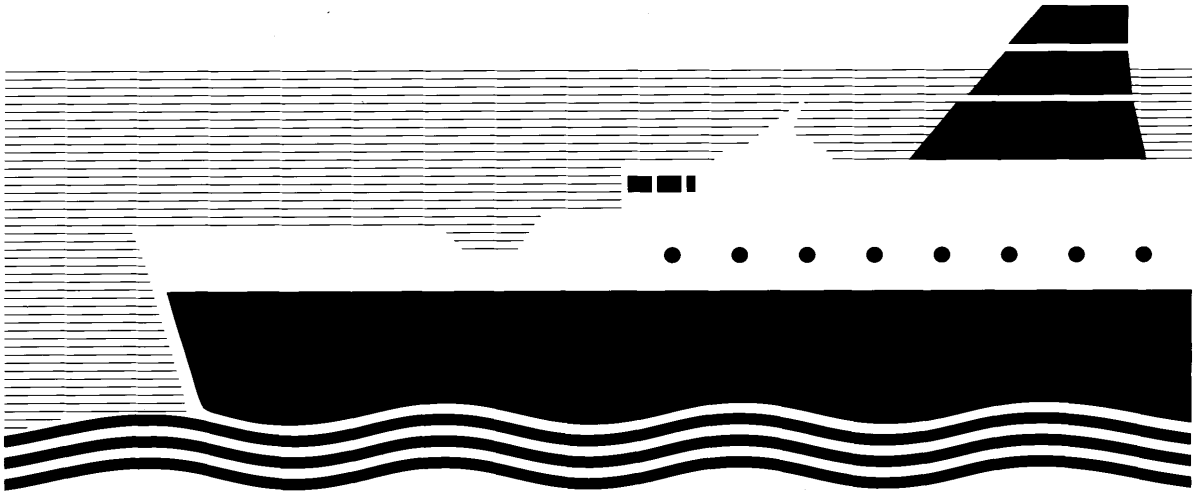
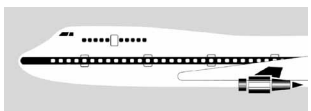
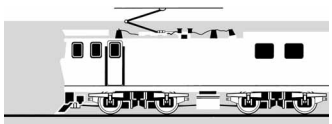


MARINE OCCURRENCE REPORT

04-215 **restricted limit passenger vessel *Southern Winds*, grounding, Charles Sound, Fiordland** **15 October 2004**


TRANSPORT ACCIDENT INVESTIGATION COMMISSION
NEW ZEALAND

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

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

Report 04-215

restricted limit passenger vessel *Southern Winds*

grounding

Charles Sound

14 October 2004

Abstract

The Department of Conservation vessel *Southern Winds* was working in the Fiordland area, with a Master and 7 persons on board. On completion of fieldwork on Thursday 14 October 2004, the boat was anchored close to Lloyd Island, in inner Gold Arm, Charles Sound. During the evening the wind freshened and the boat was unable to maintain its anchorage. The Master unsuccessfully re-set the anchor 3 times before he decided to move to the outer sound. As the boat passed between Catherine and Fanny Islands it grounded heavily on a rock. The Master took all way off the vessel and was able to navigate into clear water where the damage was assessed. It was found that the hull was split and water was entering a small compartment behind the collision bulkhead. The ingress of water was controlled.

At first light the following morning, repair personnel and equipment were flown into the area by helicopter. After temporary repairs had been made, the boat sailed to Doubtful Sound and then to Bluff, where full repairs were completed.

Safety issues identified included:

- anchoring equipment
- navigation in confined waters without full, up–to-date nautical information being available
- crewing arrangements
- communications in remote areas
- risk management of the boat's operation.

Safety recommendations were made to the Director of Maritime Safety, the Shipping Product Manager of SGS M&I and the Director General of the Department of Conservation to address these issues.

The *Southern Winds*

Contents

Figures

Abbreviations

2DTE	Second Class Diesel Trawler Engineer
BTI	base telephone interconnect
C	centigrade
CD	compact disc
DoC	Department of Conservation
DPA	designated person ashore
ECDIS	electronic chart display and information systems
GPS	global positioning system
HF	high frequency
hPa	hectoPascals
ILM	Inshore Launchmaster
kg	kilogram
kHz	kiloHertz
kW	kiloWatt
m	metre(s)
MEC5	Marine Engineer Class 5
mm	millimetre(s)
Maritime NZ	Maritime New Zealand [the new name for the Maritime Safety Authority of New Zealand.] (The change of name was made during the production of this report so both Maritime Safety and Maritime NZ have been used.)
nm	nautical mile(s)
NTI	national telephone interconnect
NZDT	New Zealand Daylight Time
NZOW	New Zealand Offshore Watchkeeper
RCCNZ	Rescue Coordination Centre New Zealand
rpm	revolutions per minute
selcall	selective calling
SOLAS	the International Maritime Organization international convention for the Safety of Life at Sea, 1974, and its Protocol of 1978
SSB	single side band
SSM	Safe Ship Management
telcall	telephone calling
VHF	very high frequency

Glossary

base telephone interconnect	a local radio transceiver through which radio communications can be connected to the public telephone system
Department of Conservation	a government department responsible for the conservation of New Zealand's natural and historic heritage
fathom(s)	measurement of length equal to 6 feet or 1.83 m
forefoot	lower extremity of the stem where it joins the keel
Iridium	brand name of a telephone that used satellites to relay signals to and from a land-based station, which interconnected to the public telephone system
katabatic wind	a wind that blows down a topographic incline such as a hill, mountain or glacier
national telephone interconnect	a national radio transceiver through which radio communications can be connected to the public telephone system
(anchor) rode	the length of anchor cable
selective calling	a radio communication system that enables one radio station to specifically call another radio station, and that station to be automatically alerted to the call
telephone calling	a radio communication system that enables a radio to be connected to the public telephone system
transceiver	a radio capable of transmitting and receiving

Data Summary

Vessel particulars:

Name:	*Southern Winds*
Type:	restricted limit passenger/non-passenger vessel
Safe Ship Management Company:	SGS M&I
Limits:	inshore and restricted coastal
Length:	22.2 m
Breadth:	6.2 m
Gross tonnage:	48
Built:	March 1995 in Fremantle, Australia
Propulsion:	2 MTU 12-cylinder diesel engines each producing 596 kW
Maximum speed:	approx 27 knots
Service speed:	about 15 knots at 1500 rpm
Owner/operator:	Department of Conservation
Port of registry:	Bluff

Date and time:	14 October 2004 at about 2330[1]
Location:	Charles Sound
Persons on board:	crew: 1 others: 7
Injuries:	crew: nil others: nil
Damage:	substantial damage to the forefoot and delamination of the fibreglass along the keel
Investigator-in-charge:	Captain Doug Monks

[1] Times in this report are New Zealand Daylight Time (UTC + 13 hours) and are expressed in the 24-hour mode.

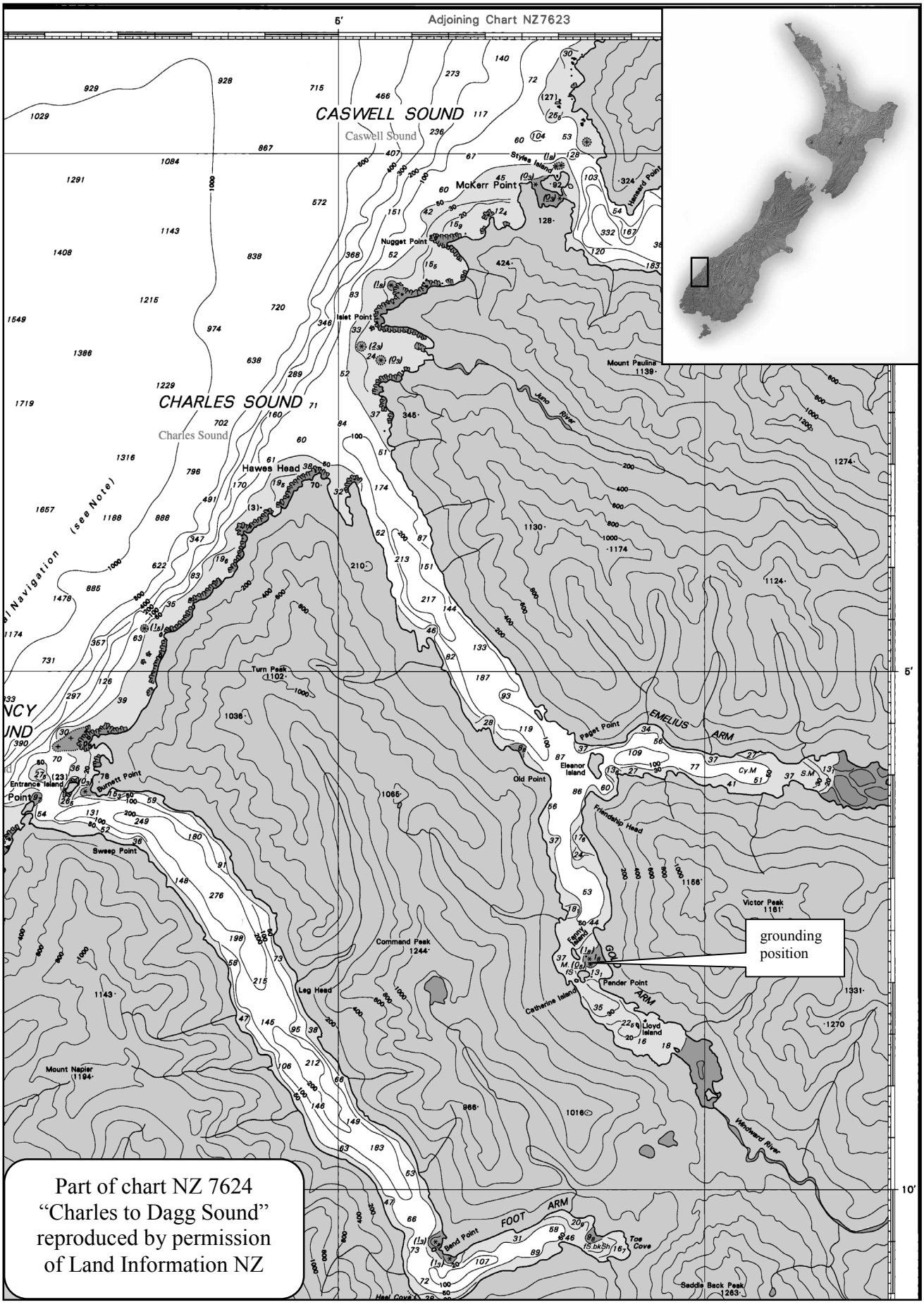


Figure 1
Part of chart NZ 7624 Charles to Dagg Sound

1 Factual Information

1.1 Narrative

1.1.1 At about 1400 on Friday 8 October 2004, the Department of Conservation (DoC) vessel *Southern Winds* departed from Bluff heading for the southwest corner of Fiordland. In addition to the Master, there were 10 persons on board; these comprised 6 DoC staff, 2 surveyors, an observer from the Guardians of Fiordland's Fisheries and Marine Environment Inc, and a pest controller and her dog.

1.1.2 The passage was uneventful and the *Southern Winds* anchored in Sportsman Cove, Preservation Inlet, on the Friday night. On Saturday morning the scientists started their projects, which they continued daily in the different sounds as they headed north. Each night the boat was anchored in a sheltered position so that all on board could sleep without maintaining anchor watches.

1.1.3 By Tuesday 12 October they had reached Doubtful Sound where DoC had a wharf in Deep Cove. The wharf was already occupied, without authority, by a fishing boat. So the Master of the *Southern Winds* made fast at a berth owned by a commercial cruise operator.

1.1.4 After working around Doubtful Sound on Wednesday they tied up at the same wharf. During that night, the weather deteriorated and the boat worked against the wharf. To prevent damage to the boat, extra mooring lines were run ashore. Even so the boat continued to be buffeted against the wharf for the entire night, disrupting the sleep of the Master and some of the other people on board.

1.1.5 The following day they carried out work in Thompson, Nancy and Charles Sounds before going to anchor in Gold Arm, the more southerly of the 2 arms of Charles Sound. The Master said that he mainly navigated the boat by eye but he also used the radar and the track plotter. In heading into the inner part of Gold Arm he passed down the middle of the sound, leaving Fanny Island to starboard, passing close to the shoal ground before altering course to port and then starboard around Catherine Island. He then continued past Pender Point and brought the boat to anchor behind Lloyd Island in 9 fathoms [16.5m] of water (see Figures 1, 2 and 3).

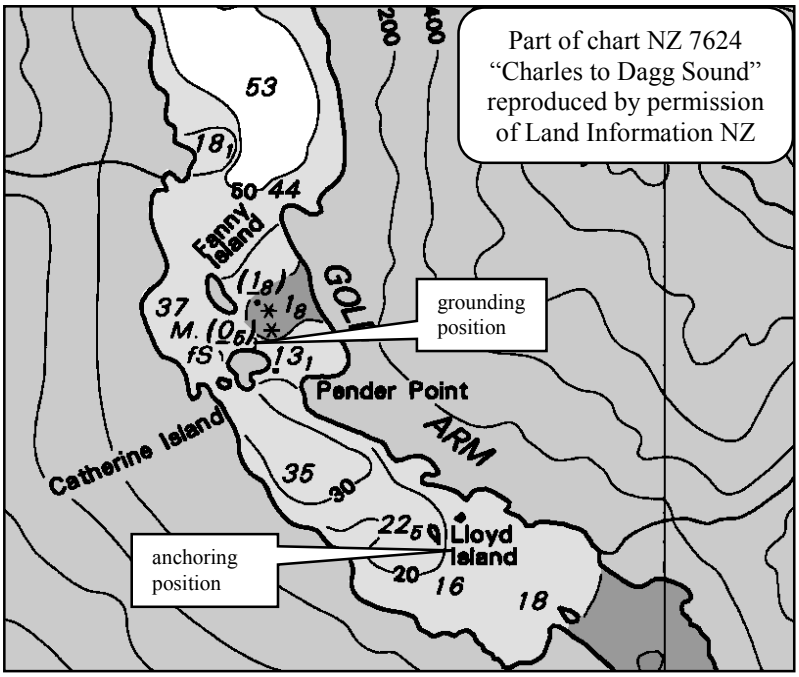


Figure 2
Part of chart NZ 7624 showing the inner portion of Gold Arm

1.1.6 Once anchored, the boat's complement ate dinner and then either completed the documentation required by their projects or relaxed. The Master relaxed but also maintained a watch on the boat and its anchorage position. The weather started to deteriorate at about 2100, and by 2230 the wind had increased to what the Master estimated was over 50 knots. By this time all except for the Master and 2 others had retired to their bunks. As the wind increased the boat started to yaw heavily on the anchor cable, causing the anchor to drag. The Master decided to weigh the anchor and re-set it. The 2 persons who had remained awake, one male and one female, donned lifejackets and went onto the foredeck to operate the windlass, while the Master manoeuvred the boat. The anchor was reset 3 times without it holding successfully. While hauling the anchor on the last occasion the man on the foredeck was blown off his feet and was only saved from falling over the side by the guardrails.

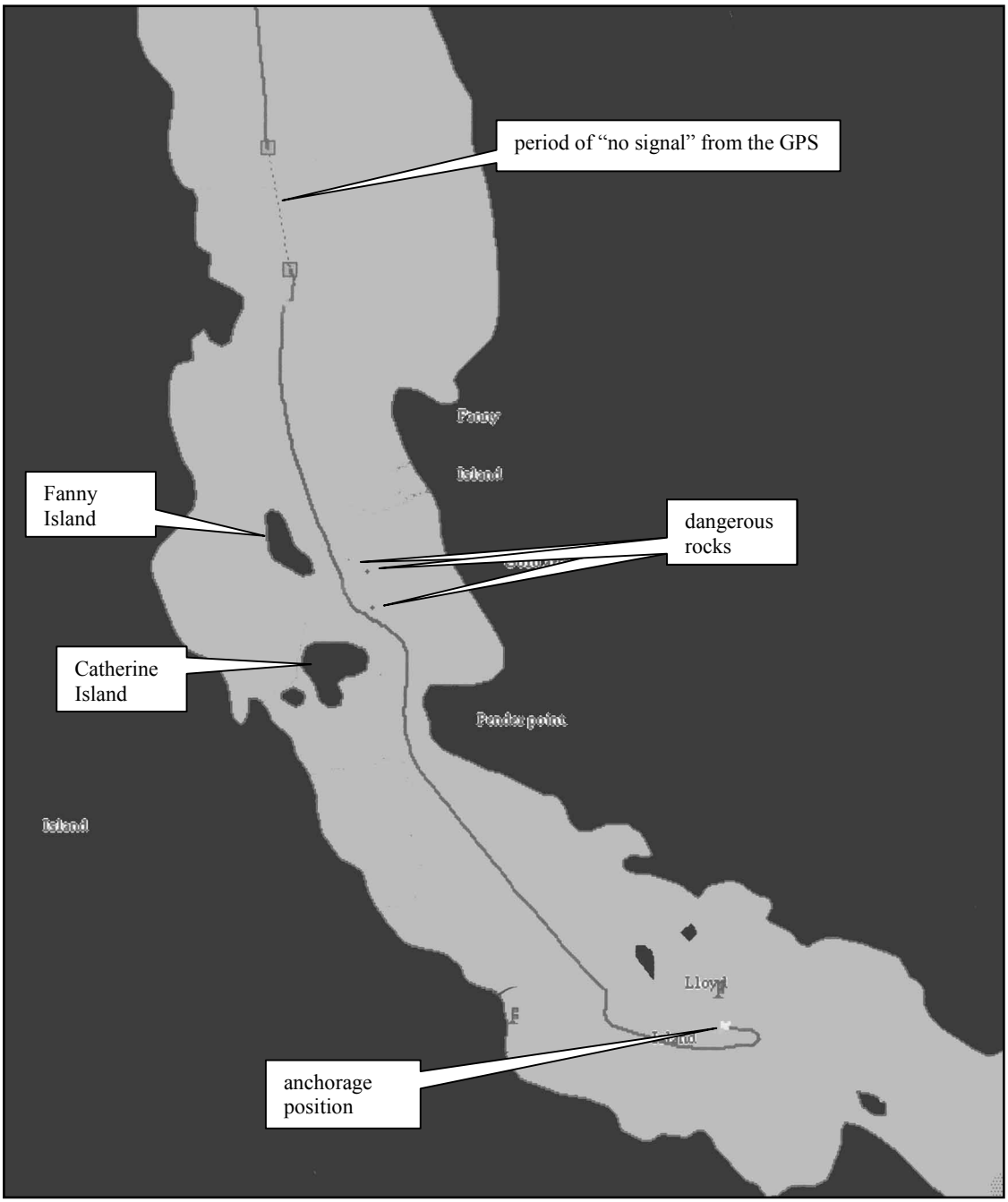


Figure 3
Inward track as recorded on the Olex track plotter

1.1.7 The poor holding of the anchor and the near loss of someone over the side caused the Master to abandon any further attempts at anchoring the boat. Instead, he decided to keep the boat

moving up and down the sound. Initially, he tried to manoeuvre in the portion of the sound between Catherine and Lloyd Islands, a distance of about 0.6 nm. However, he soon determined that the speed necessary to maintain steerage was too high for that confined area. So he decided to head into the outer part of the sound (see Figure 4).

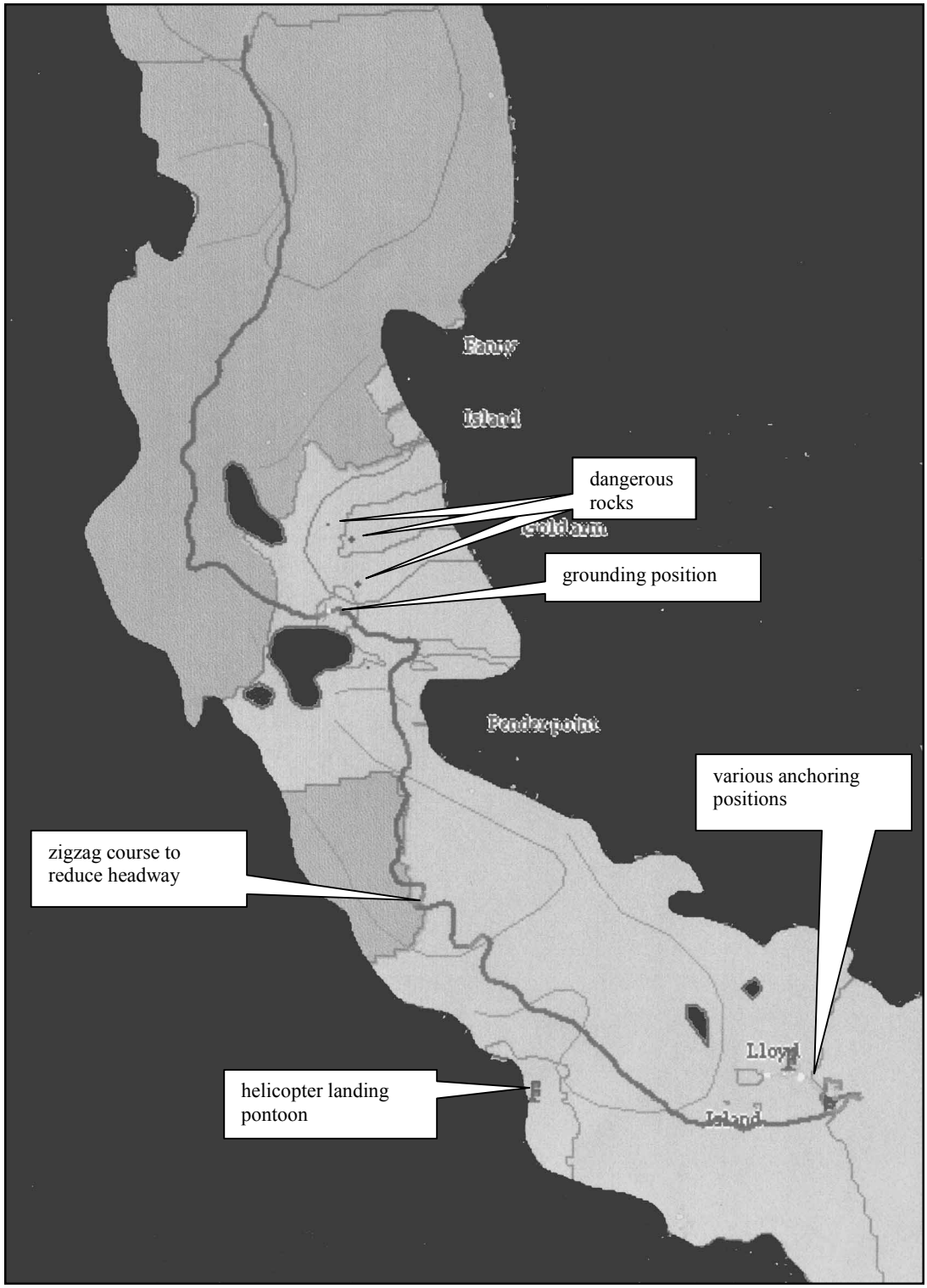


Figure 4
Outward track as recorded on the Olex track plotter

1.1.8 The Master steered the boat, at minimum steerage speed of about 7 or 8 knots, towards Catherine and Fanny Islands. It being pitch black he was unable to navigate by eye, so he was using the radar, and also referring to the echo sounder and the track plotter. He kept well to the east of Catherine Island to ensure missing the small islet close to its eastern side. He then

altered course to port to bring the boat onto a nearly westerly course to pass to the north of Catherine Island. At about 2330, as he was passing the island, the forepart of the boat struck a submerged rock. The initial contact was heavy and then there was a second lighter contact as the boat scraped down the side of the rock. The Master immediately brought the engine controls to neutral.

1.1.9 When he turned the decklights on, the Master saw the bush on the island close to the port bow, so he put the engines astern. Once clear of the island he put the engines ahead and steered the boat around the western side of Fanny Island and headed into the outer part of the sound. Any of those on board who were not already awake following the grounding were woken and told to don their lifejackets.

1.1.10 Almost immediately, 2 of the men started checking the bilges in the accommodation and the engine room for the ingress of water, but they found none. About 10 minutes later someone noticed water on the stairway into the sleeping area (see Figure 5). It was found that there was water in the compartment immediately abaft of the collision bulkhead (see Figure 8). On later inspection, it was found that the impact on the keel was sufficient to have sprung the hull away from the keel, allowing water to enter that compartment.

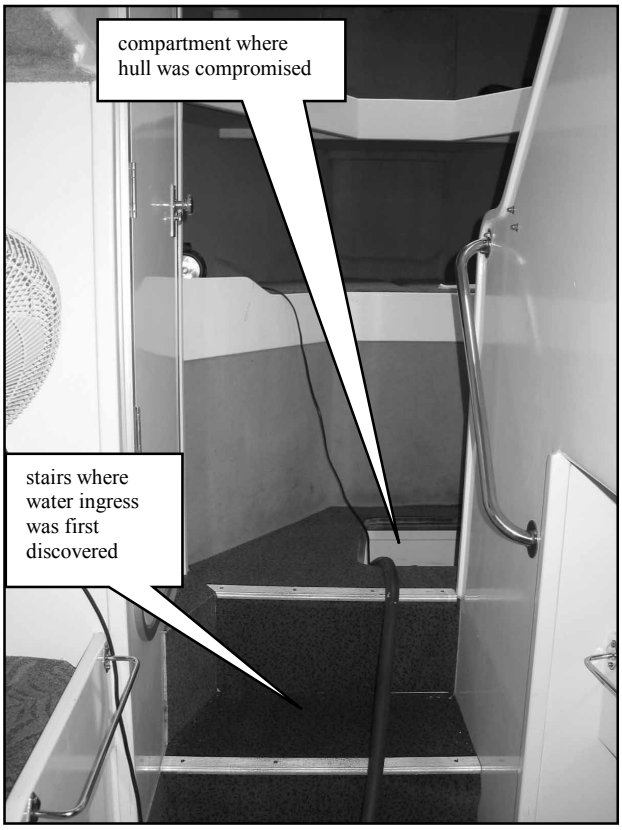


Figure 5
Looking forward towards the stairs from the accommodation to the bridge

1.1.11 The breached compartment was not watertight but the lightening holes between it and the space immediately abaft of it were blocked. This caused the water to build up in the breached compartment until it leaked through the stairs where it was noticed.

1.1.12 While the Master continued conning the boat, the others ripped up the carpets in the lower accommodation and started bailing the water out of the breached compartment. Initially they formed a chain, passing buckets up the chain into the cabin and throwing the water over the side. Later, they changed to bailing the water into a compartment further aft where the bilge pump could be used to eject it. Eventually, a flexible hose was rigged onto a spare bilge suction and the main bilge pump was used to eject water directly from the breached compartment (see Figure 6).

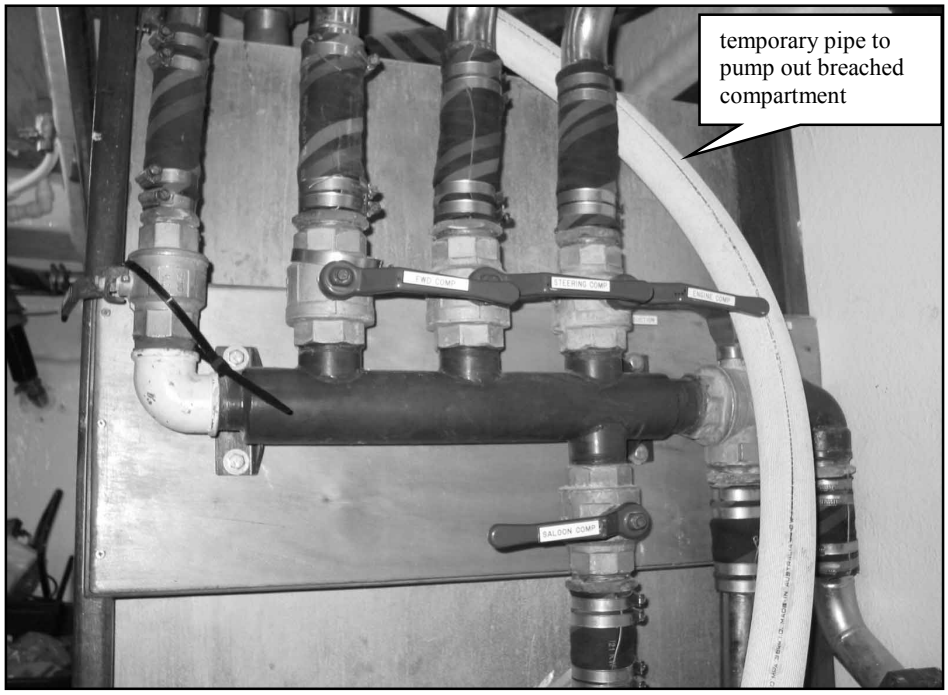


Figure 6
Bilge valve chest

1.1.13 While the water ingress was being controlled, the Master manoeuvred the boat into Emelius Arm, the northern arm of Charles Sound, where he was able to maintain position behind Eleanor Island. The Master tried to use the Iridium satellite telephone to contact one of the DoC staff in Te Anau, but there was no signal. He and one of the DoC staff also tried, without success, to use the boat's radios to contact DoC. Eventually, at about 0030 on Friday 15 October, using one of the DoC SR3 field radios, they patched into the telephone network and the Master called his wife. The signal strength fluctuated, but the Master was able to tell his wife they had hit a rock in Charles Sound and that everyone on board was well.

1.1.14 Throughout the night, the breached compartment was monitored and the water pumped out. Once the temporary bilge suction was in place, a temporary patch was applied to the inside of the hull in way of the keel in the breached compartment to further reduce the ingress of water.

1.1.15 The Master's wife telephoned the DoC offices in Te Anau and eventually talked to one of the staff at about 0200. The DoC Area Manager was then called and he tried unsuccessfully to contact the boat. Not knowing the extent of the damage, he arranged for a helicopter to fly out to the boat at first light, around 0600, with a search and rescue team and pumps. He also called the Rescue Coordination Centre New Zealand (RCCNZ) for it to contact the vessel. Maritime Radio on behalf of RCCNZ called the boat throughout the night on very high frequency (VHF) and high frequency (HF) maritime channels, and the boat's Iridium phone, all without success. At about 0600, shortly after the helicopter was airborne, the Master of *Southern Winds* contacted Fiordland Fisherman's Radio, through a repeater station on Mount Irene, on VHF radio channel 66, giving his location and the equipment he needed.

1.1.16 A helicopter landing pontoon was situated in inner Gold Arm, on the western shore across from Lloyd Island. This necessitated the Master again negotiating the area where he had grounded. The helicopter pilot, who could see the rocks and shoal areas from the air, assisted him and guided him down the eastern shore, close to Pender Point.

1.1.17 The search and rescue team included a diver, who found that on the forward starboard side of the forefoot, the hull was detached from the keel, allowing water to enter the boat. A small bilge pump with a float switch was fitted in the breached compartment and this was able to handle the ingress of water, without further use of the main bilge pump (see Figure 7).

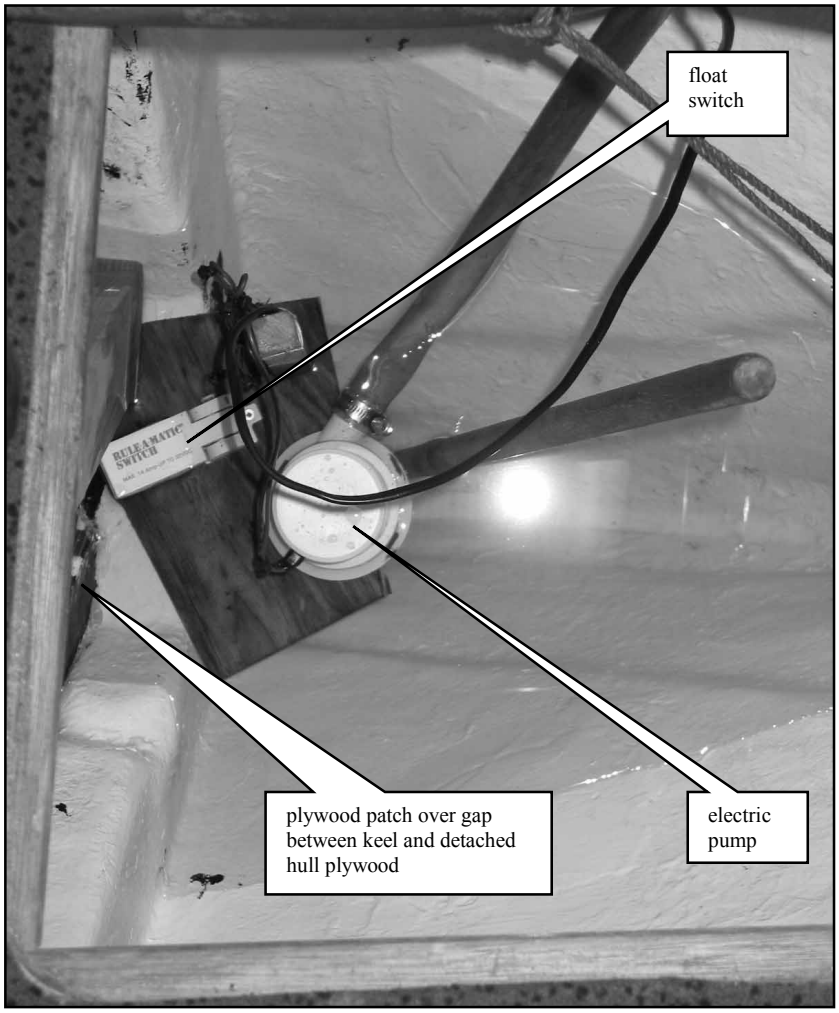


Figure 7
Breached compartment showing the jury-rigged electric pump

1.1.18 The next day the boat sailed to Doubtful Sound to refuel and then to Bluff where it was slipped and repaired.

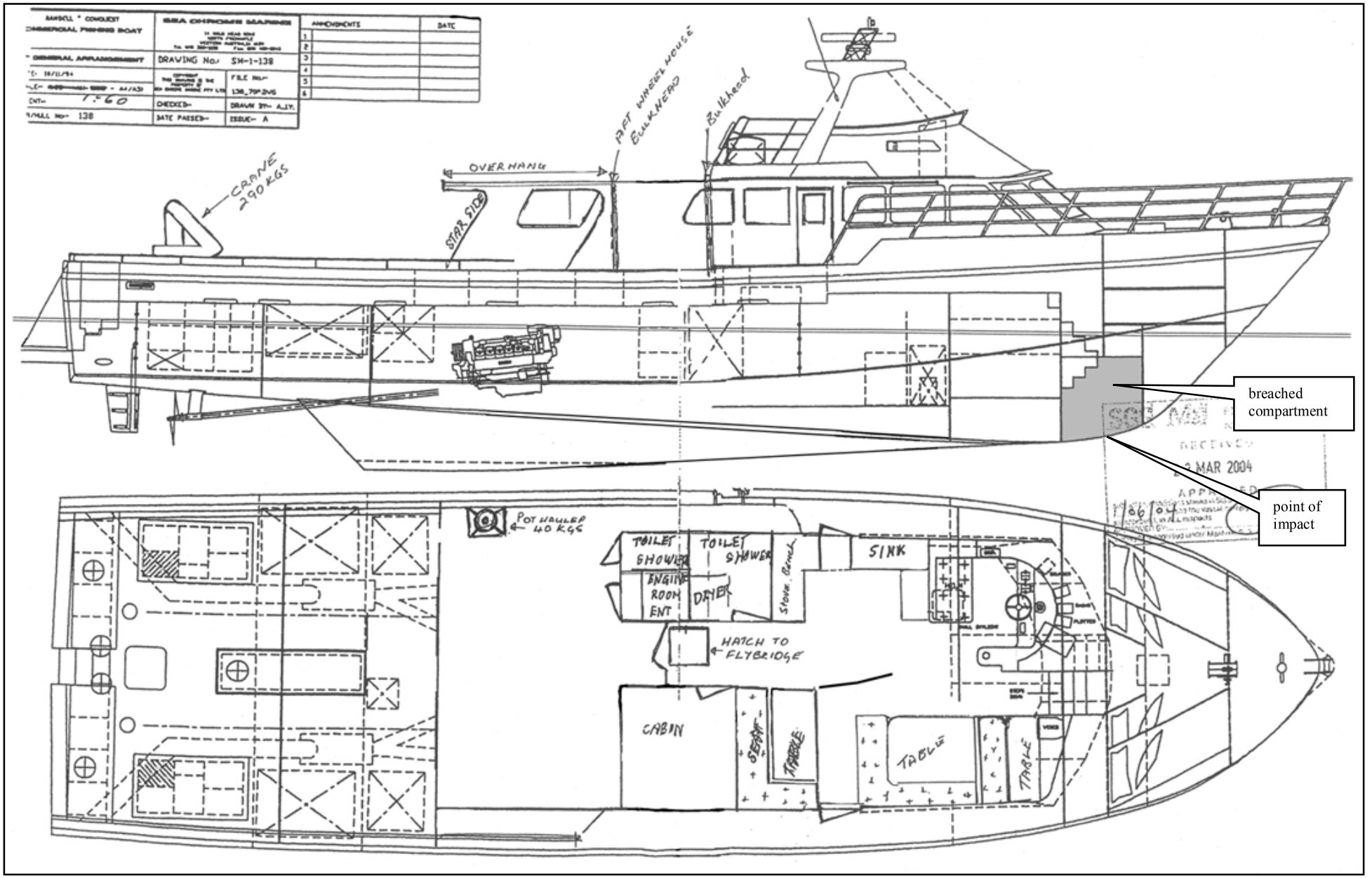


Figure 8
Line drawing of the *Southern Winds*

1.2 Voyage details

1.2.1 On this voyage, the boat was to be used as the base for 3 separate scientific projects. One of the projects was to survey parts of the sounds in order to assign boundaries to ecologically sensitive areas. The staff involved in that project had the use of one of the 2 inflatable dinghies on board. The other 2 project teams, weed eradication and pest control, used the other dinghy to visit their areas of interest. The *Southern Winds* remained close by the smaller boats throughout the day and hand-held radios were used for communications between the boat and the field teams.

1.2.2 The majority of scientific projects allowed for the *Southern Winds* to be at a safe anchorage or made fast alongside a wharf at night so that the Master would normally get sufficient rest. The intended schedule for this trip was for the fieldwork to be completed during the day and associated documentation to be completed during the evening and all on board to rest during the night.

1.2.3 For the first 5 nights they managed to get adequate rest, finding safe anchorages on the first 4 nights. On the fifth night, Tuesday, when they arrived at Deep Cove, they found another boat alongside the DoC wharf, so they had to make fast alongside a less sheltered wharf belonging to a commercial operator. That night the weather was reasonable and they managed to get a good night's sleep. The next night, however, the other boat was still on their wharf so they again had to use the commercial operator's wharf, but on that evening the weather deteriorated, causing the boat to range up and down and crash into the wharf. Even with additional mooring lines the boat continued to move, which resulted in a poor night's rest for many on board.

1.2.4 On Wednesday 13 October, one of the DoC staff left the boat while it was in Deep Cove. The following day, having completed their task, the pest controller and her dog also left the boat. In addition, the senior DoC staff member left that day due to ill health.

1.2.5 The Master had decided on the Thursday morning that because of their disrupted sleep the night before, they would stop work early that afternoon to find a secure anchorage and get a full night's rest. In previous trips to Charles Sound, the Master had always anchored in Gold Arm so he automatically went there on this occasion without considering Emelius Arm as an alternative.

1.2.6 The Master anchored in 9 fathoms [16.5 m] of water and had used about 40 fathoms [73 m] of anchor cable, a ratio of over 4:1.

1.2.7 An anchor holds best when the pull exerted by the anchor cable is near the horizontal. The length of anchor cable, or rode, used is dependant on the type of vessel, expected weather and tides, type of bottom, and whether the anchor rode is all chain or a combination of chain and wire or rope. The ratio of anchor cable to depth can vary from 3:1 for temporary anchorages in good weather up to 10:1 or more if bad weather is expected. A general rule for smaller vessels is a ratio of 5:1 in moderate weather with an all-chain rode.

1.3 Vessel information

1.3.1 The *Southern Winds* was built in Fremantle, Australia in 1995. It was 22.2 m in length, 6.2 m in breath and was constructed of fibreglass resin. Initially it was designed to fish for crayfish and was named the *Desert Wind*. It had 2 MTU 12-cylinder diesel engines that had been de-rated from 745 kW to 596 kW per engine. Two 5-bladed fixed-pitch propellers drove the vessel.

1.3.2 DoC purchased the boat from Australia in September 2003 and it was delivered to New Zealand soon after. The boat required some structural modification, primarily to the accommodation, before it was suitable for its intended purpose; this was done in Bluff. The boat started its first trip for DoC on 21 June 2004.

1.3.3 SGS M&I had issued the boat with a Safe Ship Management (SSM) certificate on 2 September 2004, which was valid, subject to periodic audits and inspections, until 30 September 2006.

1.3.4 The navigation aids were displayed on a console situated immediately in front of the steering position (see Figure 9). New navigational and communication equipment was installed before the boat was commissioned. Part of that equipment was an Olex 4.1, 7/6-2002 track plotter connected to a JRC JLR-10 GPS compass, which was set to WGS84 datum. C-MAP vector charts were installed on the track plotter. The Olex system had a bottom mapping facility that updated the vector charts when a sounding different from that shown on the electronic chart was recorded and verified as the boat passed over it. In order to produce accurate soundings, an XTide tidal calculation module was included as part of the mapping facility.

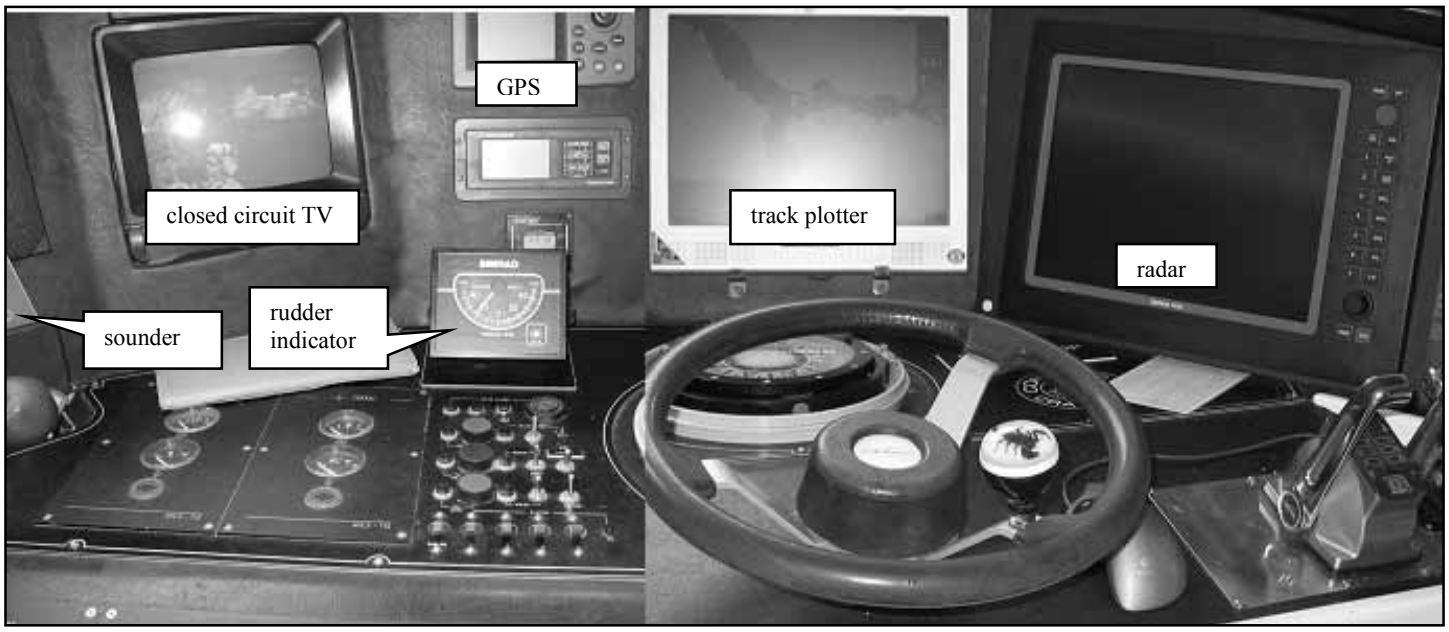


Figure 9
Bridge console

1.3.5 The track plotter showed the following disclaimer notice each time the system was turned on:

> WARNING: No National Hydrographic Office has verified the information in this product and none accept liability for the accuracy of reproduction or any modifications made thereafter. No National Hydrographic Office warrants that this product satisfies national or international regulations regarding the use of the appropriate products for navigation.
>
> Warning: Neither Olex AS nor any other party guarantees that the information shown by this product is correct or even useful.
>
> Xtide 2.0 Copyright 1998 David Flater. NO WARRANTY; see the GNU General Public License for details.

This warning had to be acknowledged by clicking on an "Okay" button on the screen before the system would start up.

1.3.6 The C-MAP chart information had been loaded onto the boat's computer from a compact disc (CD) which had the following information written on it:

CM93 Edition 2, Disk 3, Zones 3-7 & 9.
Archive number 0321153768
May 2003 Release V1

In this case C-MAP used chart NZ 7624 "Charles Sound to Dagg Sound", scale 60 000, 1/4/1999 ed1, for the information from which the vector chart was prepared. The electronic charts were prepared to WGS84 datum.

1.3.7 The cover of the chart CD contained the following warning:

> IMPORTANT
> It is important to note that visual map displays should not be used as a primary source of navigation. Electronic chart displays should only be used as an aid to navigation and a backup to official government paper charts and traditional navigational methods.

The supplier and installer of the Olex system had loaded the charts onto the system and then stored the chart CD at his premises. The Master later said that he was aware that maps displayed in a plotter are not to be used as the primary source of navigation.

1.3.8 C-MAP had 2 levels of service for the type of chart folio installed on the *Southern Winds*. The first was a subscription service, where C-MAP supplied the customer with an updated chart CD at user defined time intervals, where the interval determined the cost of the subscription. The second service was a one-off purchase, where C-MAP only supplied the chart CD current at the time of installation. Even with the one-off purchase, the customer was able to buy updated chart CDs, but obviously there was a cost involved. The supplier had told DoC that there was no advantage in buying the subscription service, which cost about $5500 per year, so it had purchased the one-off system.

1.3.9 The navigation aids were all optically coupled, that is, they were electrically isolated so that if one piece of equipment malfunctioned it would not damage the other equipment. Optical coupling also had the effect of reducing the electrical noise produced by the equipment.

1.3.10 The single side band (SSB) Codan 8528S radio had been transferred from the Department's previous vessel the *Renown*. It was installed by the same company that fitted the other navigation aids. Before it was commissioned, the boat had been subjected to a radio equipment survey, which it had passed. The radio had undergone and passed another survey immediately before the grounding trip.

1.3.11 An Iridium satellite telephone had been fitted along with all the other navigation and communication equipment during the refit.

1.3.12 In addition to the vessel's communication equipment, the DoC staff on board the vessel had 4 portable SSB radios. They also had a number of hand-held VHF radios to provide communications between the *Southern Winds* and the inflatable boats used by the shore parties.

1.3.13 The hull of the *Southern Winds* was of a semi-planing design, enabling greater speeds than traditional displacement hulls such as the *Renown*.

1.3.14 Under Maritime Rules Parts 40A Design, Construction, and Equipment - Passenger Ships which are not SOLAS Ships, and 40C Design, Construction, and Equipment - Non-passenger Ships which are not SOLAS Ships, as amended on 26 April 2004, the *Southern Winds* was defined as an existing ship and as such would not have been required to comply with the requirements for anchoring equipment as specified in those rules. However, because the anchor and part of the cable had been changed during the refit, the boat was required to comply with Maritime Rules Parts 40A and 40C, whichever had the higher requirement.

1.3.15 Maritime Rules Part 40C for an offshore vessel had a higher requirement for anchors and cables than Part 40A for an inshore vessel. Part 40C Appendix 6 Table 2(A) prescribed that 2 anchors each of 129 kg be fitted. Under Table 4 a cable length of 110 m was required to be carried for each anchor, and Table 3(A) required that cable to be close-link chain of 15 mm diameter.

1.3.16 The new anchor fitted during the refit was a Hall 100 kg stockless anchor, which had been tested by Cookes of Dunedin and certificated by SGS M&I, Dunedin. During the test, a proof load of 4043 kg had been applied to the anchor. The test certificate indicated that the anchor

met the specifications for that type of anchor. Forty-two metres of 15 mm close-link chain had been added to the outer end of the unmeasured length of the original 13 mm close-link cable.

1.3.17 A second or spare anchor of the Danforth type was on board. It was the original spare anchor fitted to the vessel when it was built in Australia, and it weighed 75 kg.

1.3.18 The anchors and cables on the *Southern Winds,* although surveyed by the SSM surveyor, did not meet the prescribed specifications for a vessel of that size operating in the offshore area.

1.3.19 The Master noted that when the wind strengthened the boat began to yaw heavily from side to side about the anchor. He indicated that the boat swung right up into the wind and lay across the wind before swinging back through the wind to lay across the wind on the other side. At the extremity of this arc the boat presented almost the whole length of its superstructure to the force of the wind and so put excessive weight on the anchor cable and anchor. This type of movement was common for semi-planing hulled boats at anchor.

1.3.20 The boat was fitted with a Jabsco bilge pump, which was connected to a bilge system through a valve chest that allowed suction to be selected from 4 nominated compartments (see Figure 6).

1.4 Damage

1.4.1 The principal damage to the boat was at the forefoot and along the port side of the keel where it made contact with the rock (see Figures 10, 11 and 12).

Figure 10
Areas of damage to the hull of the *Southern Winds*

1.4.2 The bow hit with sufficient force to spring the hull away from the keel in way of the space immediately behind the forward collision bulkhead (see Figure 11). This space was small and had drainage holes through its after bulkhead into the next compartment, but they had collapsed, thus blocking the holes and making the space almost watertight. The collision bulkhead was not breached. Once the breached compartment began to fill, the water seeped through the wooden panels that formed the stairs and into the alleyway leading aft into the accommodation. It was here that the water ingress was first discovered.

1.4.3 After the initial impact on the forefoot, the port side of the keel appears to have scraped along the rock, damaging the fibreglass sheathing, but without penetrating the hull further (see Figure 12). Repairs, consisting of reinstating the damaged fibreglass resin and the extension of the sole

plate to protect and reinforce the damaged areas, were undertaken in Bluff under the supervision of the SGS M&I surveyor. The rudders and the propellers, which were about 400 mm above the keel, showed no sign of having made contact with the rock.

Figure 11
Damage to the bow of the *Southern Winds*

Figure 12
Damage to keel

1.4.4 The failure to communicate using the boat's SSB radio was found to be due to a broken earth strap, which had probably existed before the grounding. The Iridium satellite phone had been used twice during the trip before the grounding but did not work when the crew were trying to

make contact with DoC staff in Te Anau after the grounding. On the boat's return to Bluff, the phone was found to have a fault and was returned to the manufacturer who replaced it under warranty.

1.5 Personnel information

1.5.1 The Master of the *Southern Winds* went to sea in 1970 fishing for crayfish out of Bluff and worked on a variety of boats before gaining his Commercial Launchmaster certificate in 1984. He started working for DoC on the *Renown* in 1988 and was promoted to Master in 1994. He passed a New Zealand Coastal Master certificate in 1992 and an Engineer Local Ship certificate in 1998. He remained on the *Renown* until 2003 when he assisted in the delivery voyage of the *Southern Winds* and stood by the structural modifications and refit. He had extensive experience in operating in the Fiordland area, particularly the southern sounds. When the *Southern Winds* was commissioned he was the only permanent crewmember, but there were 2 other relieving Masters.

1.5.2 DoC trained some of its staff to handle boats of less than 6 m and issued them with a certificate of competency under the delegated authority of the Director of Maritime Safety. The less than 6 m certificates were issued to allow the holder to operate designated small boats used in the course of the scientific projects. Each boat that the holder was empowered to operate was listed on the certificate.

1.5.3 The leader of one of the scientific teams held a less than 6 m certificate of competency issued by DoC, and the Master considered him to be designated as a crewmember of the *Southern Winds*. However, he had fallen ill and had left the boat at Deep Cove the morning before the accident.

1.5.4 Another person held a less than 6 m certificate of competency and a Coastguard New Zealand Day Skipper certificate. The Master considered him to be designated as a crewmember of the *Southern Winds*. The observer from the Guardians of Fiordland's Fisheries and Marine Environment Inc held a Second Class Diesel Trawler Engineer (2DTE) certificate and had extensive experience, including restoring and running his own 16 m boat. There was an entry in the vessel's logbook on the day of the accident that identified these last 2 persons as crew.

1.5.5 The maritime experience of the other people on board at the time of the grounding varied considerably, but all of them had been to sea previously. One of them held a Boatmaster's certificate and another a marine VHF Operator's certificate.

1.5.6 The *Southern Winds* was operated by the Southern Conservancy of DoC and was managed from the Te Anau office. The Area Manager had ultimate responsibility for the boat, but a Programme Manager Service, who was also the designated person ashore (DPA), usually dealt with the day-to-day operations.

1.5.7 The Programme Manager Service position had become vacant about a month before the grounding and the Department was in the process of recruiting a replacement. The Area Manager had taken on the Programme Manager Service's duties in the interim.

1.5.8 The Area Manager had no formal maritime qualifications or training, but had extensive recreational boating experience. He was responsible for the health and safety components of the vessel operation.

1.6 Management

1.6.1 The *Southern Winds* was the only large vessel managed by the Southern Conservancy of DoC. The managers in the Te Anau office had some boat operating experience, but they had little marine management experience. The Master of the boat usually reported to a Programme Manager Service, who reported to the Area Manager. As the Programme Manager Service position was vacant, the Master had to deal directly with the Area Manager.

1.6.2 The Programme Manager Service was the DPA for the boat and as such was the conduit for ship-to-shore communications. Because this position was vacant the role of DPA fell to the Area Manager, but there had been no formalisation of this transfer of responsibility.

1.6.3 The Programme Manager Service was responsible for allotting the use of the boat and coordinating the scientific project bids. He would then arrange the boat schedule with the Master. Once the Master was told the nature of the coming voyage, he was expected to have the boat prepared for the trip.

1.6.4 The Master and the relief Masters were the only persons employed to operate the *Southern Winds*. It was customary that DoC staff taking part in the scientific projects fulfilled any other crew functions. There was no management check to determine whether the boat was manned in accordance with the SSM certificate or Maritime Rules Part 31B.

1.6.5 Other than the relief Masters, the Master was the only DoC employee in the Southern Conservancy with maritime expertise on larger vessels. Consequently, if any decision concerning the boat or its operation was needed, the Master was usually called upon. In the previous 17 years the Master had worked exclusively on DoC vessels so was very familiar with their operation.

1.7 Area information

1.7.1 Fiordland is on the southwest coast of South Island and stretches from Milford Sound in the north to Preservation Inlet about 150 nm to the south. There are 14 sounds, which are generally deep and have shores that rise almost vertically to the rugged mountains above. Bush covers the mountainsides up to the snowline except where landslides have denuded the land.

1.7.2 Charles Sound is one of the smaller sounds and is situated about midway between Milford Sound and Preservation Inlet. A little over 4 nm inside the sound it divides into 2 arms, Emelius Arm, which extends to the east, and Gold Arm, which extends to the south (see Figure 13). The New Zealand Pilot (Admiralty Sailing Directions NP51) stated that good anchorage could be obtained in Emelius and Gold Arms but the latter was not easily accessible.

1.7.3 The New Zealand Pilot gave the following directions when entering Gold Arm:

> Gold Arm is entered between Old Point and Friendship Head, 4 cables [0.4 nm] ESE, whence the track leads S passing:
> E of Fanny Island, 1¾ miles SSE of Old Point, and W of a group of dangerous rocks, 1 cable [0.1 nm] E of Fanny Island, thence:
> E of Catherine Island, close S of Fanny Island.
> Thence the track leads either side of Lloyd Island, 1 mile SE of Fanny Island to a steep-to flat which extends about 6 cables [0.6 nm] from the head of the arm to Windward River.

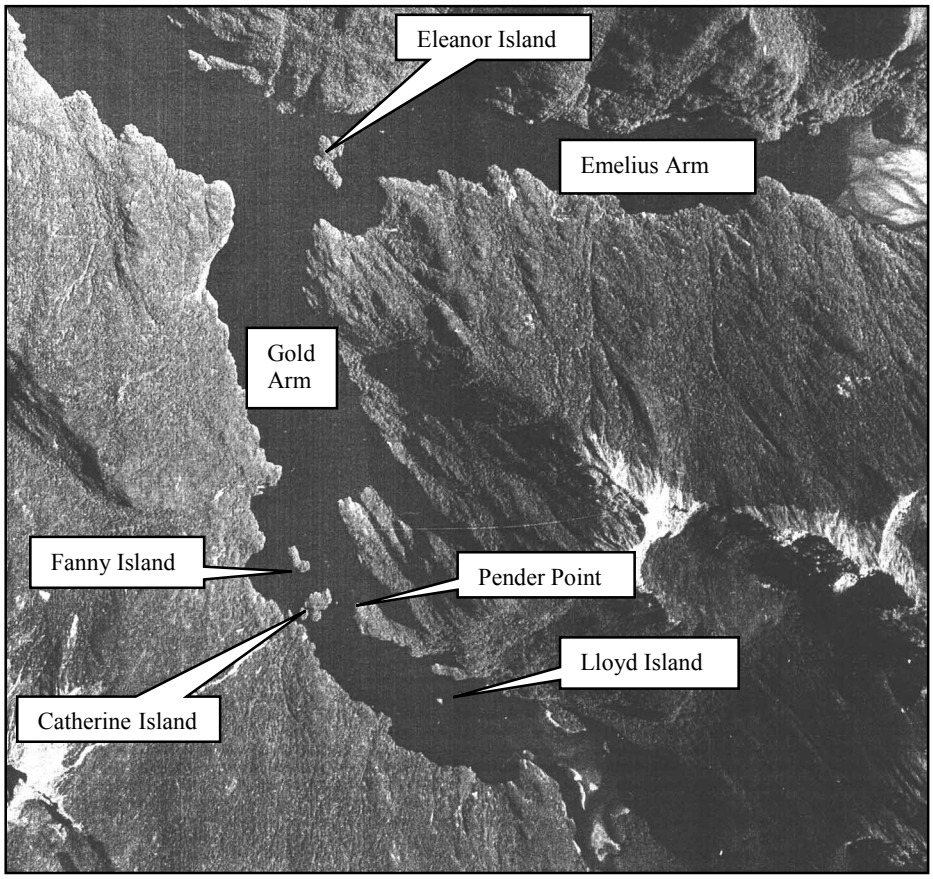


Figure 13
Aerial photograph of Charles Sound

1.7.4 The Lieutenant Commander in charge of the 1997/98 hydrographic survey, suggested in his report that the following be added to the directions in the Pilot:

> An alternative channel, surveyed between the rocks to the east of Fanny Island and the eastern shore, provides satisfactory depth of water but a 2.1m shoal close to the eastern shore requires care.

This section was not added to the most recent editions of the Pilot. The channel that he referred to was the same one down which the helicopter pilot guided the Master of the *Southern Winds* on the morning after the grounding.

1.7.5 Notice to Mariners 46/05, issued on 18 February 2005, advised that a new (16th) edition of the New Zealand Pilot had been published and was now available. There was little change between the 15th and 16th editions in reference to the Charles Sound area.

1.7.6 A boaties' guide to Fiordland produced by the Mana Cruising Club of New Zealand gave good information that could be used to supplement that contained in the New Zealand Pilot. The guide had a disclaimer warning the reader that the guide and the sketches in particular were not substitutes for the New Zealand Hydrographic charts, the Pilot, Nautical Almanac or other navigation publications. It stated that the entrance to Emelius Arm was clear of known dangers but in Gold Arm there was a cluster of rocks between Fanny Island and Pender Point. The sketch also indicated the preferred route past Fanny and Catherine Islands was by keeping to the eastern side of the islands and shoal ground. This was similar to the route down which the helicopter pilot guided the Master on the morning after the grounding.

1.7.7 Anchorages were shown in sketches accompanying the text. The guide recommended that where possible stern lines be run to the shore to make the anchorages more secure. In many places a permanently rigged line was available to be used to secure the stern (see Figure 14).

1.7.8 The Master said that he chose to anchor at Gold Arm because that was the only anchorage with which he was familiar. There were few DoC projects in Charles Sound so the Master had only been there on 6 or 7 occasions, and only on the *Renown,* before the grounding trip. Half of those visits had been as crew under the previous Master of the *Renown*.

1.7.9 The majority of DoC research took place in or to the south of Doubtful Sound, consequently the Masters of the boats were more used to navigating in that area. The sounds to the north were infrequently visited, so the Master's knowledge of those sounds, their weather conditions and safe anchorages was less extensive.

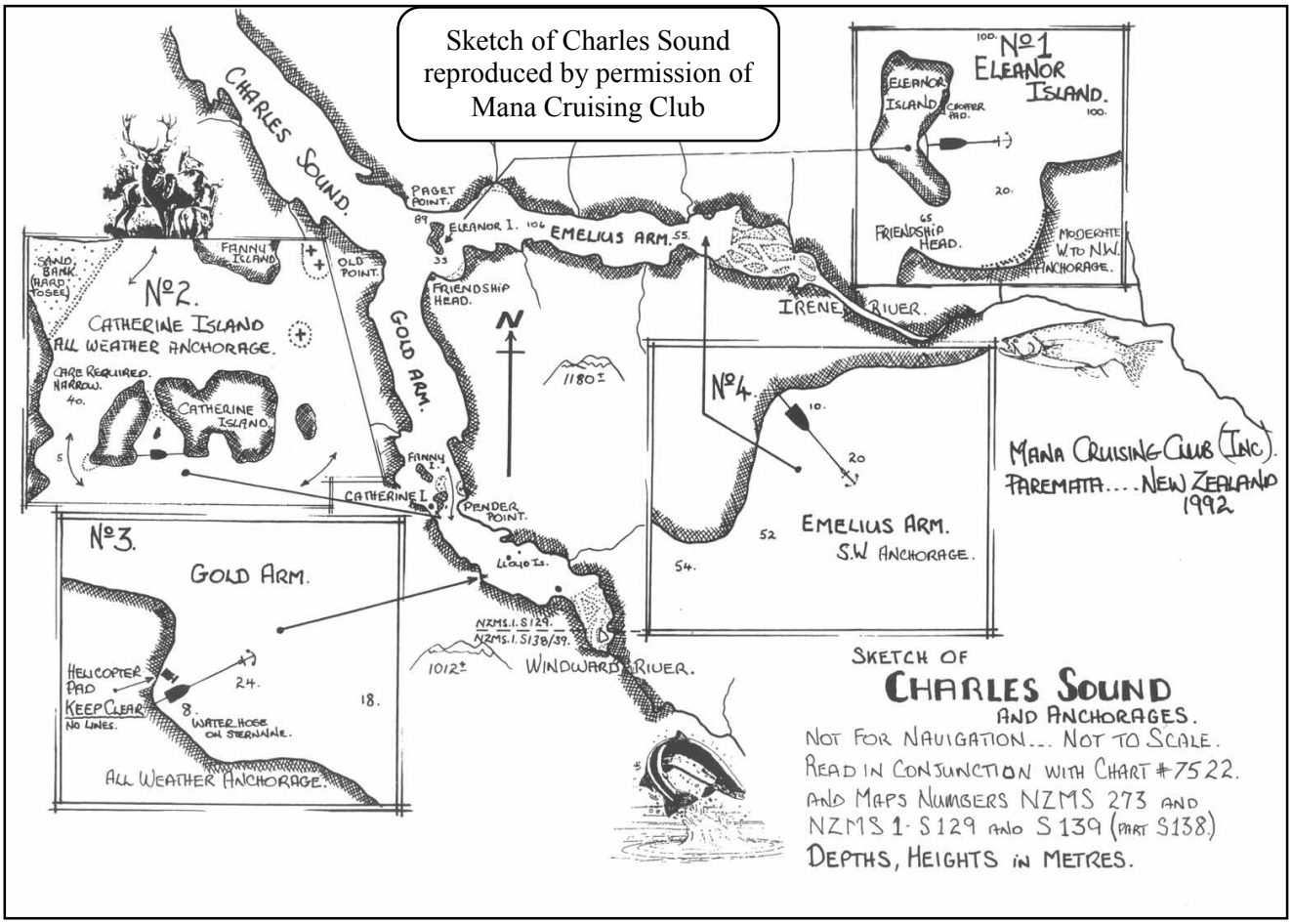


Figure 14
Sketch of Charles Sound from a boaties' guide to Fiordland

1.8 Hydrographic information

1.8.1 Maritime Rules Part 25, Nautical Charts and Publications as amended on 26 April 2004 determined the number, type and currency of the paper and electronic charts, and the nautical publications to be carried on a vessel. The relevant sections were:

> **25.6 Inshore and Enclosed Areas**
>
> (1) Except as provided in rule 25.6(2), the owner and the master of any vessel that operates in the inshore or enclosed areas must ensure that the vessel carries:
>
> (a) nautical charts that comply with rule 25.7; and
>
> (b) a nautical publication containing tide tables that complies with rule 25.8.
>
> (2) If a nautical chart or tide tables are not published for the waters in which a vessel is operating, the owner and the master of the vessel must:
>
> (a) ensure that the vessel carries the best alternative information available; and

(b) in the case of a nautical chart, advise the Director that no nautical chart is available for that operation.

25.7 Nautical Charts

(1) A nautical chart carried to meet the requirements of this Part must:

(a) be appropriate to the vessel's area of operations; and

(b) be of the largest scale available and suitable for the type of navigation it is being used for; and

(c) if it is an electronic chart:

(i) be part of an Electronic Chart Display and Information System that meets the requirements of Performance Standards for Electronic Chart Display and Information Systems (ECDIS) adopted by the International Maritime Organization by Assembly Resolution A.817(19); and

(ii) have paper back -up nautical charts; and

(iii) be operated only by persons who have received training, that is acceptable to the Director, in the use of electronic charts.

(2) Subject to rule 25.7(2A), a paper nautical chart carried to meet the requirements of this Part must:

(a) be certified by the relevant government institution as correct up to the date of supply to a chart retailer; and

(b) be maintained in a fully correct condition.

(2A) If a paper nautical chart is published by Land Information New Zealand and purchased in New Zealand, that chart will only meet the requirements of this Part if that chart:

(a) is certified by Land Information New Zealand as correct up to the date of supply to a chart retailer and is either:

(i) certified by a correcting chart retailer as correct up to the time of purchase; or

(ii) purchased from a chart retailer before the publication of corrections in the Notice to Mariners that follows the certification by Land Information New Zealand; and

(b) is maintained in a fully correct condition.

(2B) For the purposes of rule 25.7(2A), a correcting chart retailer is a chart retailer that has been approved by Land Information New Zealand to undertake chart corrections.

(2C) An electronic nautical chart carried to meet the requirements of this Part must be:

(a) if published by Land Information New Zealand and purchased in New Zealand, supplied by an agency approved by Land Information New Zealand to distribute electronic charts, and

(b) maintained in a fully corrected condition from updates supplied by Land Information New Zealand or its approved agents.

1.8.2 The paper chart NZ 7522 Charles Sound to Dagg Sound on the *Southern Winds* had been transferred from the *Renown*. The chart had been published in October 1987 and showed that small correction number 251/1990 had been done (see Figure 15).

1.8.3 In the years following the publication of the 1987 edition of NZ 7522 there had been 10 small corrections made to it up to the time the chart was withdrawn when the new chart, NZ 7624 Charles Sound to Dagg Sound, was published in April 1999. The new chart was initially printed with the land shown in green, but in October 1999 the chart was reprinted using international chart colours, where the land was shown in yellow.

1.8.4 In 1997/98 HMNZ ships *Tarapunga* and *Takapu* carried out a hydrographic survey in Fiordland. The survey had primarily been commissioned to provide accurate charts for tourist passenger ships that were visiting the area more frequently. However, the surveyors did investigate some of the inshore areas, Charles Sound being one of those areas. The survey examined the shoal area between Catherine and Fanny Islands, changing the description of some of the rocks and shoals. The new chart moved the edge of the shoal ground marginally to the west, closing the distance between it and the islands.

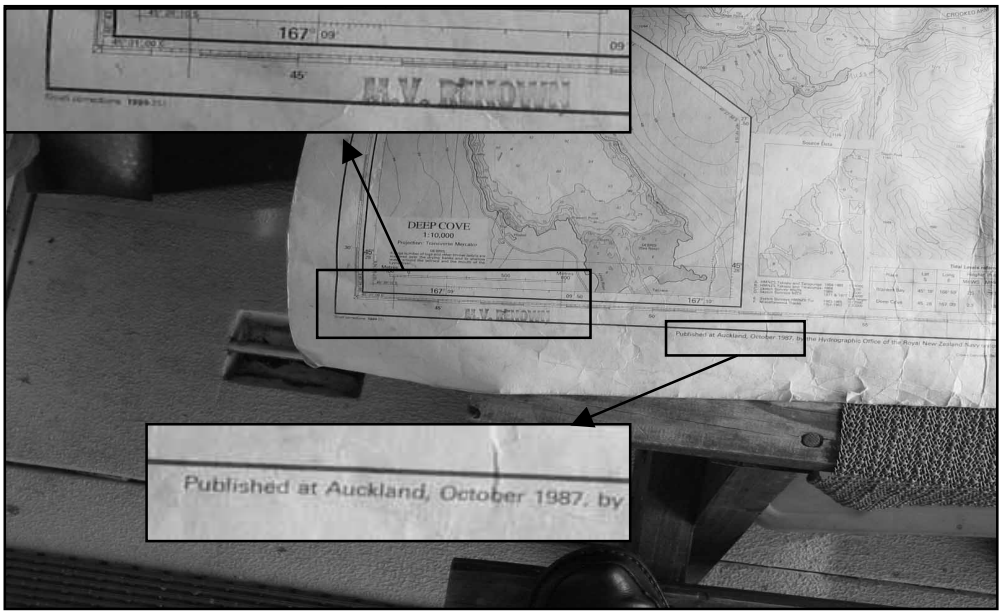


Figure 15
Paper chart carried on the *Southern Winds*

1.8.5 The chart catalogue gave the following guidance to mariners on the use of charts:

> **Advice on the use of charts**
> Mariners should ensure that the charts and publications on board their vessel are adequate for the voyage and up to date according to this catalogue and Notices to Mariners. For voyages beyond New Zealand, the British Admiralty chart catalogue and Notices to Mariners should be used. Charts are an aid to navigation and the degree of dependability must be subject to the judgement of the user.
> A source statement is given either in the title of a chart stating survey authorities with dates, or in a source data diagram showing dates and areas of surveys. For detailed information see the Admiralty Mariner's Handbook.

Chart NZ 7624 included a diagram and description of the source data and also carried a warning in respect of coastal navigation that read:

> Mariners without local knowledge should exercise caution particularly when approaching the coast in depths of less than 100 metres as not all inshore features may have been delineated.

1.8.6 Maritime Rules Part 25.7 1c (i–iii) prescribes the requirements for an electronic chart display and information system (ECDIS). The Olex track plotter and electronic chart system did not purport to be, and were not compliant with the ECDIS requirements contained in that rule.

1.8.7 The Managing Director of Olex AS indicated that the system was only as accurate as the GPS and the vector charts. He estimated that the GPS should normally be accurate to within 10 m, but intermittent errors and loss of good satellite signal could result in much larger errors. He went on to say that vector charts could easily have an error of 100 m or more.

1.8.8 Other sources estimate the value of error that can be expected by a standard GPS receiver as being variously either up to 15 m, or 50 to 100 m. Working in the sounds with the extreme topography could result in the receiver not being able to see sufficient satellites to calculate an accurate position. This had happened on the *Southern Winds* earlier in the day about one nm north of Fanny Island when they were heading into the sound (see Figure 3).

1.8.9 It was not possible to correct the C-MAP charts to accommodate the changes promulgated in the weekly Notices to Mariners. Instead mariners needed to buy an updated chart CD which, when installed, totally replaced their entire existing chart folio. As a temporary solution it was possible for mariners to add warning marks, with a description of the promulgated correction.

1.8.10 The Master said that they did not receive weekly Notices to Mariners and consequently their charts were uncorrected and he was unaware that a new chart had been published for this area.

1.8.11 Maritime Rules Part 25 required a boat operating in the enclosed or inshore area to carry nautical charts and a book containing the tide tables. When operating in the offshore or coastal area, in addition to the charts and tide tables, a boat was required to have the list of lights and, if the boat was not a fishing boat, the New Zealand Pilot. Although the SSM manual showed that the New Zealand Pilot was on board the boat, the Master could not produce it.

1.9 Environmental information

1.9.1 The wind and sea on the west coast are predominantly from the westerly quarter. The sounds give varying degrees of shelter from the weather depending on its direction.

1.9.2 Charles Sound is within the Milford weather forecast area, which extended from Jackson Head in the north to Secretary Island in the South. The meteorological notes in the New Zealand Mariner's Handbook stated that coastal weather forecasts are a general indication of average conditions expected in a particular coastal area. The forecasts are for open waters to within 60 nm of the coast and do not apply to enclosed areas such as the sounds. The local topography, in particular the high, near-vertical mountainsides, causes variations in the direction and strength of the wind, with gusts that can exceed the mean wind strength. However, in the absence of any other weather forecasts, the coastal forecast gave the mariner the best indication of the expected weather inside the sounds.

1.9.3 In the days prior to the grounding, the wind was generally from the north and west sectors and was mostly above 20 knots. The marine weather bulletin for the Milford weather forecast area, issued by the Meteorological Service of New Zealand at 1249 on 14 October, which was valid until midday on 15 October was:

> Northwest 15 knots rising to 30 knots this evening and easing to 20 knots in the morning. Sea becoming rough for a time. Westerly swell 4 metres. Poor visibility in occasional rain.
> OUTLOOK FOLLOWING 12 HOURS: Northeast 10 knots.

This forecast remained in force until midnight on 14 October.

1.9.4 The forecast for Puysegur, the area immediately to the south of Milford forecast area, for the evening of 14 October was for northwest gales of 40 knots.

1.9.5 The New Zealand Pilot had a section on local weather for the Fiordland area. In part it read:

> Weather conditions within the sounds are likely to be very different from those outside. In the sounds local katabatic winds may be experienced in strong wind conditions. Strong local gusts are common especially when the wind is from the N.
> Weather forecasts for the area should be treated with caution and mariners are warned that barometric anomalies may be experienced along the coast.

1.9.6 There was a meteorological observation station situated on Secretary Island, about 13 nm southwest of Charles Sound. The readings for the time before and immediately after the grounding were:

Date	Time (NZDT)	Wind Direction (°T)	Wind Speed (knots)	Max Gust (knots)	Temp (°C)	Dew Point (°C)	Pressure (hPa)	Rain (mm)	Relative Humidity (%)
14 Oct	2000	050	15	25	10.4	8.8	1002.2	1.2	90
14 Oct	2100	040	22	31	10.8	9.5	1002.2	0.6	92
14 Oct	2200	040	13	30	11.5	10.3	1003.0	0.6	92
14 Oct	2300	030	10	20	11.6	10.4	1003.3	nil	93
15 Oct	0000	010	5	15	11.5	10.3	1003.2	nil	92

1.9.7 During Thursday 14 October, the Master recorded the weather as northwest 15 to 25 knots. He said that when they first arrived at the anchorage there was little wind and the boat lay quietly to her anchor. But from about 2100 the weather started to deteriorate and the boat started to yaw heavily, eventually causing the anchor to drag.

1.9.8 The Master estimated that the wind continued to blow at anything up to 50 or 60 knots. It attained enough strength for the DoC staff member who was handling the anchor to be knocked off his feet and nearly blown over the side.

1.9.9 Charles Sound was a secondary tidal port of the standard port Westport. On 14 October the tides at Charles Sound were 0.5 m at 1718, 3.1 m at 2331 and 0.4 m at 0539 (15th). So the *Southern Winds* ran aground at about high water.

1.9.10 On 14 October the sun set at 2016 and civil twilight finished at 2046. The moon was new on 14 October, so was not visible during that evening. At the time of the grounding there would have been no natural light.

1.10 Department of Conservation communications

1.10.1 DoC personnel often operated in remote areas including forests, mountain ranges, off-lying islands and dense bush where reliable and effective communication was essential but difficult to provide. As part of its health and safety awareness, the Department had a telecommunications team whose task was to provide efficient emergency communications solutions for the staff. A radio system that originated from the forestry industry had been the backbone of DoC communications, and it was on this that any new system was to be based.

1.10.2 It was recognised that VHF radio waves travel in a straight line and do not bend around obstacles, such as mountains. So, if VHF were to be used, an extensive system of repeater stations on high points, like mountaintops, would be required. Such a system was occasionally used for specific local projects, but on a national scale a more reliable and flexible system was needed. It was accepted that HF radio would provide good coverage over the majority of the intended operating area for the greatest percentage of the time. HF radio uses the ionosphere to reflect (or bounce) the radio waves, making it more likely that a signal would be able to bounce over an intermediate obstacle (see Figure 16).

1.10.3 A project to improve HF communications throughout the country and to provide good coverage was launched in 2000. Primarily the communications strategy was to provide a system to summon help in the event of an emergency, but it had the second functionality of being used for rural fire fighting. The system was sufficiently comprehensive that it was also used for operational and administrative purposes, and it was for this purpose that it was used most often. The project management team decided to use a selective calling (selcall) system, where one station can transmit the identification signal of the station to which it wishes to talk and that station is automatically alerted rather than rely on open communications. The main part of the communications system was the positioning of national (NTI) and local base stations (BTI), which allowed different distances between transmitter and receiver to help overcome the propagation problem of the transmitter and receiver being too close to one another (see Figure 17).

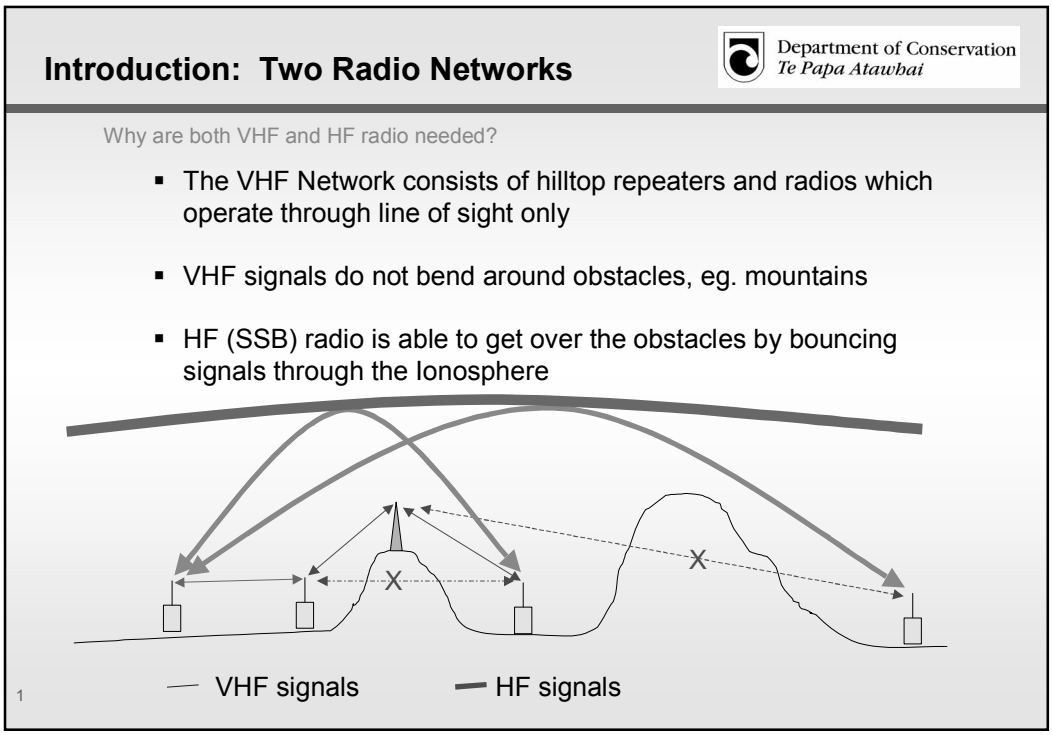


Figure 16
Diagram showing the difference between VHF and HF radio wave propagation

1.10.4 The communications system was further expanded by using telephone calling (telcall), a system whereby a radio system was automatically interlinked with the public telephone system. Consequently, the telcall system enabled people in the field to summon help from anyone connected to the telephone system, at any time, without the need for someone to maintain a continuous watch on SSB radio. It was possible to call any telephone number, however this required inputting up to 15 digits, which made mistakes likely. To reduce the risks of dialling errors DoC had put in place speed dialling for its most used numbers including the emergency services.

1.10.5 DoC standardised its radio equipment, choosing 3 models of transceiver:

- The SR3, which was a small battery-operated transceiver that had preselected radio channels, which could be programmed with the NTI and BTI frequencies. The SR3 was sufficiently small to be carried by field parties, but had enough range to provide emergency communications from most locations. It did not have a scan facility.
- The Q-Mac HF – 90, which was a semi-portable radio more suitable to transportation in vehicles. It had a scanning facility and variable channel selection.

- The Codan 8528, which was a base radio that was usually installed in huts and DoC regional offices as a base unit. It had a scanning facility and variable channel selection. The marine version of this radio, the Codan 8528S, was fitted on the *Southern Winds*.

1.10.6 A number of employees for each area had been trained in the use of the DoC radio system with the intent that they teach others in the area. This was a fairly new project that had been hindered in the Te Anau area by the resignation of the trained trainer. The selcall and telcall system had not been in use very long so the staff had not had a great deal of practical use to complement the in-house training.

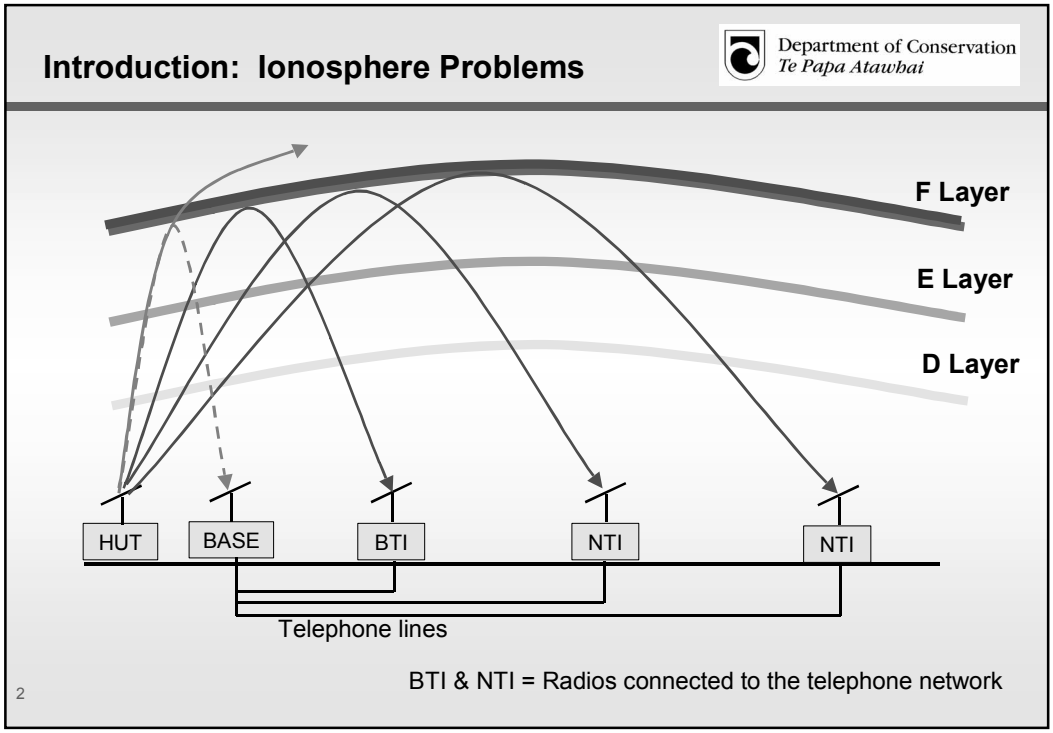


Figure 17
Ionospheric problems of HF propagation

1.10.7 The communications attempts from the boat appear to have been limited to the DoC frequencies, until after 0600 in the morning when they called the local Fiordland Fisherman's Radio on VHF channel 66 through the Mount Irene repeater. During the night there was no attempt by the people on the boat to transmit or listen on the maritime frequencies. Maritime Radio, Fiordland Fisherman's Radio and a fishing boat 3 nm off the coast attempted without success to contact the boat on SSB and VHF channels 16 and 66.

1.10.8 Section 2.4 of the *Southern Winds* SSM manual details the radio reporting schedules that the boat should keep. The reporting interval and the need to log a trip report, usually referred to as a TR, with a shore base were mentioned together with regular position reports. It was left to the Master's discretion whether the shore base was a nominated DoC base or Maritime Radio. However, the manual goes on to specify that a listening watch be maintained on VHF channel 16 or SSB frequency of 2182 kHz during the silence periods of from on the hour to 3 minutes past, and from 30 minutes past the hour to 33 minutes past the hour.

1.10.9 Maritime Radio did not have the *Southern Winds* on its database, which indicated that the boat had not contacted it since it started operations in June 2004.

1.10.10 Maritime Radio said that there was intermittent VHF radio coverage inside the sounds; particularly those that were steep sided. However, when using SSB frequencies there was almost complete coverage.

1.11 Manning and qualifications

1.11.1 The manning and qualification requirements for this vessel were extremely complicated. There were a large number of permutations and combinations of areas of operation, whether it was operating as a passenger or non-passenger vessel, the power of each engine and number of engine systems.

1.11.2 The Master held a New Zealand Coastal Master certificate, which was equivalent to a New Zealand Offshore Master certificate limited to within 100 nm of the coast. He also held an Engineer Local Ship certificate, which was equivalent to a Marine Engineer Class 5 (MEC5).

1.11.3 Maritime Rules Part 31B defined a passenger as a person carried on a vessel other than:

> the master and members of the crew, and any other person employed or engaged in any capacity on board the vessel on the business of the vessel;

A legal opinion obtained by the Commission concluded that the persons on board the vessel, other than the Master, were carrying out their core businesses ashore and so were not considered to be "employed or engaged in any capacity on board the vessel on the business of the vessel". So, for the purpose of manning and qualifications, the people on board were considered to be passengers and therefore the vessel was a passenger vessel. To date, Maritime New Zealand (Maritime NZ) has generally considered DoC employees as not being passengers.

1.11.4 The Master was of the opinion, formed after discussions with Maritime NZ representatives, that all the people on board were either crew or volunteers. The Master considered that the person who held a less than 6 m certificate of competency and a Coastguard New Zealand Day Skipper certificate and the observer from the Guardians of Fiordland's Fisheries and Marine Environment Inc who held a 2DTE were designated as crew and the vessel's logbook was annotated to this effect.

1.11.5 The position of the grounding was inside Charles Sound and was in enclosed water limits. The manning requirement for this area for both passenger and non-passenger vessels was for 2 crew with the Master holding an Inshore Launchmaster (ILM) certificate.

1.11.6 The SSM certificate defined the vessel's limits as:

> Passenger: Inshore limits - Foveaux Strait and Fiordland
> Non-passenger: Offshore limits - restricted to within 100 miles of the coast of NZ including Stewart Island

However, the key information sheet and the SSM manual for the vessel had the following:

> Passenger and Non passenger Limits - Inshore: Fiordland and Foveaux Strait
> Non passenger Limits - Coastal limits to which inshore limits have been assigned: inside a straight line commencing at Wakoputa Point, thence to a position 270° 5 miles from the west point of Cod Island, thence to a position 270° 5 miles from West Point of Long Island, thence to a position 180° 5 miles from South Cape Stewart Island, thence to a position 135° 5 miles from Shelter Point Stewart Island, thence to Waipapa Point.

1.11.7 The key information sheet had the following manning scale for the vessel:

> Master: NZOM with command endorsement
> Mate: ILM
> Crew must also include Engineer qualification MEC 4 (can be held by the master or other crewmember)

1.11.8 On the voyage from Bluff to Fiordland the *Southern Winds* went from the Foveaux inshore area, across a section of coastal area before entering the Fiordland inshore area.

1.11.9 For the vessel to operate in the inshore area as a passenger vessel with fewer than 20 passengers, it was required to have a minimum crew of one holding an ILM certificate. As a non-passenger vessel it required a crew of 2, with the Master holding an ILM certificate.

1.11.10 For the vessel to operate in the coastal area as a passenger vessel it was required to hold a minimum safe crewing document, which it did not have. As a non-passenger vessel in the coastal area it required a crew of 2, with the Master holding a New Zealand Offshore Watchkeeper certificate with command endorsement, a mate with an ILM certificate and an engineer with a MEC6 who may be the mate.

1.11.11 The manning and qualifications for enclosed and inshore areas were similar for both passenger vessels and non-passenger vessels. But the requirement to have a minimum safe crewing document made a significant difference between passenger and non-passenger in the coastal area.

2 Analysis

2.1 The weight of the anchors on the *Southern Winds* was less than that required by Maritime Rules Part 40C. The size of the original chain to which the new 15 mm chain was attached was less than prescribed in the rule. The Master used an anchor rode ratio of about 4:1, less than would have been optimal given the weather conditions, the exposed nature of the area and the movement of the vessel. Had the anchoring equipment been of the correct specifications for the vessel and the Master used a higher ratio of anchor cable to the depth of the water, the anchor may have held fast for longer.

2.2 The anchor had been certificated by SGS M&I, Dunedin as being of acceptable quality for that particular type and weight of anchor. That certification did not mean that it was the correct weight of anchor for the *Southern Winds*. The surveyor from SGS M&I, Invercargill should have determined the size and type of anchoring equipment the vessel required.

2.3 The unexpected motion, particularly the exaggerated yawing of the boat, put excessive strain on the mooring, breaking any hold that the anchor may have had. Had the Master been able to control the swing of the boat, either with a stern anchor or a stern line, the bow anchor might have been able to hold the vessel. But with the stern being unrestrained, the movement allowed the boat to lie across the wind and place enough weight on the anchor to break it out of the sea bottom.

2.4 The Master's unfamiliarity with the area prevented him considering any other anchorages when he was looking for a safe haven for the night. He automatically headed to where he had always gone in the past. He did not consider the possibility of needing to leave the inner Gold Arm in darkness; had he done so, he may have realised how perilous anchoring in that area could be.

2.5 The boat had not been in operation for very long and as such the Master might not have been fully familiar with the handling of the boat in adverse weather, at night, at slow speed. This may have resulted in the boat making more leeway than expected when it turned across the wind as it altered course to port around Catherine Island, causing it to deviate from its intended track.

2.6 The Master was familiar with navigating the vessel by eye with only casual reference to the radar and track plotter. Because of the complete darkness prevailing, the Master would have lost his primary navigation tool, his visibility, making him totally reliant on the electronic navigation aids, something at which he was less practised.

2.7 The Olex track plotter being on the console immediately in front of the Master and next to the radar would have made it almost impossible for the Master not to refer to it. The combination of the 2 streams of information from the radar and track plotter, while the Master was concentrating on steering the boat and adjusting the speed, may have been distracting.

Information that is presented on a radar differs from that on a track plotter and the 2 different views may have caused the Master confusion.

2.8 The disclaimer shown on the start-up of the Olex system, and also that on the chart CD, was similar to that on many electronic navigation chart systems. It both warned the operator of the limitations of the system and removed all responsibility from the supplier of the track plotter and the charts. Notwithstanding the warnings, the presentation of such track plotters, their apparent simplicity and the apparent accuracy of the visual display could deceive an operator into believing them to be absolutely accurate. With their increase in popularity and affordability, track plotters and electronic chart systems are becoming a relied-upon navigation aid, even leading to the exclusion of more traditional navigation aids such as radar.

2.9 The use of track plotters can both assist mariners and lead them into danger. Track plotters give a clear, apparently accurate, representation of a vessel's position in relation to the surrounding coastline and so enable the mariner to have better situational awareness. This could lead an operator to believe wrongly that the positional information is absolute, ignoring the fact that the system is subject to limitations and errors. Consequently, over reliance on track plotters and electronic chart systems could be dangerous. Notwithstanding that, with understanding of the possible errors and cross-reference to other forms of navigation, track plotter systems are generally beneficial to the safe operation of a vessel.

2.10 The Master said that he was aware of the warning on the Olex plotter and the C-MAP charts that described their limitations and that they were not to be used as the primary source of navigation. This being the case, it would have been prudent of the Master to ensure that the primary sources of navigational material available on the vessel were the most current and comprehensive. This was not the case.

2.11 At the time of the grounding, there had been no new corrections to Chart NZ 7624 since it had been published, so the electronic charts were far more up to date than the superseded NZ 7522 paper chart on the *Southern Winds*. The electronic chart was still susceptible to numerous errors and as such could not be used with any certainty while navigating in such close proximity to hazards.

2.12 The recent hydrographic survey conducted by the Navy on behalf of Land Information New Zealand was primarily to provide reliable charted routes along the coast and into the sounds for visiting cruise ships. However, the survey did examine known areas within the sounds and did better chart them. The area around Catherine and Fanny Islands in Charles Sound was surveyed and the presence of the known rocks in the shoal area was confirmed. No other rocks were noted in the survey.

2.13 The cartographer of the new edition of NZ 7624, published in 1999, incorporated the results of the 1997/98 survey. He showed that the area of shoal ground had expanded slightly westwards, reducing the charted clear water between the shoal and the islands.

2.14 All of the nautical publications and charts were of no use if they were not immediately available or consulted. Had the Master consulted the Pilot or Guide he might have realised that it would be almost impossible to negotiate the passage between the islands without visual cues. Once the weather had deteriorated and the anchor refused to hold, it was too late to consult the books, as the directions they contained were insufficiently clear for them to provide a safe route past the shoal area between the islands.

2.15 After the person had been knocked off his feet and the anchor had dragged for the third time, the Master was convinced that the only safe place to be was in the outer sound; he did not consider that getting past the shoal ground might be more perilous.

2.16 Ultimately, the absence of the up-to-date books and charts did not contribute to the grounding, as the master had not considered using them.

2.17 The weather forecast for the Milford coastal meteorological area did not indicate the likelihood of extreme winds in Charles Sound. However, the warning in the Pilot that localised wind gusts could be expected especially when the wind was from the north might have warned the Master that the force of the wind might increase, had he read it. The weather experienced in Charles Sound was not reflected in that recorded at Secretary Island on the night of the grounding. This may have been a factor of the position of the weather station or the localised increase in wind strength caused by the mountainous terrain in Charles Sound.

2.18 There was little supervision of the boat from ashore, leaving the Master to work in isolation from those who should have been overseeing its operation. This situation was exacerbated by the resignation of the Programme Manager Service before the grounding. There was little knowledge of ship management within the DoC management team; consequently alternative ways of operating the boat had not been explored.

2.19 The boat's day-to-day running was left entirely to the Master to organise. He carried out all of the safety-critical tasks himself, delegating only some of the more basic tasks to the other people on board. Essentially it was a one-man operation with little or no support for the Master should he become incapacitated or fatigued. On this occasion, when the situation deteriorated he did not have any similarly trained or qualified person with whom to discuss the best course of action.

2.20 There had been no risk assessment carried out on the boat's operation so there were no clear guidelines of how or where the boat should operate. Every operation was at the Master's discretion, without him having any guidance or control from ashore.

2.21 The definitions of passenger, and passenger vessel as contained in Maritime Rules Part 31B, when applied to this type of operation, were extremely difficult to interpret. Maritime NZ has to date considered that DoC staff on a DoC boat are not passengers, whereas a legal opinion obtained by the Commission was that they fell within the definition of passenger as contained in Part 31B. These differing views demonstrate how open to interpretation the rule was.

2.22 Other than the Master, the persons on board were there primarily to carry out scientific projects; even the 2 persons identified in the logbook as crew had alternative tasks, one weed control and the other observing the delineation of the marine reserve boundaries and assisting in the pest control project. The 2 persons identified as crew in the logbook were not sufficiently qualified to fulfil the role of crew when the vessel was in the coastal area. The less than 6 m certificates were specifically for small boats and other than general boating common sense did not infer any larger craft training and knowledge.

2.23 The manning rules were particularly difficult to apply to this vessel. The passenger/non-passenger issue had little effect on the actual manning and qualifications required on the boat in the inshore or enclosed areas, but became pertinent in the coastal area where a minimum safe crewing document would have been required. There were inconsistencies in the SSM company documentation; these could have been avoided had the boat manning and qualifications been clearly prescribed on the SSM certificate for each of the different areas and type of operation in which the boat was engaged. The imprecise notation of the minimum manning did not assist the Department to identify that the boat was being undermanned on a regular basis. However, the key information sheet for the boat did show that a Master and Mate were required. This should have guided the Department towards the fact that at least 2 properly qualified crew were required on the boat at all times.

2.24 The grounding occurred in the enclosed area; consequently the boat was adequately manned at that time. However, the trip between Bluff and Preservation Inlet was in the coastal area and during that time the vessel did not meet the manning requirements.

2.25 A prudent seaman working in such a remote and potentially inhospitable region would have been expected to ensure that the most up-to-date information was available and for that

information to be fully consulted before making critical decisions, particularly where current local knowledge was limited.

2.26 The Master had worked on DoC vessels for 17 years without exposure to alternative operations. He had not been on any industry-related training courses even though the vessel that he now commanded was a modern, fast boat with state-of-the-art electronic navigation aids. The Master had been given basic training in the use of the Olex track plotter by the installer, but he was unaware of its limitations and the types of error that could be expected in such a system. However, the Master later said that he had spent time on another fisherman's boat familiarising himself with the uses of the Olex plotter system.

2.27 The poor sleep during the night before the grounding may have resulted in the Master being fatigued on the Thursday. The frustration of yet another nights disturbed rest might have led him to decide that heading into the outer sound, past the hazardous waters in the vicinity of Catherine Island, was better than trying to remain in the inner sound. However, the Master later said that frustration did not play a part in his decision to leave Gold Arm.

2.28 One of the most critical parts of the vessel's operation was maintaining communications in remote areas such as the Fiordland sounds. During the refit of the boat, an Iridium satellite telephone had been installed with the intention of improving communications but this had not worked immediately after the grounding, and was found to be faulty when later tested in Bluff. Immediately after the grounding the boat's Codan 8528S SSB radio was used, without success. Later it was found that the boat's earth strap was broken, causing the radio's signal strength to be seriously degraded. The SR3 field radios that were carried in addition to the boat's equipment worked better ashore than on the boat, again probably due to the poor earth available on a fibreglass boat with a broken earth strap. Notwithstanding the broken earth strap, the SR3 did make contact with the Master's wife, albeit with varied signal strength leading to an incomplete message being passed. Although they did manage to use selcall and telcall to contact the Master's wife, the system was relatively new and did not appear to be fully understood or used to its full potential.

2.29 The crew on the boat was unaware of the concern the incomplete message to the Master's wife had caused. However, the Master did lose a valuable opportunity by not attempting to contact Maritime Radio or listen to the maritime frequencies throughout the night, particularly during the silence periods, which the SSM manual required him to do.

2.30 On the boat there seemed to be a culture of not using the maritime radio frequencies, even though they were part of the boat's operation manual. Most commercial vessels and an increasing number of recreational boats advise Maritime Radio of their intentions in a trip report. The *Southern Winds* did not send such reports and was not known to Maritime Radio. Irrespective of the support provided by the DoC radio system, the crew of a commercial vessel, particularly a vessel belonging to a government department, should provide information about their trip to Maritime Radio for their own safety and also for them to be available to assist others.

2.31 The difference between this boat and its predecessor was marked; it had a maximum speed almost 3 times as great, had a semi-planing hull and was constructed of fibreglass. Consequently, the *Southern Winds* was more vulnerable to damage should it make contact with the ground or be involved in a collision with another vessel or structure. DoC should therefore have put in place more stringent operating parameters to mitigate the risks inherent when operating in confined waters.

2.32 Because the point of impact was on the keel rather than the hull itself, the damage was restricted to that area. Had the hull taken the full force of the contact, the resultant damage would most probably have been much more severe.

2.33 The damage sustained during the grounding was unlikely to have compromised the integrity of the boat. Had the breached compartment become completely flooded, the water would have

drained aft into compartments connected to the fixed bilge piping from where it could have been pumped. As it was, the Master and passengers acted efficiently and were able to control the ingress of water with a patch, and rig a temporary bilge line into the breached compartment and so prevented that compartment from flooding.

3 Findings

Findings are listed in order of development, not in order of priority.

3.1 A combination of the high winds, less than optimal length of anchor cable, underweight anchor and the subsequent degree of movement of the *Southern Winds* about her anchor resulted in the boat being unable to remain at anchor.

3.2 The Master decided that not being able to anchor made it too dangerous to remain in the inner sound. He therefore chose to head into the outer sound past the islands and shoal ground in the vicinity of Catherine Island.

3.3 The boat grounded as the Master was attempting to negotiate the narrow, dangerous passage between inner and outer Charles Sound.

3.4 The boat was anchored in an area from which it was difficult to reach safe waters, particularly when there was no natural light and therefore no visibility.

3.5 The vessel did not have the latest hydrographic information on board.

3.6 The area of operation was remote and communications were unreliable. The use of Maritime Radio would have most probably resulted in communication being made, thus removing the uncertainty surrounding the boat's condition and its location.

3.7 The DoC communication network was comprehensive and gave good radio coverage over the whole country. This should have resulted in the personnel on the boat being able to contact DoC management in Te Anau.

3.8 The Master said that he usually navigated by eye with occasional reference to the radar and track plotter. On this occasion he had to navigate solely on the electronic instruments, a task in which he was less practised.

3.9 Despite the warnings on the track plotter and the C-MAPS, the display unit was situated in the prime position on the console, right in front of the Master, making it almost impossible to ignore, particularly at night when there was no visibility through the windows.

3.10 The extreme weather experienced at the time of the grounding had not been forecast, but it may have been predicted if the warnings in the New Zealand Pilot had been heeded.

3.11 The shore management team had little maritime experience or experience in overseeing the operation of a large vessel. Consequently, any nautical-based decisions were left in the hands of the Master. No risk analysis or audit of ship board operations had been carried out, nor was there a defined operating envelope within which the boat should operate.

3.12 If there had been another qualified and experienced crewmember, the Master would have had someone to support him and with whom to discuss contingency plans.

3.13 Risk prevention was more crucial, particularly when operating in remote locations because of the nature and vulnerability of the *Southern Winds.*

3.14 There had been no external training for the Master. Training for the new vessel had been limited to in-house familiarisation.

3.15 The Maritime Rules concerning the minimum crewing of vessels were so complicated that they could be interpreted in a number of ways, which made them difficult to administer.

4 Safety Actions

4.1 Since the grounding the *Southern Winds* has been equipped with up-to-date charts and nautical publications.

5 Safety Recommendations

Safety recommendations are listed in order of development, not in order of priority.

5.1 On 22 June 2005, the Commission recommended to the Director General of the Department of Conservation that he:

5.1.1 urgently undertake a comprehensive risk analysis of all aspects of the operation of the *Southern Winds*. This assessment should include the method and chain of command of the shore management team. (048/05)

5.1.2 in conjunction with the Safe Ship Management Company review the *Southern Winds* Safe Ship Management operations manual to promote best operating practices for the intended use of the boat. (049/05)

5.1.3 promote compliance with the Safe Ship Management operations manual by the boat crew, particularly the maintenance of radio contact with Maritime Radio while the boat is at sea. (050/05)

5.1.4 in consultation with the Safe Ship Management Company compile and include in the Safe Ship Management manual a comprehensive list of minimum manning for all the areas and types of operation that the *Southern Winds* intends to undertake. (051/05)

5.1.5 in consultation with the Safe Ship Management Company ensure that the *Southern Winds* meets the requirements of all Maritime Rules applicable to the vessel. (052/05)

5.1.6 initiate a training regime for the crew of the *Southern Winds* to include, but not be limited to, electronic navigation aids and blind pilotage. (053/05)

5.2 On the 8 July 2005 the Te Anau Area Manager of the Department of Conservation replied in part:

> I can confirm that the department accepts the final safety recommendations in the report.
>
> I am actively seeking to implement all the recommendations and work with MSA and SGSM&I to ensure the best result. This work has already commenced and is ongoing.
>
> Some of the recommendations require a significant amount of work and involve the co-operation of a number of external parties so may take some time to complete but work is underway on all recommendations.

5.3 On 22 June 2005, the Commission recommended to the Shipping Product Manager of SGS M&I that he:

5.3.1 ensure that his Safe Ship Management surveyors ensure that the minimum manning and operating limits of all client vessels are clearly notified in the Safe Ship Management documentation. (054/05)

5.3.2 ensure that Safe Ship Management surveyors are aware of the requirements of the Maritime Rules and that the vessels they inspect and certify meet the requirements of those rules. (055/05)

5.3.3 in conjunction with the Department of Conservation review the *Southern Winds* Safe Ship Management operations manual to promote best operating practices for the intended use of the boat. (056/05)

5.4 On 7 July 2005, the Shipping Product Manager of SGSM&I replied in part:

> The Safe Ship Management data and definitions are to be revised, in consultation with DOC for safety of operations, in particular in way of manning provisions and required qualifications, and in order to concur fully with the Safe Ship Management certificate.
>
> and
>
> Please find attached a copy of a fax memorandum that has been sent to our district offices in way of compliance with safety recommendations 054/05 and 055/05.

5.5 On 22 June 2005, the Commission recommended to the Director of Maritime Safety that he:

5.5.1 prepare and circulate a Rules Bulletin to clarify the requirements for the operation of a vessel that has both passenger and non-passenger certification. The Safe Ship Management manuals should clearly state the requirements for the vessel in each mode of operation, with particular emphasis on the classification of the persons on board whether they be designated as passengers or crew. (057/05)

5.6 On 11 July 2005, the Acting Director of Maritime New Zealand replied in part:

> This recommendation is acceptable to Maritime New Zealand and will be actioned accordingly.

5.7 On 27 May 2005 the Commission, as a result of occurrence report 04-212 the foundering of the fishing vessel *Iron Maiden* off Pandora Bank, Northland on 16 August 2004, recommended to the Director of Maritime Safety that he:

5.4.1 in order to reduce confusion and the possibility of misinterpretation, develop a policy to rationalise and simplify the current maritime rules concerning the crewing and watchkeeping requirements for non-SOLAS vessels, and the limits in which they operate. (028/05)

5.4.2 while policy and any legislative changes are being developed, consult with industry to develop a communication and education strategy to ensure that masters, owners, operators, surveyors and inspectors are aware of the validity of the present qualifications and the minimum crewing requirements for all vessels and their relevant operating areas. (029/05)

On 8 June 2005, the Maritime Safety Authority replied to the above recommendations:

> Maritime Rules 31B and C are currently being amended. MSA is prepared to accept this recommendation, provided suitable funding is obtained in its 06/07 rules bid to extend this work. (028/05)
>
> MSA accept this recommendation and will consult with industry through its publication “Safe Seas, Clean Seas”. (029/05).

These safety recommendations are equally applicable in this case, so no further recommendations relating to the revision of the Maritime Rules pertaining to crewing and qualification, and the operating limits have been made to the Director of Maritime Safety.

Approved on 30 June for publication

WP Jeffries
Chief Commissioner

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Price $32.00 ISSN 1173-5597