantially accurate and the collision did occur.

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.

The factors contributing to the collision between the pleasure craft *Sea Wasp* and the tanker *Barents Sea* on the morning of 9 February 2000 off Sydney include but are not limited to:

1. There was a lack of an effective visual look-out being maintained by both vessels in the 30 minutes prior to the collision as required by the International Regulations for Preventing Collisions at Sea.

2. *Sea Wasp* presented as a poor radar target and was consequently not detected on *Barents Sea*'s radar displays by the third mate or master.

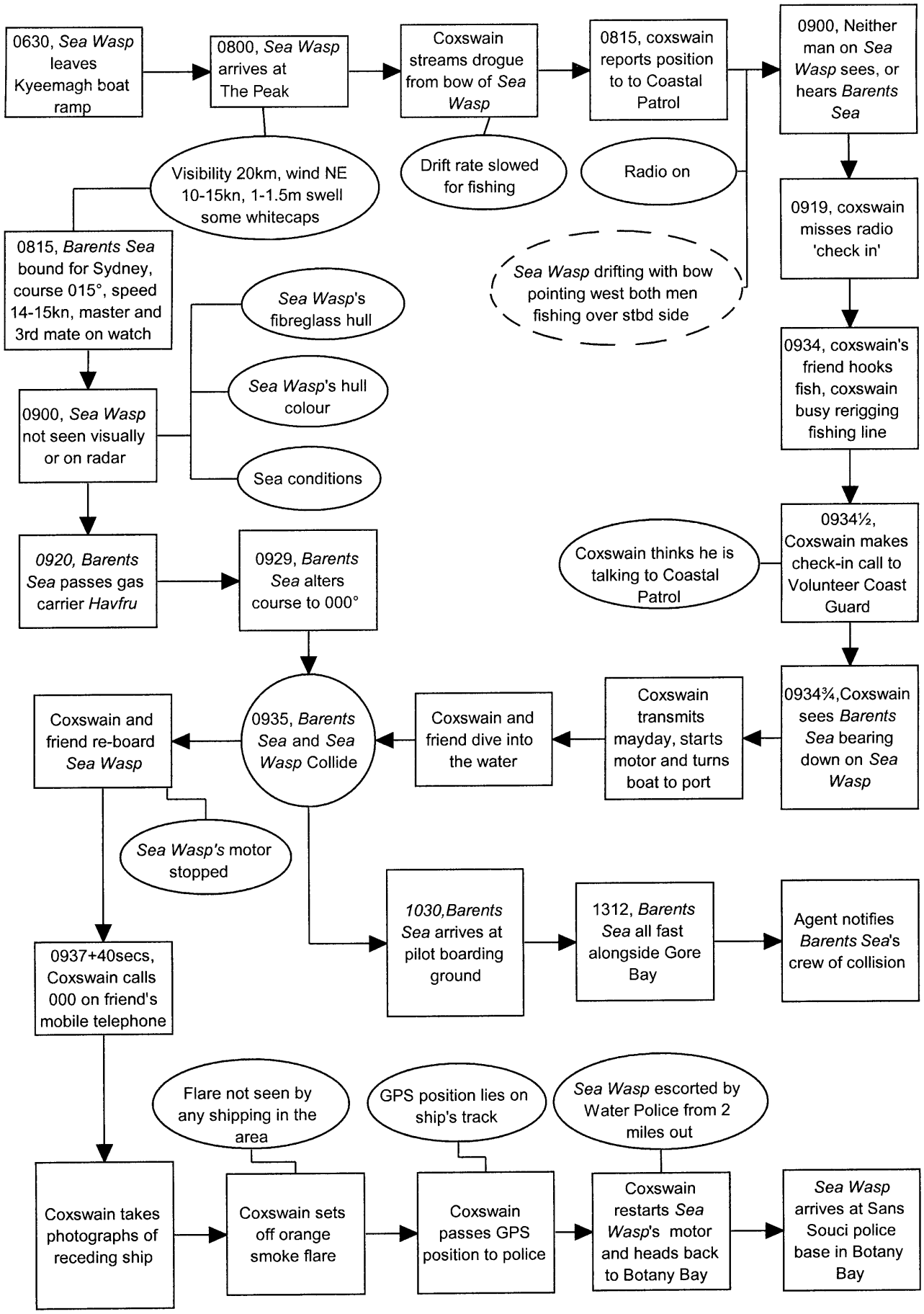
3. After *Barents Sea* changed course at 0929 any radar echo from *Sea Wasp* would have been at least partially obscured on the ship's radar displays by the electronic heading lines.

4. In the prevailing weather conditions, *Sea Wasp*'s white topsides would have made its visual detection more difficult.

5. The ability of the men aboard *Sea Wasp* to maintain an effective look-out was hindered listening to the radio.

6. The sea anchor streaming from *Sea Wasp*'s bow limited the manoeuvrability of the boat and the coxswain's ability to take evasive action immediately prior to the collision.

Figure 5:
***Barents Sea/Sea Wasp* collision 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 was sent to the following:

The coxswain of *Sea Wasp*

The coxswain's friend on *Sea Wasp*

The Australian Maritime Safety Authority

The master of *Barents Sea*

The third mate of *Barents Sea*

Tanker Pacific Management Pte Ltd

A submission was received from Tanker Pacific Management. Relevant parts of the submission have been incorporated into the text of the report.

Barents Sea

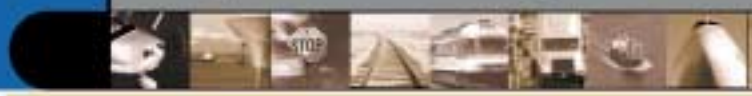
Name	*Barents Sea*
IMO No.	9192258
Flag	Panama
Classification Society	Det Norske Veritas
Vessel type	Crude Oil Tanker
Owner	Fairell Shipping Corporation, Monrovia
Year of build	1999
Builder	Hyundai Heavy Industries, Ulsan, South Korea
Gross tonnage	57 680
Summer deadweight	105 588 tonnes
Length overall	248.21 m
Breadth, moulded	43.00 m
Depth	20.236 m
Draught (summer)	14.219 m
Engine	B & W 7S 60MC, 7-cylinder, 2-stroke, single acting
Engine power	12 500 kW
Service speed	15.4 knots
Crew	26 (Indian and Romanian officers, Filipino crew)

Sea Wasp

Name	*Sea Wasp*
Reg No.	FJ234N
Reg Authority	New South Wales Waterways Authority
Vessel Type	Half cabin runabout
First Registered	1981
Construction	Glass reinforced plastic (GRP) topsides and hull
Length	4.5 m
Engine	70 horsepower, 2-stroke, Johnson outboard
Crew	2 (Australian)

Safety Bulletin 01

Ships and Fishing Vessels



Ships and Fishing Vessels

At about 0110 on 21 June 2000 a fisherman from Iluka, New South Wales, was killed when his 14 m trawler was run down and sunk by a 181 m long, 42 717 tonne deadweight bulk carrier.

The collision highlights:

1. the risks faced by fishermen from large ships;
2. the limitations of radar; and
3. the mutual obligation of all people at sea to observe the International Regulation for Preventing Collisions at Sea, 1972 (Colregs).

The Risks

Since June 1995, the Australian Transport Safety Bureau has investigated fourteen collisions between trading ships and Australian fishing vessels. In all these cases, the fact that a collision occurred indicates that the lookout aboard the trading ship, both visual and by radar for whatever reason, was ineffective. In a few cases it is probable that the lookout was non-existent. Regardless of any failure on the part of the trading ship to keep a proper lookout:

- Only three involved fishing vessels engaged in fishing.
- Seven involved fishing vessels not engaged in fishing, but en route between fishing grounds.
- Four involved fishing vessels anchored in open water.
  - On three of the four vessels at anchor no lookout was maintained and the crewmembers went to bed despite being anchored in open waters in recognised shipping lanes,
- In twelve incidents, the fishing vessel failed to maintain a proper lookout
  - In four of the incidents, a contributory factor was that the person keeping watch on the fishing vessel had no training, did not understand the obligations placed on a fishing vessel by the Colregs and did not understand how to use the radar.
  - The number of crew typically employed on fishing boats was two or three, which for a sustained 24-hour operation is insufficient to fish and maintain a proper lookout required by the Colregs.

Until 21 June, Australian fishing vessels had been lucky as no fatalities had occurred.

Figures from the UK show that since 1991, at least 19 fishermen are known to have died as a direct result of collisions. In 1998, five fishermen were killed in four collisions involving merchant vessels and British registered fishing vessels.

The Limitations of Radar

RADAR operates by transmitting electro-magnetic signals in the form of pulses from an antenna. Radar reflective objects, which lie in the path of this transmission reflect the signal, which is received by the same antenna in the form of a return signal (echo).

Radar technology has developed to the extent where radars are reliable aids to both navigation and collision avoidance. They do, however, have limitations. Radars are not 'all seeing eyes'.

It is important for fishermen to understand what these limitations are.

The weakest detectable echo, which a radar can display, is one which is just stronger than the radar receiver noise level.

The display of this echo is dependent on the following four factors.

1. The correct setting up of the radar display.
2. The siting of the vessel's radar antenna.
3. The target.
4. The weather conditions at the time of using the radar.

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All these factors are very important, but the target and weather conditions are crucial to fishermen.

The target
The echo response received from a target depends upon the following four factors:
(a) size,
(b) shape,
(c) composition and
(d) aspect

(a) size
Targets presenting a large surface area to the radar signal will be detected easily and at long range. Small targets of limited surface area, which are not very high, may not be detected, if at all, until much closer to the source radar.

(b) shape
A smooth shaped object (hull of a fishing vessel) gives a poor radar detection response as compared to a rough shaped object (rocky coastal out crop).

(c) composition
Metal objects give a better radar response than wood.

Fibreglass objects are transparent to radar signals and will not be displayed on a radar screen.

Small vessels, particularly of wooden or other non-metallic construction, can have a large number of separate reflectors (metal masts, booms, engine and other metallic reflectors). None of these are large enough to provide a constant echo. The close proximity of masts rigging, engine etc., acting as reflectors, can also make the vessel a 'multiple' reflector target. This characteristic can result in either an enhanced echo or the return echoes cancelling each other out. A very small change in relative distance from the radar antenna can make the difference between being seen – 'in phase' – and not being seen –'out of phase'.

Similarly, the phase of the radar signal and echo can be affected by skipping or bouncing off the sea surface resulting in signals that may subtract from each other as described above.

(d) aspect
A target beam on to the radar transmission is more likely to give a radar return than a target lying at an angle of 45° to the transmission.

Weather conditions at the time of using the radar
Waves themselves form targets, which when reflected and picked up by the radar, form 'sea clutter'. 'Sea clutter' varies widely with the sea state. Return echoes from rain showers (rain clutter) can have the same effect. Small vessels are more likely to be consistently lost in clutter than are large vessels.

Rain, fog, high humidity and an air temperature lower than the sea temperature will also reduce the radar detection range.

The Regulations

The Colregs apply to all vessels at sea.

The requirement to keep a proper look-out is a mutual obligation for all vessels at sea.

> *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 risk of collision.*

In short every vessel must keep a lookout, whether fishing or not.

Although power-driven vessels and sailing vessels must keep out of the way of vessels 'engaged in fishing', fishing vessels must, so far as possible keep out of the way of a vessel not under command or a vessel restricted in her ability to manoeuvre.

A vessel carrying certificates as a fishing vessel is only a 'restricted' vessel when actually engaged in fishing. It is not restricted when its nets are on the surface or when it is on passage to or from fishing grounds.

Vessels are only considered to be engaged in fishing when fishing with nets, lines, or trawls or other fishing apparatus which restrict manoeuvrability, but does not include a vessel fishing with trolling lines or other fishing apparatus which does not restrict manoeuvrability.

Please remember

If you cannot see a long way visually then the radar cannot generally detect targets at a long range either.

To improve the radar detection of small vessels you should fit as a minimum:

- **a metal corner radar reflector mounted 'in the catch water position'; or**
- **an octahedral cluster of corner reflectors;**

as high as possible above the water line.

Proper understanding and observation of the Colregs and a listening watch on channel 16 VHF can protect your life and your boat.

Safety at sea is like safety on the road. You should assume everybody else is a potential danger – an idiot – and act accordingly.

End note

The vulnerability of fishing vessels has been highlighted in a number of Incidents at Sea reports. The problems created by working lights were highlighted in Report 35 (September 1991) and Report 49 (December 1992). Since June 1995, the issue of fishing boats maintaining a lookout or the limitations in radar in detecting small vessels has been highlighted in the following reports:

81 (June 1995)
94 (July 1996)
98 (September 1996)
103 (November 1996)
104 (November 1996)
106 (December 1996)
116 (April 1997)
125 (September 1997)
131 (April 1998)
144 (February 1999)

Acknowledgements

ATSB is grateful to Mr Ian Smith, Manager Ship Simulator at the Australian Maritime College and Mr John Pothen, Teacher (Ship Simulator) at the Sydney Institute of Technology for advice on radar.

Safety Bulletin 02

Ships and Fishing Vessels

An open letter to all Masters, and bridge watch-keepers

Collisions with fishing vessels

The safety of fishermen and people in small boats is a continuing concern in terms of safety at sea. In the course of your voyages you encounter many types of fishing operations from dug out canoes, with sometimes a candle or oil lantern, to large fishing/factory ships. In and around the Australian coast fishing vessels tend to be less than 20 m in length with a crew of two or three. They often exhibit very bright working lights, though these should be shielded in order to ensure that the fishing lights required by the Colregs can be seen clearly.

Since January 1991, the Australian Transport Safety Bureau has reported on, or is in the process of investigating, 21 incidents of collision between trading ships and small fishing or pleasure craft. Fishermen claim that 'near-miss' situations are common and from time to time, incidents are reported to the ATSB.

That these incidents occur is evidence that fishing vessels and other small craft are not being detected visually or by radar by the watch keeping personnel on board trading vessels. There is an obligation on the part of all vessels at sea to maintain a proper lookout. The fact that in some cases the crews of fishing vessels do not maintain a lookout and do not carry radar reflectors, even though their boats may provide a very poor echo, does not excuse trading ships in any failure to keep a proper lookout.

The following summary underscores the main issues and demonstrates that there are normally no mitigating factors to explain the vast majority of collisions. The only explanations are the lack of a proper visual lookout, or an over reliance on radar detection in circumstances where the radar set has either not been set-up properly, maintained properly or monitored with sufficient diligence.

- Eighteen collisions occurred in clear weather.
- Three collisions occurred in conditions of heavy rain and poor radar detection conditions.
- Fourteen occurred in darkness, five in full daylight and two occurred in the half-light of twilight.
- Eleven collisions occurred between midnight and 0400 in the morning.
- Seventeen collisions involved commercial fishing vessels and four involved yachts or pleasure craft.
- Five of the seventeen fishing vessels were actually engaged in fishing, four were at anchor and eight were in transit.
- Seven small vessels on steady courses were being overtaken by the trading vessel and had been in sight for some time.
- Six vessels were not making way (five were at anchor and one drifting).

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The Australian coast generally enjoys good visibility and has relatively light traffic. It seems probable that watch-keeping officers:

- may be lulled into a sense of false security;
- attentiveness (arousal) is reduced in the clear conditions and they may easily become bored;
- lose track of time in open sea conditions;
- rely too much on radar to the detriment of a proper systematic visual look out.

Radar

As professional mariners, certificated officers hold qualifications as radar observers. However, I must stress the importance of having the radar properly tuned to its optimum performance with both gain and clutter controls correctly set.

In investigating the 21 incidents two critical issues of radar observing seem to emerge.

When using ARPA, assessments of a target's course and speed are made too quickly. Also, it must be realised that where there is a proportionately small amount of relative movement, such as in an overtaking situation, ARPA readings may be inconsistent.

Small vessels, particularly of wooden or other non-metallic construction, can have a large number of separate reflectors (metal masts, booms, engine and other metallic reflectors). None of these is large enough to provide a constant echo. The close proximity of masts rigging, engine etc, acting as reflectors on a small vessel moving in the swell causes 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 fishing 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 multi-path signals due to reflection off the sea surface, resulting in signals that are 'out of phase'.

Conclusion

You may think that a collision cannot happen to you. Experience suggests that accidents of all types can happen to anyone. The best people have the worst accidents.

Australian authorities have taken action against fishermen for the failure to observe the Colregs. They have also prosecuted a ship's master and watch-keeping officer for failure to observe the Rules.

A few minutes failure to keep a proper watch can result in the death of a fisherman and tragedy for the family. For you it can mean lengthy police interviews, delay to the ship, arrest and possible criminal charges which could result in a heavy fine or jail.

Please keep this letter in mind wherever you may be. Under normal conditions of visibility around Australia, there is no substitute for a proper visual lookout supplemented by sensible use of a well set up radar.

Kym Bills
Executive Director

3 August 2000

PS For further information on ATSB's marine casualty and incident reports visit our web site at www.atsb.gov.au

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