

REPORT ON THE
PRELIMINARY INVESTIGATION INTO THE
GROUNDING OF MV NELLA DAN
AT MACQUARIE ISLAND ON 3 DECEMBER 1987

April 1988

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NELLA DAN PRELIMINARY INVESTIGATION
OUTLINE OF INCIDENT

The Danish Antarctic supply vessel NELLA DAN grounded in Buckles Bay at the northern end of Macquarie Island on the evening of 3 December 1987 in approximate position, latitude 54 degrees 29.2 minutes South, longitude 158 degrees 58.1 minutes East.

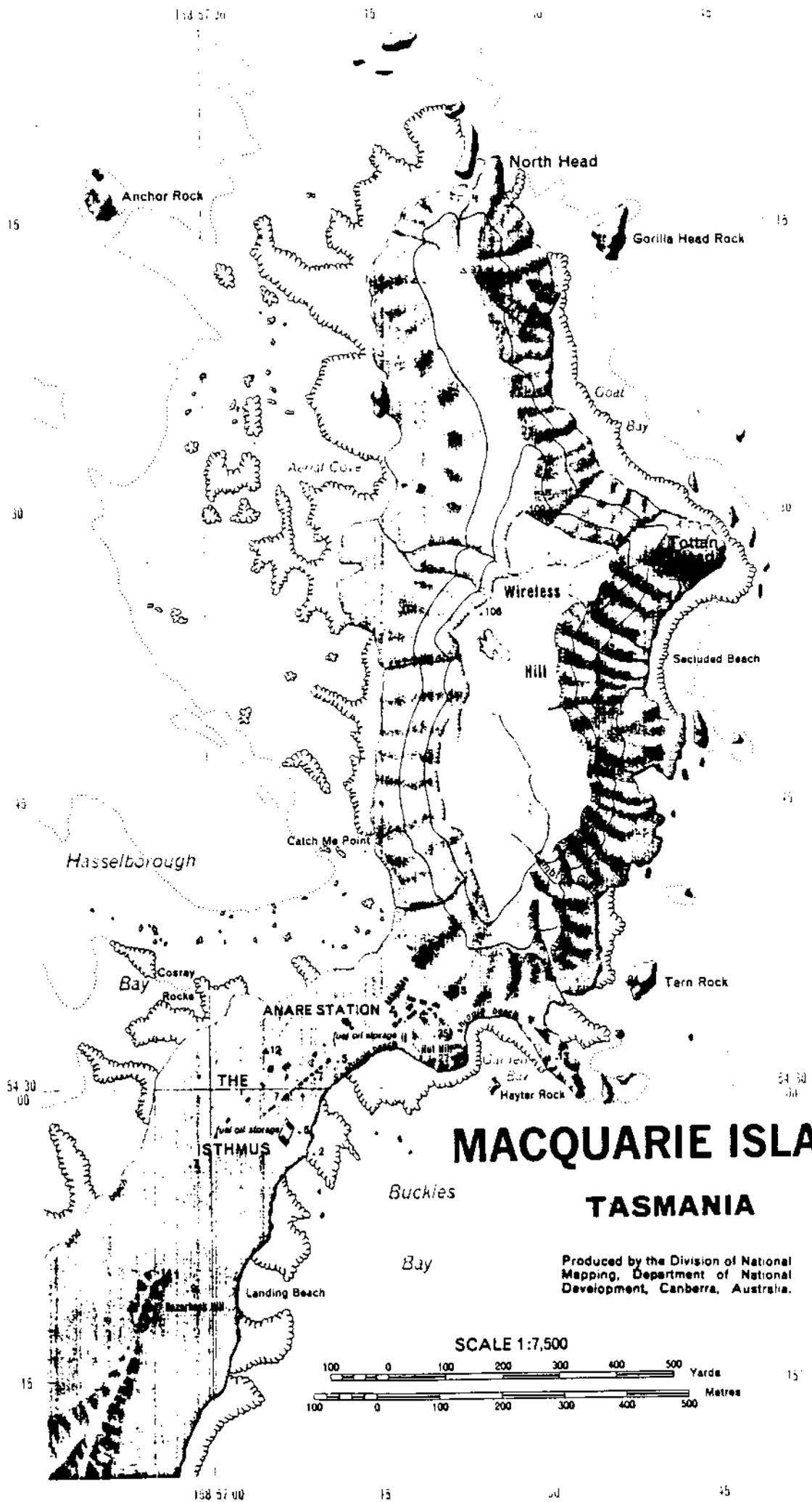
On board at the time of the incident were 33 crew and 17 expeditioners, all were disembarked safely by Australian Army light amphibious resupply craft (LARC). Some crew, expeditioners and LARC drivers sustained minor eye irritation from diesel oil spray and a certain amount of pollution was caused by the spillage of light diesel oil. The Master, four officers and the boatswain remained on board.

Two officers of the Department of Transport and Communications, Christopher William Filor (Director Ship Operations, Canberra) and Thomas Michael Fitzpatrick (Senior Surveyor, Tasmania) were appointed under the provisions of section 377A of the Navigation Act 1912 to make a preliminary investigation into the circumstances of the grounding.

The investigation commenced on 12 December 1987 at Hobart.

His Excellency Mr Birger Abrahamson, the Danish Ambassador, represented the interests of the Danish Government through-out the interviews of the various witnesses.

54
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54
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54
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15

15

158 57 00

15

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PERSONS INTERVIEWED

At Hobart on 12 December witnesses from Macquarie Island:

Mr Stephen Manning	Meteorological Observer Grade 3
Mr Richard Ferguson	Historian
Mr Jeffrey Treloar	Senior Tradesman
Mr Gerard Clougher	Meteorological Observer Grade 2
Mr Ian G Jacobson	Station Leader

and from the relief vessel ICEBIRD:

Mr Rex Moncur	Voyage Leader
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At Hobart on 13 December 1987 the following crew members from the NELLA DAN

Mr Anders H Soerensen	Second Officer
Mr Jes Christensen	First Engineer
Mr Lars P Mortensen	Assistant Engineer
Mr Kim Falkenberg	Able Seaman
Mr Willy Pedersen	Able Seaman
Mr Kenn P Joergensen	Radio Officer
Mr Henrik Lindhardt	Second Engineer
Mr Ole Wittenberg	Assistant Engineer
Mr Klaus Brogaard	Motorman
Mr Morten Quist	Motorman

and management representatives of J. Lauritzen A/S owners of the NELLA DAN

Mr Ole Amelung	Vice President, Polar Services.
Mr Bent Rasmussen	Vice President, Maritime and Offshore Personnel, Nautical

At the Antarctic Division Offices, Kingston on 14 December

Mr Richard M Burbury	Deputy Voyage Leader
Ms Geraldine V Nash	Cargo Supervisor.

At the Department's offices Hobart on 29 December

Captain Arne J Soerensen	Master
Mr Gustav Henriksen	Chief Officer
Mr Magnus Olafsson	1st Officer
Mr Erling V Helslev	Chief Engineer
Mr Benny S Nielsen	Bosun
Mr David J Lyons	Voyage Leader

By telephone at ANARE base on 12 February 1988	
Mr Graeme McDiarmid	Senior Technical Officer

Tidal data and information was supplied by the Hydrographer Royal Australian Navy. Meteorological records by various officers of the Bureau of Meteorology. Video recordings of the NELLA DAN in Buckles Bay during the period 1 December to 8 December by the Army Audio Visual Unit and the Parks and Wild Life Department.

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UNITS

All times given in this report are in Eastern Summer Time (Zone Time - 11).

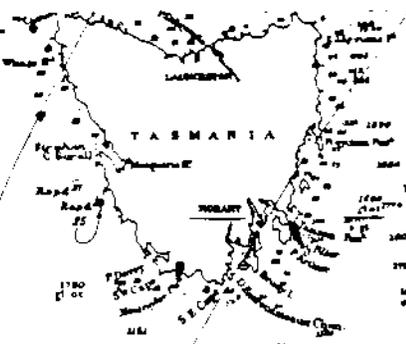
Much of the scientific and meteorological data were given in Greenwich Mean Time or Universal Co-ordinated Time and tidal data was given based on Zone Time - 1130. These have all been converted to Eastern Summer Time.

Units of distance are given either in nautical miles (1853 metres), or cables (0.1 of a nautical mile). Units of measurement are given in metres except where reference in the report is made to lengths of anchor chain traditionally referred to as "shackles", which are 15 fathoms in length (27.43 metres).

Water depths are referred to throughout the text in metres. The working chart (attachment C), however, shows depths in fathoms (1.892 metres).

Units of wind speed are given in knots (nautical miles per hour).

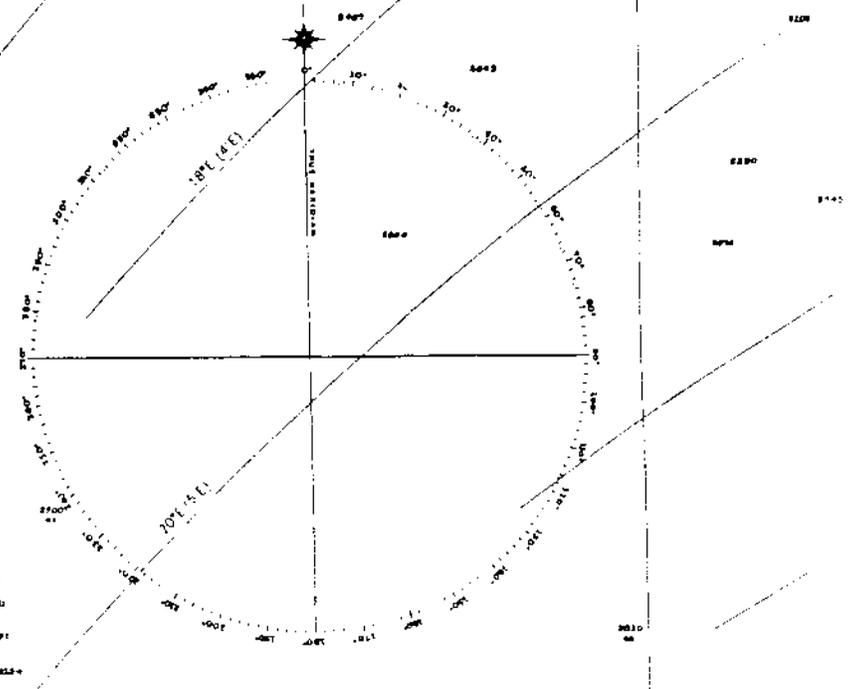
EXTRACT FROM CHART
BA788 SOUTH PACIFIC OCEAN—
WESTERN SHEET



15°

50°

55°



MACQUARIE ISLAND

1970 Rev. 4 30
1966
Aero RC
Macquarie Island Chart No. 1022
1954. Depth to 100 fathoms
from charted soundings

145°

150°

155°

160°

MACQUARIE ISLAND

Macquarie Island is Australian territory situated 840 miles south south east of Hobart, (Attachment A) it is part of the State of Tasmania and is a declared national park and wildlife sanctuary. The Island was discovered by Frederick Hasselborough master of the brig PERSERVERANCE, and was for some time associated with the exploitation of seals and the blubber oil trade.

In March 1948 the Australian National Antarctic Research Expeditions (ANARE) established a station at Buckles Bay. The station is a scientific base including a meteorological observation station. The station is serviced regularly by ships chartered to the Antarctic Division of the Department of Art, Sport, the Environment, Tourism and Territories, which bring supplies including oil, scientific equipment and relief personnel. The Island is one of a number of stations maintained by Australia in the Antarctic and sub-Antarctic region.

The weather at Macquarie Island is characterised by persistent winds and precipitation either in the form of rain or snow; with mean daily temperatures up to 8°C. Winds from west to north west predominate for 70% of the year at an average speed of 20 knots. Easterly winds do occur and reach gale force but they do not usually persist for more than a matter of hours.

Hasselborough Bay at the North Western extreme of the Island is separated from Buckles Bay by a narrow, low lying isthmus which connects the main part of the island with Wireless Hill and North Head. This isthmus is the site of the ANARE base. Buckles Bay is relatively sheltered from the prevailing westerly winds and is normally used as the anchorage for ships supplying the base.

In early December in latitude 54 degrees South it is daylight for about 19 hours of the day between 0245 and 2145 approximately.

SEQUENCE OF EVENTS

The Danish Antarctic supply vessel NELLA DAN sailed from Hobart on 27 November 1987 with 33 crew and 50 expeditioners on voyage 4 of the 1987/88 Antarctic sailing season. The ship was chartered to the Commonwealth of Australia by J. Lauritzen A/S, the owners of the NELLA DAN.

The NELLA DAN was a ship of 2186 gross tonnage, a little over 75.2 metres in length and was powered by an 8 cylinder diesel engine of 1,648 kW giving a service speed of 13 knots (Appendix 9). The ship, built in 1961, was classed with Lloyd's Register of Shipping and was assigned the notation "Strengthened for Navigation in Ice Class 1". The ship was manoeuvred directly from the bridge with control to a variable pitch propeller attached to a shaft turning at constant speed.

The ship was under the command of Captain A J Soerensen. Captain Soerensen had some eight or nine years experience aboard the NELLA DAN; as an apprentice in the late 1960's; Chief Officer from 1978 to 1980; and Master since 1982. He holds a Master's Licence issued by the Danish Marine Authorities.

The 50 expeditioners were led by Mr David Lyons who, amongst his other duties, represented the charterers. The voyage leader had full responsibility for the operational decisions, subject only to the Captain's final responsibility where the safety of the crew and the ship were at risk.

The Charter Party states:

"That the Captain shall prosecute his voyage with the utmost dispatch, and shall render all customary assistance with the ship's crew. Although appointed by the owners the Captain shall be under the directions of the Charterers as regards the employment, agency, or other arrangements....."

and

"All movements of the ship are finally the Captains responsibility and he is justified under the charter to refuse to take any action which he considers prejudicial to the safety of the crew, the ship and its boats. The Captain of the ship is to carry out the operational instructions of the Director, Antarctic Division, or in his absence the instructions of his deputy, except under circumstances when the Captain considers that obeying such instructions will endanger the crew, the ship and its boats. In such a case the Captain must make a full written report of the circumstances....."

The ship was originally scheduled to arrive at Macquarie Island (Attachment A) on 4 December and sail for Commonwealth Bay on 8 December, returning via Macquarie Island (27 December) arriving in Hobart on 1 January. The outward, south bound, passage was to include a marine science program involving analysis of marine characteristics at a number of "stations" enroute. The program was anticipated to involve the ship in a six to seven day passage to Macquarie Island instead of the normal three day passage. Connected with this program was a powerful echo sounding system operating at a frequency of 1200Kz in deep water and 200 Kz in shallower water. This system, connected to a data log facility (Attachment B), ran continuously from sailing Hobart to the time of the casualty. Every 11 seconds, the time, depth of water, position by

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satellite fix, ship's speed, and heading by gyro compass were recorded on the data log. Once anchored in Buckles Bay scientists connected with the marine science experiment set the program's echo sounder to minimum depth range. All data from the echo sounder was corrected by 5.8 metres in respect of the ship's draught, thus all depths shown indicated total depth of water. The echo sounder was set for a minimum depth of 10 metres.

During the voyage from Hobart to Macquarie Island part of the marine science equipment failed and it was decided by the Voyage Leader to proceed directly to Macquarie Island. Those areas of the program that had not been completed south bound were to be completed on the return voyage.

The weather for the passage to Macquarie Island had been generally fair with northerly winds between force 3 and 6 on the Beaufort scale. The ship carried a weather facsimile machine which received forecasts and synoptic charts twice daily.

1 DECEMBER TO 0600 3 DECEMBER

The NELLA DAN anchored to the port anchor at 1405 hours 1 December with 4 shackles (109.7 metres) of cable in a total of 18 metres of water. The ship was drawing approximately 5.25 metres forward and 6.6 metres aft. The anchor itself was dropped in the position usually favoured by Captain Soerensen, 296° x 2.3 cables from the front leading beacons situated south of the ANARE station (Attachment C). The anchor position was 2.2 cables (407 metres) from the shore. The marine science data log record of depth shows the ship anchored in 16 metres of water and that the vessel lay to the anchor in a N.E'ly direction until about 2000 hours 1 December. The wind was northerly at about 22 knots, the predicted height of tide was about 0.3 metres above datum with a northerly tidal flow. The anchoring party was supervised by the First Officer who stated that the ship was anchored in its normal position and that the ship was brought up to its anchor properly with the starboard anchor ready to drop if required. The Master stated that the overall radius of swing about the anchor was in the region of 180 metres.

Approaching Buckles Bay the sea bed shelves steeply from over 200 metres to the shore line in the space of 1 nautical mile (Attachment D). The Master stated that the bottom at this position had, over the years, proved to have good holding characteristics, reported to be sand with some stone, and that on the few occasions the ship had dragged anchor in strong westerly winds the vessel drifted off shore. Captain Soerensen expressed the opinion that in such a case the anchor was dragging "down hill" and lost its grip as it got into deeper water. He went on to state that in the event of an easterly wind the vessel would pull the anchor uphill and that under these conditions the anchor usually held very well. The Master and ANARE personnel considered it desirable for the ship to anchor as close to the shore as was consistent with safety, in order to minimise the distance that the LARCs had to travel when transferring cargo and to facilitate the handling of the fuel transfer pipeline.

The NELLA DAN carried three anchors, a port and a starboard bow anchor and a spare anchor stowed on deck. Each anchor was of the type normally carried on merchant ships being stockless anchors made of cast steel, and weighing in the region of 1740 kg. The anchor cables for the port and starboard anchors were made of stud link chain of 44mm diameter.

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The conduct of the ship's deck officers was based on their understanding of the requirements of professional seamen and by standing orders. The standing orders were formulated by a previous Master of the NELLA DAN and adopted by Captain Soerensen. These standing orders were meant to be read and countersigned by the watchkeeping officers. The First Officer stated that he had not signed the orders on this voyage. The Second Officer stated that he had not seen the standing orders, which had not been referred to him.

The Master received, as necessary, instructions from J. Lauritzen A/S in the form of "Captains Letters". These "letters" were retained on board and kept in five volumes totalling 66 chapters. Chapter 2 dealt with bridge organisation which included the International Chamber of Shipping publication "Bridge Procedure Guide" and the International Maritime Organization's International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978" (see Appendix 5). Where necessary Masters of the NELLA DAN had supplemented these company instructions to take account of the NELLA DAN's particular operation.

The ship's officers adopted normal anchor routine. The Second Officer kept the 0600-1200/1800-2400 watch while the First Officer kept watch during the remaining periods. The Master had overall responsibility for the ship's safety and safe cargo operation, the Chief Officer superintended the cargo operations and the crew working routine.

The Officers on anchor watch were responsible to the Master for ensuring that the ship maintained its anchor position. At least one of the two radars and the echo sounder digital display were in use at all times. The distance from prominent land echos was measured by using the radar variable range ring with the radar in "north up" display mode. The officers were also able to fix their position by compass cross bearings and by visually monitoring transit marks. The anchor cable was marked at the windlass by a piece of white cloth, attached to the cable, to show whether the windlass brake was holding.

The only notation in the log book as to the position of the anchorage was made at 1405 when the ship dropped anchor, which read "in the transit marks". No position was entered in the subsequent days, the only reference being at the end of each watch that anchor positions had been "checked frequently".

Whilst on passage in open waters the engine room operated in the "unmanned machinery space" (UMS) mode. In ice and at anchor the engine room was manned. From the time of arrival on 1 December to the time of the grounding the engine room was manned at all times, other than when the engineer left the engine room to check tank soundings during the discharge of oil. From the commencement of the discharge of oil a separate engineer officer was stationed on the bridge at all times to keep watch on the oil hose and to operate the emergency stop fitted to the oil transfer pump should the need arise.

At anchor the engines were stopped. If the engines were required in an emergency, control could be transferred to the bridge in less than two minutes, providing the engines were started without purging the eight cylinders for water, oil etc., as all ancilliary pumps connected with the running of the main engine and the steering motors were left running.

Communications between the bridge and engine room conformed to international requirements in that a telephone and an engine telegraph connected the two areas. The telephone was reported by some interviewees to be difficult to use; while the person on the bridge could be heard satisfactorily in the engine room, there was some suggestion that any message passed from the engine room was not easily heard by the person on the bridge. The Master and Chief Engineer however, stated that the telephone system had been recently renewed and that they had experienced no difficulty in this regard.

The expeditioners aboard the NELLA DAN included an Army LARC team with three vehicles and an Army film unit, who were to make a training film of LARC operation. The LARCs were also the means by which stores and personnel were landed on the Island. Upon arrival the LARCs were discharged and the unloading of dry cargo commenced and certain expeditioners were landed ashore during the day. Most of these personnel returned to eat and sleep aboard.

It was expected that the ship would take four days to discharge dry cargo which included a quantity of cement. The rate of discharge was governed by the 3 tonne load limit for each LARC and the time taken for the LARCs to "turn around".

Discharge of dry cargo continued through 1 December and 2 December. The discharge of oil was delayed in view of the wind direction, which although not strong tended to be firstly from a northerly and then a southerly direction. Mr Jeffrey Treloar, the senior tradesman responsible for the receiving of the oil, stated that he had wished to start oil transfer on 2 December. The Master, however, preferred to wait until the wind was from a westerly direction when, from experience, it could be expected to persist and reduce the chances of the ship fouling the oil discharge hose through swinging to the anchor.

Weather Bureau reports and recordings made aboard the NELLA DAN show that the northerly wind died to light airs at 2100 hours 1 December and then turned south westerly at about 12 knots from midnight until some time after 0600 2 December, the wind then backed to between south and south east and remained in that quarter for the rest of the day. The record of the anemometer readings aboard the NELLA DAN shows a relatively steady wind speed of approximately 15 knots and the ship's deck log book records winds generally from a southerly direction force 4(11-16 knots).

At 0600 hours 2 December the ship was lying to the anchor in a southerly direction, having swung through north from the original N.E'ly direction. The ship maintained a general southerly and south of east heading into the evening of 3 December.

Vessels at anchor in still conditions normally lie with the anchor and cable fine on the appropriate bow. Wind and tide, however, can cause a ship to yaw* from side to side on the anchor cable. The degree of yaw depends upon the size and trim of the ship and the strength of wind and tide. In certain circumstances the yaw can cause an anchor to break out of its holding ground. From the data log record run in conjunction with the marine science program it is apparent that the 'NELLA DAN' tended to yaw or swing at anchor throughout 2 December (Appendix 3).

* Unavoidable oscillation of the ship's head either side of the course being steered or at anchor due to wind and waves.

The weather was under the influence of an intense low pressure system to the north of the Island. It was expected therefore, that as the system tracked eastward the winds would veer to the west. The southerly wind persisted however throughout 2 December.

0600 3 DECEMBER TO 2100 3 DECEMBER

At 0600 on 3 December the wind remained from the south to south east. In view of the time already spent at anchor and the proposed schedule the Master decided that the oil transfer should commence. The wind was recorded at this time by the Meteorological Station to be south easterly at 26 knots, which agreed with the weather recorded in the ship's log book and the record of wind speed maintained by the Bureau of Meteorology aboard the NELLA DAN. The discharge of diesel oil commenced at 0740.

Fuel stocks of diesel oil for the Macquarie Island base are stored in a number of tanks south of the main ANARE complex. The fuel is transferred by means of a 50mm diameter hose, which is stored on a reel in a shed close to the tanks and towed to and from the ship by a LARC. At the time the NELLA DAN was at Buckles Bay on 3 December there were sufficient fuel stocks on the Island for about 120 days.

The NELLA DAN carried the 230 cu metres of diesel oil for the base in a special cargo hold fitted with an oil tight hatch cover, situated on the level of the tween deck between frames 95 and 100. The oil was pumped via the ship's pipelines from the hold, through the engine room, to the hose connection on the starboard side of the deck by way of Number 2 hold and thence by the 50mm hose to the shore. On the shore a small booster pump was being used for the first time.

On 3 December discharge of dry cargo via the LARCS resumed at 0645. At 0950 hours discharge of dry cargo was suspended due to rough weather. The wind was recorded by the Meteorological bureau to be south east at 30 knots. This corresponded to the observed weather at the ship as recorded in the deck log book of force 8 winds (32-38 knots) and sea state equivalent to that normally associated with force 6 (22-27 knots). These conditions, particularly the swell, made it hazardous to load items of dry cargo on to the limited deck space of the LARCS. The discharge of oil continued.

At 1200 hours 3 December the First Officer relieved the Second Officer as officer of the watch. There was no improvement in the weather conditions. The wind remained from the south east at above thirty knots. Both Officers maintained that the ship's position had not changed and stated that the radar's variable range ring showed the beach below Hut Hill and the point of land to the east of Garden Bay to be 0.2 miles distant. There was no evidence to show that the ship's position had been marked on the chart in any previous or subsequent watch. The only notation on copies of the chart available was the original position of the anchor rather than the ship's bridge at any given time.

At 1430 approximately, about three metres of anchor cable paid out when the windlass brake failed to hold. The brake was hardened up by the Chief Officer and a seaman, and the "tell tale" marker cloth repositioned on the cable. The wind at this time was recorded at about 38 knots from the south east with a maximum gust of 53 knots recorded at 1446 hours (Attachment E). Gale force winds from the south east persisted. The Master visited the bridge on several

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occasions but was not directly informed of this incident, though he became aware that the windlass brake had apparently failed some time later in the afternoon. The Master also discussed the weather situation with the chief officer and told him that he had decided to put to sea when the oil transfer had been completed.

The Voyage Leader, Mr David Lyons, had discussions with the Master at various times of the day regarding the discharge operation, but at no time were the fuel stocks already on the Island or the need to continue the discharge discussed. The Master in interview stated that he was reluctant to suspend discharge of the oil as he recognised the inconvenience and difficulty involved in releasing and then recovering and reconnecting the oil hose. Sometime during the afternoon the Captain expressed concern at the exposed position of the ship and told Mr Lyons of his decision to put to sea on completion of the oil discharge and possibly anchor in the shelter of Hasselborough Bay to discharge dry cargo on the following day. The Master also discussed the proximity of the shore in view of the exposed position. Mr Lyons states that he, as a layman, asked about the possibility of using two anchors. The Master replied that using two anchors could lead to problems if the cables crossed and became fouled as a result of a substantial change in the ship's heading and cited the incident some years before when the NELLA DAN had to abandon an anchor in Buckles Bay when this in fact happened. The Captain also explained his view that in the prevailing conditions the anchor would tend to be pulled into shallower water or "up hill" causing the anchor to dig in to the sea bed and increase its hold.

The Voyage Leader was in frequent radio contact with the station leader on Macquarie Island. At about 1500 hours he alerted the shore that, because of the strong winds and rough seas, those personnel that had gone ashore earlier in the day might not be able to return to the ship that night.

The First Officer noted, at a time he put to be about 1600, that the digital echo sounder was showing a depth under the keel of about 7 metres, which was a slight reduction from the previous day and earlier in the watch (Attachment F).

During the voyage south and while the ship was at anchor in Buckles Bay Mr Graeme McDiarmid, a senior radio technical officer, who was to winter on Macquarie Island but had yet to go ashore, went to the Bridge. Mr McDiarmid had some knowledge of aviation radar and stated that he was interested in the ship's radar and had become familiar with its controls. At 1630 approximately he went to the bridge and looked at the radar screen. He recalled that the variable range ring when set to the nearest points of land by the oil tanks and the beach at Hut Hill showed 0.21 miles and this was the same distance as the previous day. He also went on to state that he was watching the movement of the ship from the passenger's day lounge located on the starboard side of the compass platform before he went to tea at 1800 and the vessel appeared to be in the same general position.

The First Officer stated that, at some time during the course of the afternoon watch, the distance between the ship and the shore marks decreased from 0.2 miles to 0.17 miles. He considered that some of this reduction could be accounted for by the ship taking up the slack in the cable, but also a gradual movement over a period of time. The First Officer stated that he carefully monitored the ship's movement. By 1700 hours the anchor had apparently taken

hold and the ship had stopped shifting its position. The ship's radar showed that, with the ship's head in a generally SSE direction, the beach below Hut Hill and the point east of Garden Bay were 0.17 miles from the ship and the ship had moved north some 55 metres (Attachment G). The First Officer did not call the Master to inform him that the ship had apparently dragged anchor.

When the Master came to the bridge at about 1700 he and the First Officer discussed the fact that the ship was closer to the shore and took special note of new transit marks, though apparently the position of the ship was not marked on the chart. The Master did not recall any mention of the ship dragging anchor and apparently attributed the changed position to some adjustment in the cable and anchor (Attachment H). No record of the ship dragging anchor was entered in the log book and no position for the ship was drawn on the chart.

No extra cable was veered on the port anchor. The starboard anchor was not dropped, nor were the engines started so that the ship could instantly be manoeuvred to reduce the strain on the cable or as a precautionary measure.

Mr Treloar, the senior tradesman in charge of the shore oil transfer operation, also stated that in his opinion the ship had 'early in the afternoon' dragged its anchor. He observed that the arc made by the 50mm oil hose between the shore and the ship became more pronounced during the afternoon. He gauged that the ship was drifting slowly, but not at a rate that caused him any alarm. He stated that at the time the ship was clear of the light shaded water marking the shallows and in the dark coloured water. He made no mention of this apparent change in the ship's position to anybody in a position of responsibility.

Mr Ferguson, an expeditioner, landed ashore on 1 December to undertake a two day "walk". At a little before 1700 he was returning in company with a Mr Mark Fanning, walking north along the isthmus towards the ANARE camp. Mr Ferguson stated that at that time he estimated a combined wave and swell height of 2 to 3 metres. While the actual height of the waves and swell cannot be estimated accurately it is clear from various statements and from photographs and video film shot during the 3 December that by late afternoon the weather and sea conditions had deteriorated from earlier in the day. He also stated that at this time the ship was between 150 and 250 metres from the shore based on his experience with small boats and from photographs taken at the time. He admitted that the conditions were far from ideal to make such estimations. Mr Ferguson also stated that approaching the station from the south he could see that the anchor chain was at times taut as the NELLA DAN rode the swell.

At 1700 the Voyage leader confirmed with the Station leader that it would not be possible for anybody to return to the NELLA DAN that evening. Arrangements were made for those people to remain ashore for the night. This left some 33 crew and 17 expeditioners on board.

At 1800 hours the Second Officer relieved the First Officer on the bridge. The wind was recorded in the log book as south south east force 8, with a sea state 6. The meteorological station recorded the wind from 150° at 32 knots. Low water was at this time.

The First Officer confirmed the ship's position, telling the Second Officer that the brake had failed to hold earlier in the afternoon paying out some three metres of cable and that the anchor had dragged slightly but had held for the last hour. The Second Officer checked the position on the 10 centimetre radar which was on the 0.75 mile range. He confirmed that the variable range ring had to be adjusted to 0.17 miles to realign the ring with the features being used to monitor the ship's position rather than the 0.2 miles in his previous watch.

At 1800 approximately the Master entered the passenger's saloon and started his evening meal in the company of the Chief Engineer and a number of expeditioners, including the Voyage Leader, Deputy Voyage Leader and the Cargo Supervisor. The Master stated that he was able to observe the transit marks he had established late in the afternoon through the saloon window. At 1830 approximately the Master could see that the transit marks had altered and he sensed that something was wrong. He immediately left the saloon without saying anything to the Chief Engineer or any other person at the table and went directly to the bridge.

The times given by all witnesses from this time onwards are very approximate. The Deck log book was written up some hours after the event. The engine room log book, radio log book and any contemporaneous notes were destroyed after the ship caught fire when equipment and documents were being transferred to the towing vessel prior to scuttling the NELLA DAN. The only accurate record of time available is that recorded by the marine science data log.

At about 1830 Mr Treloar discussed with the 2nd Officer, via VHF radio, the likely time and procedure for releasing the oil pipeline. After completing this conversation Mr Treloar noticed that the ship appeared much closer to the shore and was no longer in the dark, deeper water but was lying inside the line of light coloured water. He then checked with the ANARE radio officer on duty as to whether the ship had reported getting underway. As no such communication had been received Mr Treloar used his hand held VHF to again contact the ship and it was confirmed that the ship was in the process of getting underway.

When the Master arrived on the bridge at approximately 1830 the Second Officer was talking on the ship's hand held radio regarding the discharge of the oil cargo. An assistant engineer, and the seaman on call were also present. The Master told the Second Officer to inform the shore that pumping of oil was to be suspended immediately.

The Master instructed the Assistant Engineer to go to the engine room and tell the First Engineer to start the main engine. There is some conflict of evidence as to the exact words used. The Master stated that he used the word "immediately" and "straight away" and tried to impart a degree of urgency. The Assistant Engineer apparently did not appreciate the urgency and proceeded to the engine room without any undue haste. The Assistant Engineer stated that he took 3 or 4 minutes to reach the engine room. Other evidence is that about two minutes later the telegraph was put on standby by the First Engineer in the engine room and was duly acknowledged by the Master on the bridge. After "stand by" was acknowledged the Master stated that he heard the engine start straight away.

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When the Master noted that the tachometer showed sufficient revolutions he moved the pitch control to the equivalent to dead slow ahead and put the wheel hard to port. This manoeuvre appeared to have no effect.

At this time the Master stopped the fuel transfer pump by pressing the stop button on the bridge as he could see that the ship was dragging rapidly.

When the Assistant Engineer arrived in the engine room the First Engineer put the engine room telegraph to stand by and assisted by the Assistant Engineer proceeded to start the engines under normal routine conditions. The engines were first turned over on air and then the cocks at the cylinder heads closed. The engines were initially run on 150 r.p.m. while the First Engineer started to routinely check that the engine was running properly. The First Engineer stated that the Chief Engineer came to the engine room and told him to hurry, as there was an emergency situation. According to the First Engineer's recollection he then immediately gave control of the engines to the bridge with engines running at normal operational speed of 300 r.p.m.

The Chief Engineer's recollection differs in that he stated, having finished tea, he was in the process of donning his engine room boiler suit when he heard the engines being turned on air. He went immediately to the engine room where the First Engineer told him that the engines were required by the bridge. The Chief Engineer increased the revolutions to 250 r.p.m. and ordered that the bridge should be given engine control immediately. The engine and bridge control levers were coupled together and the telegraph rung full ahead to signify that the bridge had full engine control.

The Chief Engineer, accompanied by the Assistant Engineer, then went to the fore deck to release the oil hose. This was done with the help of the ship's bosun. Before the pipeline was released over the ship's side the Chief Engineer inserted and secured the pipeline cap and it is probable that no pollution resulted from this source.

The Second Officer prepared the portable radio sets for the anchor party and then put on a coat ready to go forward. At a time that the Second Officer put at 1835, and while he was still on the bridge, the NELLA DAN apparently took the ground for the first time. He immediately went forward to the windlass and he described his passage across the deck as "a little bit hard" as the ship was bumping on the bottom.

On the bridge the Master sent the Able Seaman on watch to call the anchor party and ordered them to start weighing anchor. Mr Pedersen, who usually acted as carpenter was in one of the mess rooms watching a television video which had been running for just a few minutes. He immediately went to his cabin and donned outside working clothes and within a matter of 2 to 3 minutes reached the foc'sle head. He put the anchor into gear and made ready to weigh anchor and was joined by the Second Officer. It was found that the anchor windlass was unable to heave more than a metre or so of cable before the automatic override cut in to prevent overload on the ship's electrical circuit.

It is apparent that by this time the ship had already taken the ground as the Second Officer recalls the sensation of the ship jarring against the sea bed whilst on his way to the foc'sle. The NELLA DAN was estimated to be drawing 4.45 metres forward and 6.45 metres aft.

The Master was unable to manoeuvre the ship, he tried using a small amount of pitch, and at the same time putting the rudder hard to port. When this failed he put the engines full astern in an attempt to bring the ship's stern up into the wind. None of these actions had any effect.

When it became obvious that the ship was aground the Master ordered the boat station signal to be sounded and radioed to the shore requesting that the LARCS be sent to the ship to evacuate all personnel and that those ashore stand by to assist the evacuation. The 17 expeditioners and the crew assembled at their boat stations.

The Chief Engineer returned to the engine room and the First Engineer went to his boat station. The Chief Engineer stated that the engines were running and he could see oil and water coming out of the engine and that the lubricating oil pressure alarm was sounding. He closed the sliding watertight door to the auxiliary engine room at the forward end of the engine room. A short time later he received instructions to stop the main engine. Before leaving the engine room he closed the watertight door at the after end of the engine room and stated that he could see a quantity of water in the shaft tunnel apparently coming from the gear box. He then left the engine room and made his way to the bridge. He also stated that he checked the two other watertight doors on the second deck between the provisions store and the refrigeration compartment, and between the crew's day room and sleeping accommodation.

All personnel were accounted for and the ship was abandoned in an orderly and efficient manner. The expeditioners donned warm clothing and lifejackets and the ship's crew donned survival suits. The ship was abandoned by way of the boat ladders into the LARCs rafted together. The abandonment was hampered by a spray of ship's diesel oil from No. 2 double bottom. The tank had been holed and the pressure of the water and the movement of the ship forced oil through a vent pipe on the ship's starboard side. Although the vent was covered with canvas by the Second Officer and a seaman, the oil continued to be forced out of the vent and spill from the deck scupper, where the gale force winds drove an oil spray over the ship's decks, the evacuation ladders and over the people in the LARCs.

Evacuation was completed in some 15 minutes with only minor injury sustained in the form of eye irritation from the diesel oil spray. The Master, Chief Engineer, Chief Officer, First Officer and the Bosun remained on board. The evacuation of the NELLA DAN was recorded on video film by the Army Video Unit and an officer of the Parks and Wildlife Service.

At 2100 hours approximately the Master in consultation with the Officers aboard, entered the time and occurrences from 1800 hours in the log book to the best of their recollection. The log book was maintained thereafter until 8 December.

2100 3 December to 1742 24 December

Later, when it became clear that there was no immediate prospect of refloating the ship, the Master considered ballasting the ship to keep the ship firmly in place to minimise movement and thereby reducing further damage. In the event, however, the failure of the emergency generator at about 2300 hours meant that this could not be done that night.

Log book entries record various inspections of the ship and occurrences over the next few days. At 2200 hours 3 December the cargo spaces were inspected by the Master and First Officer and water was reported in No 3 lower hold. At 2250 an inspection of the machinery spaces by the Master and Chief Engineer showed 1½ metres of water in the main engine room while the shaft tunnel was full. It was also recorded that the watertight door between the main engine room and the tunnel space, which had been closed by the Chief Engineer earlier, was partially open, apparently through the movement of the ship on the rocks. During the night a list of about 11 degrees to port developed and the ship continued to take in water. During the night the ship moved progressively closer to the shore and by daylight on 4 December was firmly aground approximately 50 metres from the shore (Attachment J).

By 5 December the situation had stabilised. Water in No 3 hold had risen above the tween deck, the main and auxiliary engine rooms were filled to a depth of approximately 2 metres. Number 2 double bottom was known to have been holed.

As the position stabilised an assessment was made of the oil spill and the potential for further oil pollution. It was known that the lubricating oil tank under the main engine had been holed as had No. 2 double bottom containing diesel oil. Initial estimates were that 5 tonnes of lubricating oil and 90 tonnes of diesel oil had been spilled. As an environmental protection measure the Owner's Protection and Indemnity Club engaged a firm of professional salvors to recover the oil (Appendix 6) and, if possible, to refloat the NELLA DAN pending a decision as to the ship's future.

On 13 December the offshore services vessel LADY LORRAINE arrived at Buckles Bay to remove the oil remaining aboard the NELLA DAN. Approximately 360 cubic metres of oil was recovered and retained in the LADY LORRAINE tanks for discharge when the vessel returned to Hobart.

In the region of 120 cu metres of diesel oil and 5 cu metres of lubricating oil was not accounted for. Most of this would have been lost in the first hours of the grounding, the remainder from seepage from the ship over the ensuing days. On 22 December an officer of the Tasmanian National Parks and Wildlife Service, representatives of the ship's insurers and the Department of Transport and Communications made a thorough inspection of the foreshore areas and no oil pollution of consequence was found.

The NELLA DAN was refloated at 2347 on 21 December and moored offshore using the ship's port anchor and groundtackle laid by the salvors.

On 23 December J Lauritzen A/S advised of their decision to scuttle the NELLA DAN, and later in the afternoon the port anchor cable was burned through and slipped together with the ground tackle wire.

At 1742 hours 24 December 1987 the ship was scuttled in over 2000 metres of water in position 54 degrees 37.5 minutes South 159 degrees 13.3 minutes East, Tom Ugly Point bearing 289 degrees X 10 miles.

OBSERVATIONS

The NELLA DAN was seaworthy when it sailed Hobart on 27 November 1987. All convention certificates were valid. The ship had been inspected on two occasions within the year, at Le Havre and Fremantle, for compliance with the Safety of Life at Sea convention 1974, and the International Load Line Convention 1966 and no deficiencies were reported.

From the information contained in the marine science data log it is possible to trace the ship's heading and total depth of water at any given time. The ship stemmed the wind rather than tide and the ship's head at any time gives an indication of the general direction of the wind. The data shows that at about 0600 on 2 December the depth of water, allowing for tidal variations, fell from 16 to 18 metres to 14 to 15 metres, which is accounted for by a wind and heading shift from SW to SE. Later in the afternoon the general depth appeared to be 13 metres which corresponds to the First Officer's observation of 7 metres under the keel.

The data log was set for a minimum reading of 10 metres. The data log first recorded this minimum reading at 18:46:14 (allowing zone time) and by 18:48:26 the data was obviously corrupted. The time of grounding was therefore at or soon after 1846.

The ship was well and properly equipped with navigational aids. Although the charts (Appendix 1) for Macquarie Island were not of a desirable scale and lacked detail the ship had an effective adaptation of chart BA 1022 which had been suitably supplemented by previous Masters of the NELLA DAN. This chart was adequate for use whilst anchored in Buckles Bay (Attachment C).

The Weather pattern (Appendix 2) was unusual in that the wind would not normally have been expected to persist from a southerly to south easterly direction over the length of time experienced. The NELLA DAN was effectively anchored off a lee shore and at 1800 3 December was 0.1 mile from shoal water. Under these conditions the 'normal' anchor position, which is only 0.3 miles from the beach, is considered hazardous. While in westerly winds the anchorage may be considered relatively safe, as the ship would tend to drag its anchor seaward, in southerly or easterly winds there is no margin for error, particularly as it was acknowledged that the ship had dragged anchor in Buckles Bay on previous occasions in westerly winds.

During the afternoon of 3 December one witness on the shore stated that at about 1700 hours he saw the anchor cable apparently at right angles to the ship's heading and that the cable appeared tight. The First Officer during his afternoon watch also stated that at times he could see the anchor cable from the bridge leading about 20 degrees on the bow. Given the flare on the bow the anchor cable must have been under some strain for the cable to be observed in this manner from the bridge. It is therefore reasonable to assume that at various times during the 3 December the holding power of the anchor was considerably reduced as the cable became taut (Appendix 3). With the propensity of the ship to yaw there was a reasonable possibility that the anchor would break out of its ground.

Members of the ship's crew apparently did not at any time regard the degree of yaw as excessive or of particular note. From information contained in the data log the variations in the range and period of yaw can be objectively tabulated (Appendix 3). On the afternoon of 2 December the yaw was irregular

and relatively gentle; by the afternoon of 3 December however, the range of the yaw had increased and in particular the period of the yaw had markedly decreased to a degree which may have caused or contributed to the anchor breaking out of its holding ground. The increase in the yaw can be accounted for by the change in the ship's trim, due to discharge of cargo, as well as the stronger wind and rougher sea conditions.

The ancilliary pumps required to run the main engine and the steering motors were operational at all times (Appendix 4). The main engine could have been started at any time and left running with the propeller at zero pitch, particularly as the fuel was relatively light diesel oil and little damage would have been done to the exhaust valves through running the engine with minimal load.

Both the deck and engineering officers interviewed stated that they were confident in their own minds as to their duties and under what circumstances they should alert the Master (or Chief Engineer). The First Officer stated that on a previous voyage he had read, understood and signed the Master's standing orders. It was stated that these standing orders referred to the Convention on Standards of Training, Certification and Watchkeeping 1978 which requires inter alia that a watchkeeping officer "notify the master and undertake all necessary measures if the ship drags anchor".

It is accepted that standing orders and company directions as to the duties and conduct of staff aboard the ship were carried on the NELLA DAN. It does not appear that all officers were either aware of their existence or the extent of their content. (Appendix 5) It is apparent that the ship's position was not plotted on the chart and neither the Master nor the Officers on anchor watch appreciated their position relative to shoal water.

Captain Soerensen made a conscious decision to remain at anchor until the oil discharge was complete. While there appeared to be good communication between ANARE and the Master, the Master should have been advised or made himself aware that fuel stocks on the Island were sufficient for approximately 120 days. No pressure was brought to bear by ANARE personal to expedite the discharge of oil. Having made the decision he did not pay out any extra cable, drop the starboard anchor or start the main engine so that they would be ready for immediate use. The main engine remained on five minutes notice with the expectation that in an emergency it could be started and control given to the bridge in two minutes. In the event, the time lapse between Captain Soerensen noting the ship's changing position whilst in the saloon to the time that the bridge was given control of the main engine was at least five minutes and probably longer. This delay was critical.

When the emergency situation was apparent to the Master he opted not to use the ship's telegraph or ship's phone to contact the duty engineer. From the bridge he could have used either the phone, which he understood to be in good working order, or the telegraph. This would have speeded communication significantly and allowed his direct order to reach the engineer on duty without going through an intermediary. Had he been concerned about the whereabouts of the First Engineer, there was nothing to prevent him sending a verbal message as well as using the phone or telegraph. He had the option of at least alerting the engine room from the dining saloon by phone, or by direct order to the Chief Engineer who was present in the saloon.

CONCLUSIONS

The Investigating Officers find that;

1. The NELLA DAN grounded at approximately 1846 3 December 1987 when the port anchor dragged in gale force south to south easterly winds.
2. The investigating officers are satisfied that there is no evidence to suggest that any person was unfit through the use of alcohol or drugs.
3. It is not possible to determine the precise time at which the anchor failed to hold or the time that elapsed before the ship touched bottom. It is therefore not possible to assess whether the Second Officer was at fault for not realising the ship was dragging before the Master arrived on the bridge, whether there was time to let go the starboard anchor so that it would have been effective or whether other action could have been taken to prevent the casualty. The actions of the Master in leaving the dining saloon at approximately 1830 without alerting the Chief Engineer to a possible emergency was an error of judgement. Captain Soerensen's subsequent decision to send the Assistant Engineer, to instruct the First Engineer to start the engine rather than use the telephone or telegraph was a serious error of judgement. The Master should have used the telephone and/or telegraph and to cover any uncertainty as to the whereabouts of the First Engineer he could also have used a messenger. Valuable time was wasted in starting the engines.
4. The Master's decision to continue the transfer of oil after dry cargo operations had been suspended and to continue the operation into the afternoon was an error of judgement.
5. The Master having taken the decision to continue and complete the oil transfer and also having expressed concern for the ship's position to the Voyage Leader failed to take precautions that would have been prudent given the wind and sea conditions at the time and the proximity of shallow water
 - he did not pay out extra cable to increase the theoretical holding power of the port anchor
 - he did not let go the starboard anchor. (His concern that the cables might cross had the ship swung to another direction was not well founded given the persistent nature of the wind that day and the fact that, by use of engines and helm, fouling of the cable could have been avoided.)
 - even though the steering motors and all necessary ancilliary equipment were running, he did not start the engines and leave them running at zero pitch so that his ship was immediately manoeuvrable
 - he did not warn the duty engineer of the weather being experienced or alert the engineering staff to the potential risks of remaining at anchor.
6. The First Officer was significantly at fault in that he failed to advise the Master that in his opinion the ship was dragging anchor, nor did he bring this fact to the Master's attention at 1700. While there is no guarantee as to the Master's reaction to this information, the First Officer had a clear duty to inform the Master of the occurrence.

7. Given the southerly wind that developed on 2 December and subsequently increased in intensity on 3 December the anchorage position was too close to the lee shore and shoal water. Considerations of the LARC operation and the oil transfer were secondary to the safety of the ship.
8. The bridge management was deficient in that the Master did not ensure that his officers had read and understood the "Master's Standing Orders" and were fully conversant with and carried out the Owner's requirements as detailed in the "Master's Letters" in respect of keeping a safe navigational watch.
9. The First and Second Officers did not properly plot the ship's position whilst at anchor and apparently the Master did not require them to do so.
10. After the ship grounded the actions and decisions taken by the Master were in all respects correct. His decision to seek LARC assistance rather than use ship's survival craft minimised the potential for serious personal injury.
11. Most of the pollution caused was as a direct result of the grounding and occurred on 3 and 4 December. The Chief Engineer acted with great presence of mind in capping the oil hose before releasing it from the ship. Approximately 120 cu metres of diesel bunker oil and 5 cubic metres of lubricating oil were unaccounted for. The investigating officers concluded that after the grounding nothing could have been done to prevent the pollution that occurred from the NELLA DAN.

"MACQUARIE ISLAND"

ATTACHMENT 2

HASSELBOROUGH BAY

THIS HILL TOO FAR NORTH ON B.A. CHART

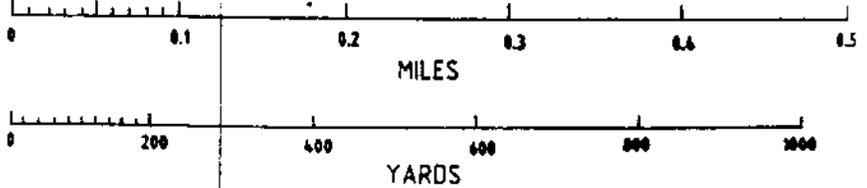
MÆRKENE OVERET | RV. 296°

029°
Rocks in line

Position of NELLA DAN'S anchor

Radius of anchorage with centre C 0.32 miles from front beacon

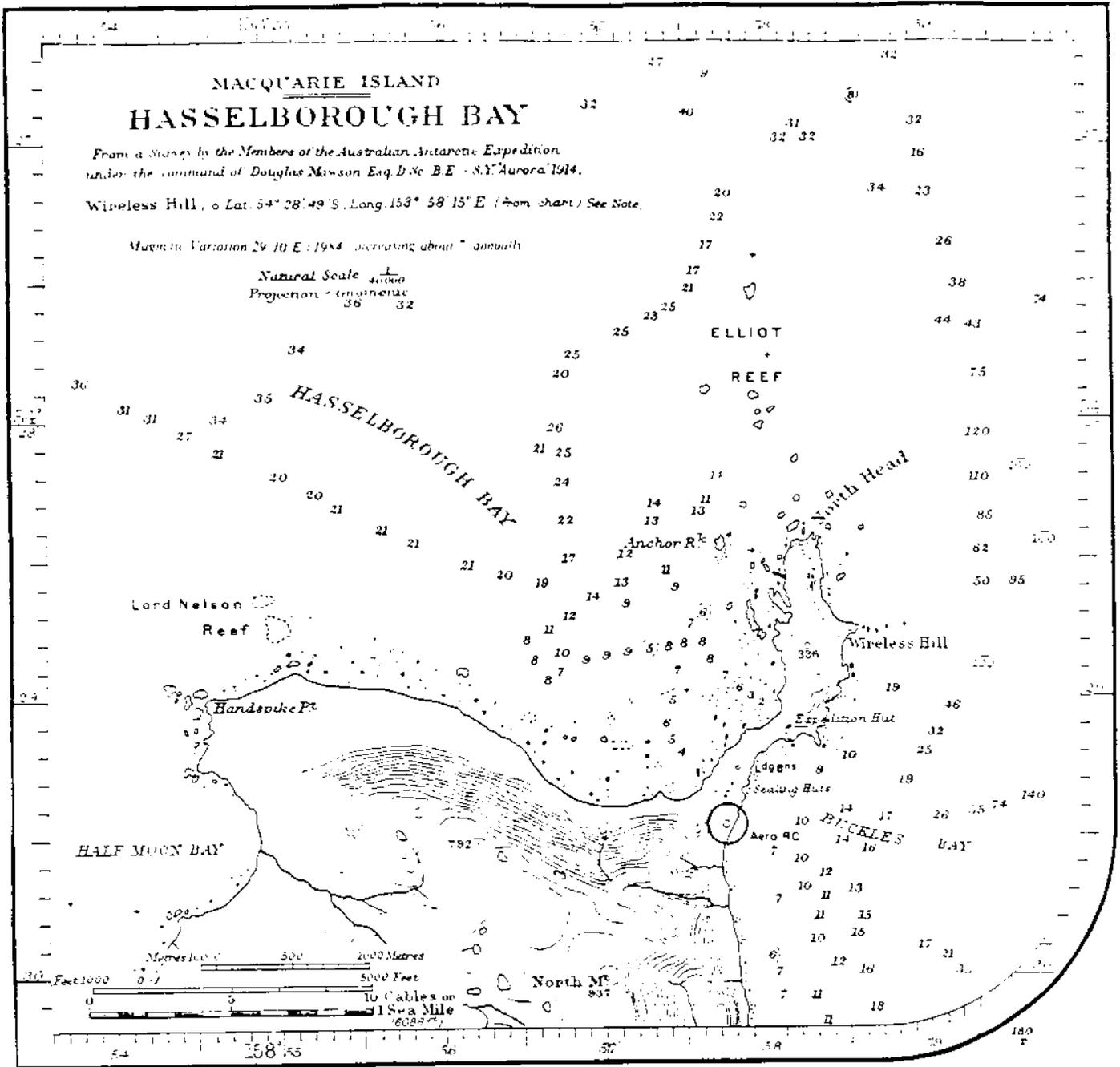
BUCKLES BAY



ENLARGMENT OF PORTION OF B.A. CHART 1022 WITH ADDITIONAL

SOUNDINGS BY M.V. MAGGA DAN IN 1960

SOUNDINGS IN FATHOMS



MACQUARIE ISLAND

"MACQUARIE ISLAND"

ATTACHMENT G

HASSELBOROUGH BAY

NELLA DAN 1846 3 DEC

NELLA DAN 4 DEC

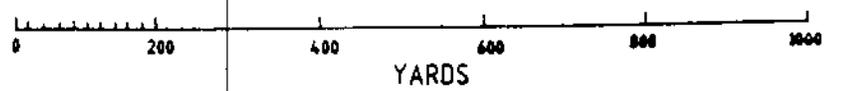
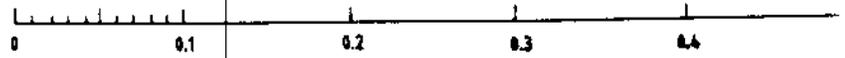
THIS HILL TOO FAR NORTH ON B.A. CHART

MÆRKENE OVERET | RV. 296°

NELLA DAN ANCHOR POSITIONS 10 1-3 DECEMBER

- (3rd) Position of bridge 1700 3 Dec 0.17 nm from land features A B C
- (2nd) Position of bridge when 0.2 nm from land features A B C.
- (3rd) Estimated position of anchor 1700 3 Dec, allowing 111m horizontal measurement anchor to hawsepipe.
- (2nd) Estimated position of anchor when bridge 0.2 nm from land features A B C allowing 108m horizontal measurement anchor to hawsepipe
- (1st) Stated position of anchor on arrival.
- (1st) Estimate of bridge position on arrival.
- Circle showing possible position of bridge at 1st anchor position

BUCKLES BAY



ENLARGMENT OF PORTION OF B.A. CHART 1022 WITH ADDITIONAL

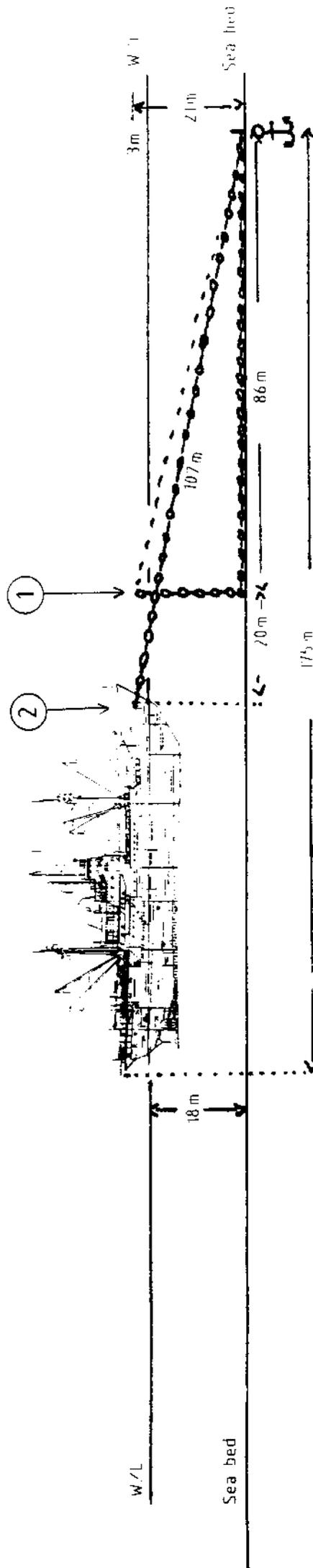
SOUNDINGS BY M.V. MAGGA DAN IN 1960

SOUNDINGS IN FATHOMS

DIAGRAMATIC REPRESENTATION OF NELLA DAN AT ANCHOR

Position 1 cable leading up and down

Position 2 cable taut to anchor no catenary



Standing Orders and Ship Organisation

Standing orders, issued by the Master, existed for deck officers. It is not possible to comment upon them in detail, due to their loss when the ship caught fire. It would appear however, that apart from reference to the Convention on Standards of Training, Certification and Watchkeeping 1978, the duties of officers at anchor watch were not detailed. All officers stated that, based on their training and experience, they had no doubt as to the circumstances under which the Master should be called.

There were no standing orders for engine room staff. The Chief Engineer regarded his team as experienced in the operation of the NELLA DAN and considered standing orders unnecessary.

Chapter 2 of the "Master's Letters" issued by J. Lauritzen A/S includes reference to the international Chamber of Shipping Guide to Bridge Watch Keeping, which includes very general advice on anchor watches.

No contingency plans were in place for the emergency starting of the engine or how the engine room would be informed of an emergency. Nor were there any directions covering the conditions under which the oil transfer operation should be aborted.