CONTENTS

ATTACHMENTS

APPENDICES

OUTLINE OF INCIDENT

The Philippine registered bulk carrier SINGA SEA, a ship of 26586 tonnes deadweight and some 175 metres in length overall, loaded a mixed bulk cargo of mineral sands and copper ore at the West Australian ports of Geraldton and Bunbury between 27 June and 2 July. At 0915 hours Western Standard Time (WST)* the ship sailed for Rotterdam via Cape Town, where it was expected to take on bunker fuel.

At 0600 Universal Co-ordinated Time (z) (1400 WST) on 3 July the vessel made a routine position report to the Department of Transport and Communications' Federal Sea Safety Centre (FSSC) under the Australian Ship Reporting System (AUSREP) based on the ship's noon position at 1200 WST. The ship failed to keep its next scheduled broadcast at 1400 WST on 4 July and the search and rescue procedures were put into operation by the FSSC.

At 1018 WST on 7 July a "P3" Orion of the RAAF took off from Pearce RAAF base to search for the missing ship, followed by another sortie on 8 July with the primary task of searching for survival craft. Neither search found any trace of the ship.

On 12 July a search was undertaken of the West coast of Australia by a chartered civil aircraft, as it was possible that liferafts or debris may have drifted onto the coast by then. No trace was found of SINGA SEA, or of any pertinent wreckage.

By 27 July the SINGA SEA had failed to arrive in South Africa and no radio traffic had been heard from the ship. As the cargo had been loaded in Australia and the ship had been participating in the AUSREP System, a preliminary investigation was commenced into the loading of the ship and the procedures followed by the Federal Sea Safety Centre as they related to the reporting of the SINGA SEA under the AUSREP scheme.

* See Appendix A for an explanation of the times used in this report.

Shortly after midnight WST on the night of Z/3 August, the Greek flag bulk carrier STANDARD VIRTUE saw a single red flare in approximate position 34° 19'S 112° 22' E, and subsequently recovered six survivors from a lifeboat belonging to the SINGA SEA.

The survivors reported that the vessel had sunk rapidly, after breaking in two in heavy seas, on 4 July 1988. They had been adrift in the lifeboat since that time.

The survivors all definitely stated that no other person had survived the wreck of the vessel, and that no other life raft or boat had been seen subsequent to the sinking. No further searches were therefore carried out for survivors.

The STANDARD VIRTUE diverted towards Fremantle where, on 4 August, the six survivors were lifted off by helicopter arranged by the Sea Safety Centre. After being landed at Fremantle, the survivors were briefly hospitalised before being repatriated to the Philippines.

TERMS OF REFERENCE

On 27 July 1988 two officers of the Federal Department of Transport and Communications, Christopher William Filor, Director Ship Operations, Wilfred Burrell Thomson, Marine Surveyor, were appointed to make a preliminary investigation under the provisions of sub-section 377A (1) of the Navigation Act 1912, into the supposed loss of the Philippine registered bulk carrier SINGA SEA in the South Indian Ocean at some time after 1400 western standard time 3 July 1988.

They were specifically to inquire into

whether the cargo loaded by the SINGA SEA at the ports of Geraldton and Bunbury was loaded in an appropriate manner

whether the conduct of the Federal Sea Safety Centre was proper and in accordance with established operational procedures.

PERSONS INTERVIEWED

At Fremantle

1 Aug	Jonathon Paul ANDREWS	Ship's Agent, Jebsens Australia Pty Ltd
	David Joseph ASLETT	Stevedore, Conaust (WA) Pty Ltd
4 Aug	Sigvald Leif AKSLEN	Supervisor. OTC Perth Radio
	Michael MESSENGER	Radio Engineer, AWA Electronic Services
5 Aug	Sabas MARTUS	Second Officer, SINGA SEA
	Gejone CAMPANTERO	Fourth Engineer, SINGA SEA
	Erendo BUENCONSEJO	Engineer cadet, SINGA SEA
	Enrique CARLITO	Mess Man, SINGA SEA
	Peter DOUGLAS	Marine Surveyor (in private practice)
	Michael J. DAMNJANOVIC	Manager Operations, Jebsens Australia Pty Ltd
	John D. WALKER	Senior Operations Controller, Perth Airport, Civil Aviation Authority
11 Aug	Neville Henry GIBB	Marine Surveyor (in private practice)

At Bunbury

2 Aug	Clyde Alan AMBROSE	Harbour Master, Bunbury Port Authority
	Peter V. BELE	Port Supervisor, Bunbury Port Authority
	Rodney J. SIMMONS	Ships' Agent, Willis Shipping

At Geraldton

3 Aug	Lyall W. GAULT	Assistant Harbour Master
	John A. WILSON	Cargo Surveyor

At Perth

11 Aug	John W. THORNETT	Manager, Associated Minerals Consolidated Ltd

At RAAF Headquarters Operational Command Glenbrook

17 Aug	Sqn Ldr Vaughn CROSBY.....	Search and Rescue and Survival Officer RAAF

At Canberra
Officers of the Federal Sea Safety Centre
Department of Transport and Communications

1 Aug	Robert D. McCULLOCH.....	..Director Operations
	Vincent J. DALY.....	Controller
9 Aug	Christopher D. PAYNE.....	Senior Co-ordinator
	Peter DEN DUYN	..Co-ordinator
	Graham LLOYD.....	Co-ordinator
	William PATTERSON	..AUSREP. Marine Operations Officer
10 Aug	Michael B. TAYLOR	..Senior Co-ordinator
	Phillip M. DOYLE	..Acting Senior Co-ordinator
	Richard G. BLAKEY	..Co-ordinator
11 Aug	Michael JACKSON-CALWAY ...	..Senior Co-ordinator
14 Aug	Anthony J. HUGHES.....	Co-ordinator
12 Aug	Michael H. JULIAN	..A/g Assistant Secretary, Safety Operations Branch, Department of Transport and Communications

CONCLUSIONS

1. The cargo was offered for shipment in accordance with the requirements of Marine Orders, Part 34 (Cargo and Cargo Handling - Solid Bulk Cargoes) and the International Maritime Organization's "Code of Safe Practice for Solid Bulk Cargoes".

2. The cargo was loaded in accordance with the Master's requirements, and the "Code of Safe Practice for Solid Bulk Cargoes".

3. The ship was not overloaded and the draught survey undertaken on completion of loading indicated it was upright.

4. Evidence available to the preliminary investigation is not such as to allow determination of likely stress experienced by the SINGA SEA. This aspect has been referred by Singa Ship Management to consultants and the results will be submitted to the Philippine authorities.

5. The ship sank after breaking in two in heavy seas at about 0300 GMT on 4 July 1988, in approximate position 35°00'S 106°00'E.

6. The reasons for the failure of the ship's structure are not known, but they are not considered to be attributable to the quality or physical characteristics of the cargo as loaded in Geraldton and Bunbury.

7. The Master of the SINGA SEA failed to follow the general instructions for vessels participating in the AUSREP scheme by neglecting to report the ship's deviation of course at approximately 1800 WST 3 July. Thereby, this compromised the objectives of the AUSREP system and failed to supply valuable information to potential rescuers.

8. The actions and procedures of the Federal Sea Safety Centre between the time that the position report from the SINGA SEA became overdue and the time 24 hours had elapsed were correct and in accordance with the AUSREP guidelines.

9. By deciding not to initiate an air search after the scheduled position report from the SINGA SEA was 24 hours overdue, having established that the ship had not been heard by ships specially tasked to attempt radio contact, or by coast radio stations handling traffic from the ship, the stated objective of the AUSREP scheme was compromised.

10. The decision by the Director not to fly an air search for the vessel on 6 July was made in the face of mounting evidence that something may have been amiss with the vessel and was not consistent with the primary objective of AUSREP.

11. The air searches carried out on 7 and 8 July were conducted properly and in accordance with sound and established search and rescue practices.

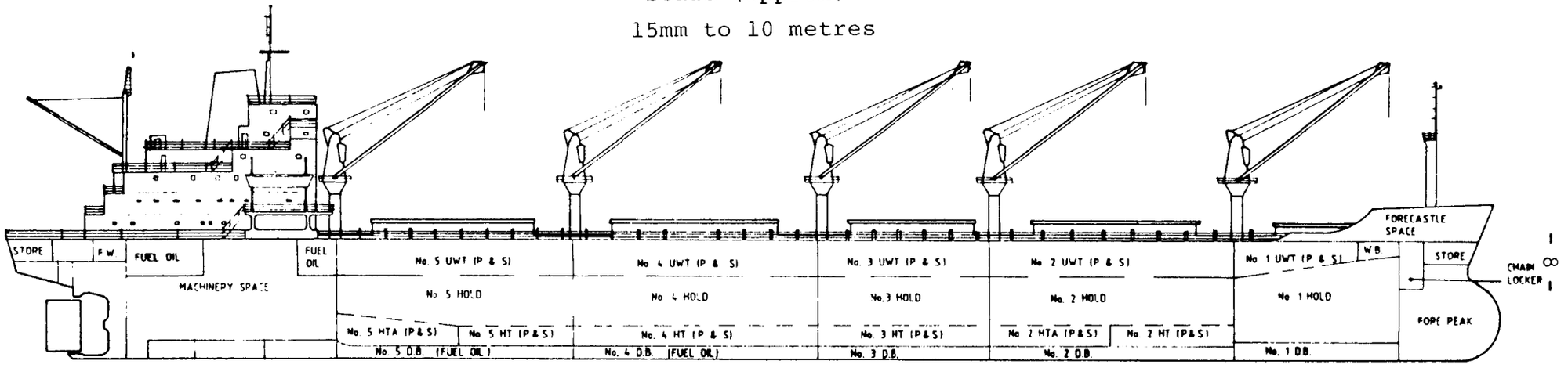
12. Given the circumstances of this particular AUSREP incident and the availability of an RAAF aircraft, the decision not to fly a daylight visual search for survival craft on 9 July, or subsequent days, was questionable, following the unsuccessful flare search of 8 July.

13. Following notification of the rescue of survivors from the SINGA SEA on 3 August, an air search for further survivors was undertaken. The decision not to conduct further searches after 3 August was correct, and made on the information available.

SINGA SEA GENERAL ARRANGEMENT

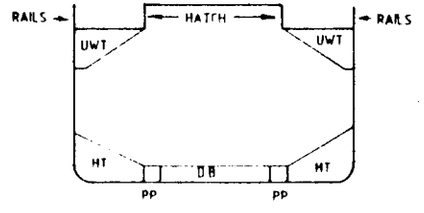
Scale (approx)

15mm to 10 metres



P - PORT
S - STARBOARD
UWT - UPPER WING TANK
H.T - HOPPER TANK
D.B - DOUBLE BOTTOM
P.P - PIPE PASSAGE

SECTION AT No. 3 HOLD



SECTION 1

LOADING OF THE SINGA SEA

SEQUENCE OF EVENTS

The M.V. SINGA SEA (previously named the DONA MAGDELENA) was a five hold bulk carrier of 26586 tonnes deadweight, 175 metres in length, 25.5 metres beam, 14.03 metres in depth, with a maximum summer draught of 9.964 metres and powered by a single Kincaid (Burmeister and Wain) diesel engine developing 8532 kW. Built in 1976 by Govan Shipbuilders of Glasgow, and classed with Lloyds Register of Shipping, the ship was constructed of steel, part of which was high tensile steel and was strengthened for heavy cargoes. Numbers 1 and 3 holds or numbers 1 and 4 holds could be empty with the remainder full. The ship was registered in Manila, owned by Singa Sea Holdings and managed by Singa Ship Management of Singapore.

From records held by the ship's agents all international safety certificates were current with the expiry dates as follows:

Load Line.....4 June 1992
Safety Radiotelegraphy.....23 October 1988
Safety Equipment.....11 June 1989
Safety Construction.....11 June 1989

The ship had undergone a special survey in June 1987.

The SINGA SEA was time chartered to A/S Christian Jebsen Rederi of Norway (Jebsens) and was due to commence charter from arrival at the pilot station Geraldton. The charter stipulated that the ship was to be delivered with holds "grain clean" at Geraldton. Jebsens in turn had entered into agreement involving two voyage charters of mineral sands and copper ore concentrate from Geraldton and Bunbury to Rotterdam and Hamburg.

The SINGA SEA arrived in Geraldton from Keelung, Taiwan, at 1900 WST on 18 June 1988. The Assistant Harbour Master, Captain L.W. Gault piloted the ship to its berth. On 19 June Captain Gault carried out an 'on-hire' survey on

behalf of Jebsens which involved surveying the ship for cleanliness and also a detailed examination of the ship's holds and deck area, noting in a written report any obvious damage, indentations or faults. The purpose of such a survey is to note the condition of the ship before hire to ensure the conditions of the charter party are met and so that any damage sustained during the charter may be identified for appropriate settlement at the end of the charter period and to establish the quantities of fuel on board at the beginning of the hire.

In Captain Gault's opinion, the cleanliness of the holds were not of such a standard to meet the requirements for vessels loading grain and the vessel was pronounced off hire as at 1900 WST on 18 June.

In general Captain Gault's "on hire" report listed the grab damage and wear and tear to be expected in a bulk carrier of this age, but he did note a heavy buckle 2 to 5 metres above the tank top on the starboard side of number 1 hold after bulkhead. He also found heavy indentations and one small puncture in the after bulkhead of number 4 hold. On deck, Captain Gault noted that significant number of welds connecting the lower round section ship side rails to the upright stanchions had carried away both on the port and starboard side. He also noted that the hatch cover seals were in a satisfactory condition.

At interview, Captain Gault was asked about the manhole access to the upper wing ballast tanks. Manhole covers were of a patent type in which the cover seated against a rubber seal and was held in place by a locking bar. He noted that some of the rubber seals appeared in poor condition and that there were gaps between the seal and the cover. Whilst in Geraldton the ship's crew were engaged in repairing the rubber seals on some of the manhole covers. The Geraldton stevedore, Captain D.J. Aslett, also remarked on the poor condition of the manhole seals.

The crew were also reported to be involved in welding in the upper wing tank and the Second Officer recalled, that at Geraldton, welding was being undertaken in the bulkhead between 3 and 4 Starboard upper wing tanks. The ship's classification society was not advised of this work.

Cleaning of the holds was undertaken by shore labour and at 1730 WST on 24 June, Captain Gault passed the holds as "grain clean" on behalf of Jebsens and at this time the ship came 'on hire' again. Agents for the ship's owners also engaged a surveyor to inspect the holds; on their behalf, Captain N.H. Gibb attended the ship and passed the holds "grain clean" at 0630 on 25 June. Further cleaning was then carried out by Jebsens to bring the holds to the "sand" clean requirements of the voyage charterers. The vessel was passed by Mr J. Wilson, on behalf of these charterers at 1615 on 27 June.

To promote the safe stowage and shipment of bulk cargoes, the International Maritime Organization (IMO) has issued a Code which provides guidance to those involved in the shipment and carriage of bulk cargoes by sea. The Code is given force in Australia by Marine Orders, Part 34 (Cargo and Cargo Handling - Solid Bulk Cargoes), made under the Navigation (Orders) Regulations, made pursuant to the Navigation Act 1912. The code requires shippers to provide the Master with all relevant details including any hazardous property of the cargo the ship is to carry. The SINGA SEA cargo was to consist of 6000 tonnes of ilmenite sand, 13000 tonnes of zircon sand and 5400 tonnes of copper ore.

The copper ore concentrate had been tested by the shippers and identified as a cargo subject to the hazard of liquefaction in transit if shipped wet. A transportable moisture limit of 10.96% had been established in accordance with the Code and the average moisture content was stated to be 7.11%. (Appendix B) Apart from a propensity to deplete oxygen, no other hazard was known. The ilmenite and zircon sands had no hazards.

Jebsens retained a firm of Marine Surveyors, Cox and Associates to assist the Master of the SINGA SEA in regard to loading and stowing the cargo. Captain P. Douglas carried out this work on behalf of Cox and Associates and conducted an initial draught survey at 1000 WST on 24 June which showed that there was 6013 tonnes of ballast, 84 tonnes of fresh water and 877 tonnes of fuel and diesel oil on board at that time. The ship was deeper by the stern, with forward and after draughts of 3.075 metres and 6.075 metres respectively, and was hogged 14.5 centimetres*.

* Hog - a term applied to the distortion of a ship's hull when the bow and stern of the vessel are lower than their normal position in relation to the middle portion of the vessel. Opposite to sag.

Captain Douglas, in consultation with the Master and Chief Officer drew up a loading plan for the two ports. The ship had to be loaded and de-ballasted so as to minimise lost loading time through the necessity of cleaning the conveyor belt between grades. To achieve this, while loading in Geraldton, the copper ore had to be loaded into number 3 hatch after loading of the other grades had been completed. The ship's freeboard was such that the loading chute was not high enough to reach into number 1 hold. It was therefore necessary to ballast the ship in the forward tanks and to list the ship to starboard to enable loading into number 1 hold to commence and this was completed on the evening of 27 June, when loading of 3201 tonnes ilmenite sand commenced, with the freeboard reduced to below 10.5 metres.

The Second Officer when interviewed following the loss, stated that it was usual for the Master and Chief Officer to make the stability and strength calculations, but he was unaware of the details. Captain Douglas understood that the appropriate calculations had been made and the loading plan was within the stress criteria of the ship. Captain Douglas returned to Perth before loading commenced.

The stevedore responsible for loading the cargo was Captain D.J. Aslett. Captain Aslett stated that the ilmenite sand was poured so as to cover the tank top but it was peaked on the centre line to one third the height of the hold. The ilmenite sand was loaded from covered storage and, according to the shippers, was effectively dry with a measured moisture content of 0.14%, an angle of repose of 35-37% with a stowage factor of 2.33 tonne/m3.

Captain Aslett stated that the loader then shifted to number 4 hold where an initial parcel of 3701.6 tonnes of zircon sand was loaded in the after end of the hold. A plastic sheet separation was then placed on the forward end of the stow and 6204.4 tonnes of a different grade of zircon sand was stowed at the forward end. Captain Aslett recalls that the cargo was levelled across the compartment, but was peaked in the fore and aft line. He estimated that the cargo peaked at about 60% of height of the compartment at the after end and about 75% at the forward end. The zircon sand was also stored under cover and was stated by the shippers to be effectively dry having a moisture content of between 0.012% and 0.006%, an angle of repose of 35-37 degrees and stowing at 2.8 tonnes/m3.

On completing the loading of sand at 0600 WST on 29 June, Captain Aslett carried out a draught survey which showed that the 14.5 cm hog had been removed by the loading in numbers one and four holds and by the disposition of the remaining 2178 tonnes of ballast aboard.

5433 tonnes of copper ore were then loaded in to number 3 hold. Loading was complete at 2030 WST on 29 June. Captain Aslett recalls that the ore stow was level apart from what he described as a "hole" on the starboard side at the forward end. He elaborated this to explain that during the last half hour of loading the ore the Chief Officer had required the foreman to pour to the middle of the hold to remove the list. This hole appeared to Captain Aslett to be about 20 feet (approx 6m) deep and sloped to the ship's side and it did not "look too bad". The copper ore had a measured moisture content of 6.74%, well below the maximum permitted of 10.96%, a stowage factor of 1.8 tonnes/m3 and an angle of repose of 37 degrees. Certificates were provided to the Master to this effect. (Appendix B)

At the completion of loading the hatch covers to numbers 1, 3, and 4 holds were dogged down and, according to the Second Officer, sealed with waterproof tape. A further draught survey was undertaken by Captain Aslett who found the ship trimmed by the stern with a forward draught of 8.43 metres, an after draught of 8.965 metres and a midships draught of 8.8 metres, a sag* of 10.25 centimetres. The depth at the Geraldton sand berth is 9.40 metres and Captain Gault was satisfied that the ship was always afloat.

While in Geraldton the vessel enjoyed generally fine weather. Records from Geraldton Aerodrome show that no rain fell while the ship was loading.

The SINGA SEA sailed from Geraldton at 0820 WST on 30 June, a voyage of about 280 miles, with 18540 tonnes of cargo, 867 tonnes of fuel and diesel oil, 131 tonnes of freshwater and 2,178 tonnes of water ballast. Numbers 2 and 5 holds were empty, Number 1 hold contained 3201 tonnes ilemnite sand, Number 3 hold 5433 tonnes copper ore and Number 4 hold 9,905 tonnes of zircon sand.

* Sag - a term applied to the distortion of a ship's hull when the middle portion of a vessel is lower than its normal position in relation to the bow and stern. Opposite to hog.

The ship arrived at Bunbury at 0637 WST on 1 July. Loading of zircon sand into number 2 hold commenced at 1810 and was suspended at 2145 after loading 2148 tonnes. The loader was then moved to number 5 hold and loading of a complete parcel of 2825 tonnes of ilmenite sand was finished at 0300 2 July. The loader was then moved back to number 2 hold and a further 1355 tonnes loaded to complete the parcel of zircon sand. Mr P.V. Bele, the Port Supervisor in charge of the mechanical loader, recalled that both parcels were spread evenly across the tank top of their respective holds with some crowning on the centre line. The zircon sand parcel had an average measured moisture content of 0.071% while the measured moisture content of the ilmenite sand was 0.4%; the other properties of the cargo were as for Geraldton. At the completion of loading, the hatch covers to numbers 2 and 5 holds were dogged down and sealed with waterproof tape.

Loading and the quantity of ballast had to be carefully controlled to ensure that the ship was always afloat alongside. The ship had to discharge ballast in sufficient time to finish loading and sail on high water. The ship's draught and the depth of water was monitored by the Harbour Master, Bunbury, Captain C.A. Ambrose, who stated that he was satisfied that there was always sufficient depth in the berth. The ship did have to suspend loading on two occasions during the loading to ensure that there was water under the keel.

The ship's crew was occupied in maintenance and in discharging ballast from the upper wing tanks. Captain Douglas attended the vessel on arrival in Bunbury and recalls that he was told that the ship had only one effective ballast pump. Although on most bulk carriers of this type it should have been possible to discharge ballast by gravity from these upper tanks whilst pumping others, the ship's staff apparently felt it was quicker to pump from the upper tanks. According to Captain Douglas, during the afternoon of 1 July the pump broke down and for a period of some five hours virtually no ballast was discharged. Captain Douglas then arranged for two air driven submersible pumps to supplement the main pump. These were lowered through the tanks' manhole covers on the main deck. By the time the vessel completed loading, all but 422 tonnes of ballast had been discharged. (Attachment 1)

after the ship arrived in Bunbury on 1 July, a radio engineer from Amalgamated Wireless (Australia) Ltd, Mr Michael Messenger, attended the ship at the request of the Master. The Radio Officer had reported a fault with the main receiver, an "ITT R700M", and Mr Messenger identified an intermittent fault in the MODULA "N" divider board. He was unable to obtain parts for the repair and recommended that the ship obtain a replacement board in Cape Town and showed the Radio Officer how to fit it. He commented that the Radio Officer was not confident as regards maintenance but otherwise appeared to understand the equipment. Mr Messenger stated that the fault was intermittent only and should not have affected reception too badly. Mr Messenger tested the emergency radio unit, which apart from the additional power source, was identical to the "main set", and found to be working satisfactorily.

Captain Douglas undertook the final draught survey at 0630 WST on 2 July. The SINGA SEA had a draught forward of 9.93 metres, after draught of 9.82 metres and a midships draught of 9.96 port and 9.98 starboard, which meant the ship was trimmed by the head by 11 centimetres and sagged 9.5 centimetres. The density of water at Bunbury was recorded as 1022 and, allowing for this, the midships mean draught in salt water would have been 9.94 metres as against the draught equivalent to the Summer Load Line of 9.963 metres.

Captain Douglas stated that he advised the Chief Officer to ensure that all manhole covers were in place before sailing and to his knowledge this was done. He assumed that ballast would be discharged once the ship cleared the port. The Second Officer stated that the ship was properly prepared for sea with hatches properly dogged down, the foc'scle head sealed by steel doors and at no time in the next two days were the manhole covers opened.

COMMENTS ON LOADING

The cargo loaded at Geraldton and Bunbury was apparently loaded in accordance with the normal practice.

The ilmenite sand and the zircon sand were stored under cover and were shipped dry with minimal moisture content. The copper ore which itself was a concentrate was shipped at a moisture content of 6.74% well below the transportable moisture limit of 10.96% and shown on a "Shippers Declaration" (Appendix B) provided to the Master, as required under the "Bulk Cargoes" Code. A "Certificate of Wet and Dry Tonnes" issued by Griffith W.A. Services, Cargo Surveyors, Shipping Samplers and Assayers shows moisture content samples of the copper ore taken every 500 tonnes. From meteorological records it is known that no rain fell while loading in either Geraldton or Bunbury which could have altered the moisture content of the mineral sands or the copper ore after they were sampled.

From statements made by those involved in the loading of the "Singa Sea" the cargo appears to have been evenly distributed within each hold except in number 3 where a 'hole' was left in the copper ore loaded at Geraldton. This 'hole' was caused by the Chief Officer instructing the loading foreman to pour towards the centre line during the last half hour of loading. In view of the small tonnage concerned and the fact that Captain Aslett, an experienced stevedore, thought that it did not look "too bad" and that a lack of transverse stability or a transverse shift of cargo appear to have played no part in the tragedy this 'hole' is not regarded as significant.

The marine surveyor engaged to assist in the loading was led to understand that this distribution of cargo, together with the disposition of bunker oil, fresh water and other stores, had been considered by the Master and Mate to be within the stress parameters of the ship for the voyage between Geraldton and Bunbury and thence to Europe. This understanding was supported by the Second Officer. According to the Second Officer the ship was very "stiff"*. This is not an unusual stability condition for loaded bulk carriers.

* Stiff - a term when applied to a ship, indicates that she returns quickly to the vertical when rolling in a heavy seaway

The Code of Safe Practice for Solid Bulk Cargoes, in addition to requiring that the Master be informed of any hazardous property peculiar to any given bulk cargo, also gives general advice on precautions to be taken in loading. The Code gives advice with regard to preventing a ship structure being overstressed. As, however, the ship was especially strengthened for bulk cargoes and the evidence is that loading information to enable the Master to arrange the loading of high density bulk cargoes, including data to assess longitudinal stress, was carried, the formulae shown in the code were not applicable.

In addition to the calculated weights, 422 tonnes of water ballast remained aboard as determined by the draught survey undertaken by Captain Douglas. 325 tonnes were distributed between ballast tanks forward of number 4 hold and 97 tonnes in number 5 forward hopper tank. It was noted that at the initial draught survey the ship was initially hogged by some 14.5 centimetres and sailed, trimmed slightly by the head, with a sag of 9.5 centimetres.

An analysis of the bending moments and shear forces has been commissioned by the ship's owners from consultants and this information will be submitted to the Philippine authorities.

The condition of the SINGA SEA was commented upon by the various witnesses with opinions varying from a vessel in poor condition, to those who found the ship much as they would expect to find a ship of that age and type. Two witnesses commented upon the poor condition of the rubber seals on some of the upper wing tank man hole covers. Some or all of these, however, were being replaced in Geraldton. The hatch covers and rubber gaskets were reported to be in satisfactory condition and the hatch covers properly 'secured and taped before putting to sea. The steel doors to the foc'scle were also reported to have been closed when the ship was at sea. There is no information that water entered the ship's tanks or holds after sailing.

Captain Gault, the deputy Harbour Master at Geraldton, noted a number of side rails broken at the weld to the upright stanchion. He stated however that, in his opinion, the rails were not such that the ship was in breach of the conditions of the load line assignment. When interviewed Captain Gault expressed concern at the buckle in number 1 hold after bulkhead, which he thought could have been caused by the vessel working very heavily in a seaway.

Evidence related to the flexing of the ship between the loaded and unloaded condition, the hog and sag noted at the draught surveys, may suggest that the damage was due to similar flexing of the SINGA SEA's hull on earlier occasions.

CONCLUSIONS ON CARGO AND LOADING

The cargo was offered for shipment in accordance with the requirements of Marine Orders, Part 34 (Cargo and Cargo Handling - Solid Bulk Cargoes) and the International Maritime Organization "Code of Safe Practice for Solid Bulk Cargoes".

The cargo was presented and stowed in accordance with the Master's requirements, and the "Code of Safe Practice for Solid Bulk Cargoes".

The ship was not overloaded and the draught survey undertaken on completion of loading indicated it was upright.

Evidence available to the preliminary investigation is not such as to allow determination of the likely stress experienced by the SINGA SEA. This aspect has been referred by Singa Ship Management to consultants and the results will be submitted to the Philippine authorities.

SECTION 2

VOYAGE OF THE SINGA SEA

SEQUENCE OF EVENTS

The vessel sailed at 0915 WST on 2 July bound for Rotterdam via Cape Town. The Second Officer, on instruction from the Master, laid off a rhumb line course for Cape Town of 269° True. This course was not in accordance with the track recommended by either the British Admiralty's "Ocean Passages of the World", or the United States equivalent for winter months in the South Indian Ocean. Both British and United States routeing charts were carried aboard the SINGA SEA and the Second Officer stated that other publications in routeing were also carried.

The Second Officer recalled that the weather on 2 July was good, with slight seas. The conditions became progressively worse however, and by 3 July the seas were rough with gale force winds. The weather was primarily affected by a low pressure system of 986 hpa, which was first reported by the Bureau of Meteorology, Perth, at 0015 WST on 3 July as centred at 33°S 94°E moving east at 20 knots. Further gale warnings were issued periodically which tracked the progress of the low pressure cell. (Appendix C)

At noon WST on 3 July the vessel was in position 33° 33'S 109° 31'E on a course of 269° at a speed of 11.7 knots. This report, received by the Sea Safety Centre, Canberra, as the ship's position report for 3 July, was the last message received from the ship.

The Second Officer stated that the ship did not have a weather facsimile machine but relied on weather broadcasts transmitted by coast radio stations. He stated that the radio officer was reliable in providing weather forecasts received from Coast Radio Stations. He recalled going to the bridge after his evening meal at about 1730. When on the bridge he and the master discussed a weather broadcast just received which to the 2nd officer's recollection, reported the low pressure centered on 34°S 106°E to the south and some 350 miles west of the ship. The SINGA SEA's position at that time was approximately 33° 35'S, 108° 10'E. This recollection probably corresponds

with the gale warning issued by the Bureau at 030957z (3 July 1800 WST) which read:

> "GALE WARNING
> ISSUED BY THE BUREAU OF METEOROLOGY, PERTH AT 07031000Z
> AREA AFFECTED
> BOUNDED BY LONG 94 EAST AND LINE TO 26 SOUTH 94 EAST TO 26 SOUTH 110 EAST TO 30 SOUTH 115 EAST TO 40 SOUTH 120 EAST TO 40 SOUTH 94 EAST LOW 990 HPA NEAR 34 SOUTH 102 EAST MOVING EAST AT 20 KNOTS MAINTAINING SOUTHERLY WINDS 35/45 KNOTS TO THE WEST OF LOW, AND NORTHERLY WINDS 25/40 KNOTS TO THE EAST OF LOW, WITH VERY ROUGH TO HIGH SEAS AND A MODERATE TO HEAVY SWELL".

It was at this time that the Master ordered an alteration of course to 200° true. At this time the ship's speed had been reduced from 100 - 103 rpm to 90 - 92 rpm giving a speed estimated to be 10 knots. At this time the winds were from a northerly direction and the alteration of course would have put the wind on the starboard quarter. (Attachments 2 to 5 and Appendix C)

According to the Second Officer, the ship maintained this course until a little under an hour before he went on watch at midnight (0000 hours 4 July ship's time) when the course was altered to 260°. The ship's zone time was altered that night from zone time -8 (WST) to zone time -7 hours by each watch keeping officer doing an extra 20 minutes duty. The Second Officer completed his watch at 0400 hours ship's time and went to bed.

The Second Officer woke at about 0930 ship's time. He recalled that the wind and sea was on the port bow and that the sea was very rough' to high. He stated that he went to the mess room and had some coffee. As it was a public holiday in the Philippines, some of the crew were not working and he stayed there talking for a while. He returned to his cabin at a time he remembered as being precisely 1000 ship's time. He had settled to do some paper work when he felt the ship take a series of abnormal pitches. After the third such pitch the vessel appeared sluggish and unable to recover. A few moments later the general alarm sounded. The Second Officer went from his cabin on the port side of the ship to the officers' lounge on the centre line with windows looking forward towards the bow, a distance of some 10 metres. From the

windows he could see that the vessel appeared to be "cut in two" by way of hatches 3 and 4. With the alarm bells still ringing he ran back to his cabin to don his life-jacket and shoes. By this time the vessel was developing an increasing list to port.

The Second Officer did not know whether any distress signal had been sent. Checks for the period 0200-0400 z (0900-1100 ship's time) by Overseas Telecommunications Commission (OTC) of tape recordings which continuously monitor the emergency frequencies of 500, 2182, 4125 and 6215.5 kHz showed that no MAYDAY or SOS signal was received from the SINGA SEA. No distress message was reported by any other coast station bordering the Indian Ocean. A specific check of Mauritius Radio Station, in response to a press report that a distress message had been heard by that station, also provided no evidence of contact.

The Second Officer was unable to get to his lifeboat station as the vessel had a very steep list to port. He managed to gain access to the port side of the poop deck aft. From there he could see 16 or 18 of the crew at the lifeboat on the port side. They had apparently been unable to release the boat or swing the boat out in preparation for boarding. The Second Officer stated that at this time the ship lurched further to port and he was thrown into the water. The sea was rough and the water covered in oil.

In the water the Second Officer was able to cling to a lifebuoy and a piece of timber. He estimated that he was in the water about five minutes when he saw and managed to swim to a lifeboat which somehow had cleared the ship. When alongside the lifeboat, he was pulled aboard by three persons already aboard.

The first person to board the lifeboat was the engineer apprentice Erendo Buenconsejo. Mr Buenconsejo had joined the SINGA SEA in Hong Kong some 29 to 30 days before and together with the other cadet, Apolinario Quinsay, it was his first trip to sea.

At 1000 ship's time 4 July the two cadets were taking a morning break. Upon hearing the emergency alarm, Mr Buenconsejo ran to the mess room where he saw his companion wearing a lifejacket. He immediately returned to his cabin and collected his lifejacket which he donned over his shirt. He then ran to the

port side where he saw the remainder of the crew gathered. At this time, apparently, the ship lurched, throwing him into the water. Once in the water he saw a lifeboat floating nearby, he took off his lifejacket and gave it to the 4th engineer who was close by in the water and swam to the boat. With help from another survivor who pushed him up, he managed to clamber on board. He found the lifeboat to be half full of water. He then assisted the 4th engineer, the Chief Officer and the other engineer cadet to climb on board.

The other survivors tell similar stories of being thrown into the water. The 4th engineer stated that he was asleep when the alarm sounded and he heard shouts of "abandon ship". He reacted by pulling on clothes and grabbing a life jacket. As he gained the open deck, water was already entering the accommodation. He then jumped into the sea and was the second person to get to the lifeboat.

Once the seven were aboard the lifeboat they clung together in shock. At about this time the Second Officer recalls looking at his watch which showed a time of about 1015 ship's time. The ship by this time had completely disappeared leaving the sea and lifeboat covered in oil. The sea remained rough with a heavy swell and the wind was estimated as gale force. Only one other crew member was visible, at a distance estimated by the Second Officer to be about 50 metres. The survivors were unable to manoeuvre the boat sufficiently to rescue the man.

The survivors all stated that they saw no other person or survival craft clear the stricken vessel.

Once the survivors had overcome their first shock, the Second Officer took charge and they took stock of the situation. They found the drain holes in the bottom of the boat had not been plugged and once this was done they started the process of bailing out the water.

The Chief Officer had been badly hurt, sustaining a serious gash in the forehead and his face was badly swollen. He was conscious and able to talk, and was given analgesic tablets before having the wound cleaned. The Chief Officer died, apparently from his injuries, within 24 hours of the sinking.

The boat was equipped with food, water and survival gear, contained in plastic containers stowed loosely in the boat. Some of these containers and the oars had apparently been lost overboard from the boat when the ship capsized. Water, food, the exposure cover and some other equipment remained. The lifeboat was equipped with a motor, but this had been flooded by the sea water.

The lifeboat was not equipped with an EPIRB and the survivors did not have sufficient time to collect the ship's emergency lifeboat radio from its normal stowage position in the radio room.

Under the direction of the Second Officer, the exposure cover was rigged over the forward half of the boat, and two man watches were organised. Amongst the stores, four parachute flares were found.

Over the next 29 days, in varying weather, watches were maintained and the lifeboat drifted. The Second Officer would not allow the use of the lifeboat flares. The survivors stated that at no time were any aircraft heard or seen, no flares were observed nor were any ships sighted.

Just after midnight ship's time (2315 2 August WST) on 3 August the mess man, Carlito Enrique, saw the masthead and port side lights of a large ship. He called the Second Officer who fired the first of their parachute flares. Shortly after the ship was seen to turn towards them and the rescue was effected.

On 4 August 1988 in position 34° 19'S 112°22'E, some 400 miles east of the estimated position of the sinking, the Greek bulk carrier STANDARD VIRTUE picked up the six survivors of the SINGA SEA.

COMMENTS ON VOYAGE OF SINGA SEA

With the presumed death of the Master, it is not possible to comment fully on the conduct of the SINGA SEA between sailing Bunbury on 2 July and the loss of the ship on 4 July. The following comments are made without the benefit of knowing the Master's thinking or justification for the decisions he took.

The Hydrographer of the Navy (UK) publishes "Ocean Passages of the World", which is written for use in planning deep-sea voyages taking into account the weather and sea conditions that may be encountered. For ships on voyages between the west coast of Australia and the Cape of Good Hope it is recommended that ships on all voyages throughout the year keep north of 30° 00'S from 100° OO'E. "From May to September all traffic should proceed along the parallel of 30 degrees South to a position off Durban . . . . . ' The Second Officer stated that the ship carried this or similar publications.

The Master however, decided on a rhumb line course of almost due west. It is not unusual for large modern ships to disregard routeing advice, and a number of ships were known to have followed the rhumb line route south of 30° S during this same period.

According to the Second Officer, the Radio Officer was reliable in receiving weather forecasts. Between the time of sailing and the Master's decision to alter course to 200" at about 1730 WST, some eight gale warnings should have been received. The first warning of significance was issued by the Bureau of Meteorology, Perth at 0015 WST on 3 July warning of a low pressure centre in 33°S 94°E. The following report issued approximately 12 hours later, identified the system as a complex low with two centres: one 30°S 96°E and the other 34°S 96°E, moving East at 20 knots. The next gale warning issued at 1228 West Australian time also identified the system as having two low pressure systems, while subsequent forecasts identify one centre of low pressure. (Attachment 2 and Appendix C)

The Second Officer stated that the Master ordered an alteration of course soon after receiving a gale warning at about 1700 ship's time. From the Second Officer's recollection of the wording it would appear that this was the warning sent at 1756 WST. The wind at this time would have been from the

north with wind speeds forecast at 35 to 45 knots. Assuming that the earlier forecasts had been received, which showed the complex system with two centres, it would appear that the Master elected to put the sea on the SINGA SEA's starboard quarter and go to the south of the low pressure system rather than alter course to the north and pass between the two centres (Attachment 2). It is possible that the low pressure system passed over the ship during the evening watch, at about the time the course was altered to 260° at 2330 ship's time. By the morning at least the ship was to the west of the system with southerly winds of 35 to 40 knots and heavy to very heavy seas on the ship's port bow.

Unfortunately, in view of subsequent events, the Master did not inform the FSSC of the deviation as required under the AUSREP system. The FSSC was therefore unaware of the ship's probable position at the time of the sinking or the fact that the weather was such as to lead the Master to decide modify the ship's intended route. Thus projections of the ships course based on the position report sent earlier in the day were incorrect. (Attachment 6)

The Second Officer also recalls that the Master had reduced the engine revolutions by 10 rpm to 92-93 rpm in view of the rough seas. He stated that the course being steered when he came off watch at 0400 hours ship's time was 260 degrees. Assuming that the ship's course had not been altered between 0400 and 1000 the wind, reported as being on the port bow, would have been from a South Westerly direction. It is questionable whether the reduction in propeller revolutions by 10rpm, was sufficient to reduce the effects of slamming and pounding to a significant degree, given the heavy weather experienced.

The actions of the survivors in utilising the lifeboat exposure cover and in particular the action of the Second.Officer in taking command, posting lookouts and rationing water and lifeboat stores is highly commendable and was central to their survival. The discipline showed by the Second Officer in not expending any lifeboat pyrotechnics for 29 days until a positive sighting was made was a crucial factor in their rescue.

CONCLUSIONS

The ship sank after breaking in two in heavy seas at about 0300 GMT on 4 July 1988, in approximate position 35°00'S 106°00'E.

The reasons for the failure of the ship's structure are not known, but they are not considered to be attributable to the quality or physical characteristics of the cargo as loaded in Geraldton and Bunbury.

The Master of the SINGA SEA failed to follow the general instructions for vessels participating the AUSREP scheme by neglecting to report the ship's deviation of course at approximately 1800 WST 3 July. Thereby, this compromised the objectives of the AUSREP system and failed to supply valuable information to potential rescuers.

SECTION 3

THE ACTIONS OF THE FEDERAL SEA SAFETY CENTRE (FSSC)

AUSREP AND THE SINGA SEA

The SINGA SEA first entered the area covered by the AUSREP system (Appendix F) on 15 June on the voyage from Keelung, Taiwan, to Geraldton. The ship voluntarily took part in reporting daily to the FSSC and followed the requirements of the AUSREP scheme by reporting on five occasions, including an initial report, three position reports and a final report, before arriving at Geraldton on the 18 June.

Masters participating in the AUSREP scheme are also encouraged to furnish to the FSSC, by mail, further details of their ship, size, type, owners, agents, lifesaving appliances carried and whether the ship carries emergency position indicating radio beacons (EPIRBs). These details were not provided by the SINGA SEA.

Under the provisions of Division 14, Part IV of the Navigation Act 1912, participation in AUSREP is mandatory for all foreign flag ships sailing between Australian ports. Despite voluntary participation on the voyage to Australia, the Master of the SINGA SEA failed to notify the FSSC of his departure from Geraldton, nominate a reporting time, and notify his arrival at Bunbury.

When the ship sailed from Bunbury on 2 July, for North West Europe, the Master filed a sailing plan as required under the AUSREP system, nominating a daily reporting time of 06002 (1400 WST), an estimated time of departure of 2020 WST on 7 July for leaving the AUSREP area at longitude 75° E, and Perth Radio as the coast radio station monitored.

At 0647z (1447 WST) 3 July a position report was received at the Federal Sea Safety Centre giving the ship's noon position as 33° 33'S, 109° 31'E on a course of 269 degrees at a speed of 11.7 knots. This was the last message received from the SINGA SEA.

SINGA SEA OVERDUE

The SINGA SEA's next position report was due at 1600 EST (06002) 4 July*. At 1957 EST Perth Coast Radio Station was contacted by telex asking them to place the vessel on their traffic lists and to pass the message -

MASTER
SINGA SEA/DZJF

AUSREP
YOUR VESSEL IS OVERDUE FOR A 0406002 JUL POSITION REPORT.
PLEASE ADVISE YOUR POSITION
REGARDS SEA SAFETY CANBERRA 0409572 JUL 88

Perth Radio were asked to confirm when the message had been passed to the ship.

Checks with Perth (VIP) and Sydney (VIS) radio were then undertaken. At 2207 EST (1207z) at six hours and seven minutes after the missed report time (MR+6 hours) a request to broadcast the JJJ/Report Immediate group** was telexed to Sydney and Perth radio stations and the MARSAR*** (Marine Search and Rescue) file was raised. The Senior Co-ordinator**** judged that at 2200 EST the radio operator aboard the SINGA SEA would probably be on duty or have one more duty period to complete and the dedicated AUSREP radio group 'JJJ/Report Immediately' could bring a response within a short time. To reinforce the JJJ message a further message preceded by the international group CQ and requesting all ships to report if they had heard or seen the SINGA SEA was also passed to Sydney and Perth for broadcast.

* In this narrative, this is called the missed report time, (MR) with the time elapsed since this time being given in figures to the nearest half hour. eg. (MR + 6½). Times are from here given mainly in Eastern Standard Time (EST), the time zone kept in Canberra.

** JJJ - a unique AUSREP signal to alert the subject vessel and other vessels that a report is overdue. See Appendix F.

*** MARSAR File contains a copy of all telex and telegram communications received and relevant telephone messages. All telexes and telegrams record the time sent or received, telephone messages or file notes are date stamped and documents are entered sequentially on the file.

**** See Appendix E for a brief explanation of the responsibilities of the various ranks in the Sea Safety Centre

Between 2200 EST on 4 July (MR+6) and 1000 EST on 5 July (MR+18) routine checks were made with any coast radio station that the SINGA SEA was likely to pass messages through, including Scheveningen (Holland), Cape Town and Singapore. Singapore Radio reported that their last contact with the ship was on 3 July at 05542, effectively the same time at which the last position report from the SINGA SEA was sent to the FSSC. As the ship had a Filipino crew, the stations telexed included Manila Radio, but no contact could be made through communications channels normally used. The FSSC also attempted to contact the ship by telegram lodged through these radio stations.

Singa Ship Management, Singapore, was telexed and advice requested as to the last known contact by the Company. Contact was also made with the American world-wide ship reporting system, the Automated Mutual-Assistance Vessel Rescue System, (AMVER) to see whether the ship had reported under their scheme.

A surface picture (SURPIC) based on ships known to have been in the area by AUSREP was called up by the duty Senior Co-ordinator and two ships were identified as being in the expected area of SINGA SEA. The Polish flag ship WROCLAW on an eastbound voyage, bound for Melbourne, and the Japanese flag YAMANAKA MARU which was approximately 60 miles astern and slightly to the north of the expected position of SINGA SEA, were asked to attempt to make contact by Medium Frequency (MF) and the short range Very High Frequency (VHF) radio.

At 1205 EST on 5 July (MR + 20 hours) the Senior Co-ordinator on duty at the FSSC, Mr C Payne, requested Sydney and Perth radio stations'to issue an urgency message, prefaced by the group XXX in radiotelegraphy and PAN PAN by radiotelephony. The message gave the last known position, course and speed of the SINGA SEA and requested sighting or hearing reports, the message to be repeated at two hourly intervals. Additionally traffic lists, weather forecasts and navigational warnings were also to be prefaced by the urgency message.

At about this time, in accordance with normal practice, the Controller of the Federal Sea Safety Centre Mr V. Daly, was informed of the overdue vessel, and

read the MARSAR file. The Director, Mr R. McCulloch, was also told of the overdue report on the SINGA SEA and the action taken to date.

By 1240 EST (MR+20½) WROCLAW and YAMANAKA MARU had reported that they had made no contact with the SINGA SEA, but would continue to call. The YAMANAKA MARU being relatively close to the intended course of the SINGA SEA also used her radar to search, but without making contact with any target. (Attachment 6)

At this time the Senior Operations Controller, Perth Airport, was contacted by telephone. It is the responsibility of the Senior Operations Controller to assign aircraft once a request is made for an air search to be undertaken. He was told that the SINGA SEA was overdue and asked whether there were any aircraft in the area. He informed the Senior Coordinator on duty (Sea Safety Centre) that there was no record of any aircraft in or due in the area. The only scheduled flight in the area was the weekly QANTAS flight from Perth to Harare some two days later on Thursday 7 July, returning Friday 8 July. There was no request for or indication of any immediate requirement for search aircraft.

At about MR+21 Jebsens Australia Pty Ltd, Fremantle, the ship's agents were contacted for a description of the vessel, her cargo, number of persons aboard and the ship's expected movements. In replying a few minutes later, a representative of the company stated that from general office conversation it appeared that there had been some difficulty in contacting the ship and there may have been some problem with the ability of the radio officer.

This query was then referred by telephone to the supervisor on duty at the OTC Perth radio station. After checking, he confirmed that his' operators were of the view that the radio officer did not know how to operate properly and the ship at times responded to cables sent to the ship via Perth Radio by stating that the message was not understood. At subsequent interview, the supervisor referred to the station log book which contained specific comments on contact with the SINGA SEA. These referred to mutilated messages sent by auto key, problems in address and general procedural difficulties. The Supervisor concluded that the general standards of radio telegraphic operation aboard the SINGA SEA were inferior and the ship's operator was not conversant with the International Telecommunication Union "Q" Code, a code in general use in day-

to-day radiotelegraphy operation.

At 1500 EST (MR+23) Mr Payne was relieved by Mr P. Doyle who had been temporarily promoted as an acting Senior Co-ordinator. Mr Doyle took over responsibility for the SINGA SEA search and rescue. One hour after Mr Doyle assumed duty, a decision with regard to an airsearch was due to be made.

While the SINGA SEA had participated in AUSREP effectively on the voyage from Keelung to Geraldton and again after sailing from Bunbury, the Controller, at the FSSC, formed the view that the most probable reason for the missed report was either radio equipment or radio operator problems. He took into account that the ship was a large bulk carrier, apparently well found and that no distress message had been reported either in the form of direct radio contact with the ship or by EPIRB. He decided to await further communications checks, particularly with the owners, and checks were continued through Rogaland Coast Radio Station, Norway, and attempted through Manila radio. It was concluded that at that time an air search was not warranted. The Controller stated that at no time did he consider suspending the search and rescue action already in hand, as further checks were being made and the situation would be kept under review as information came to hand.

At 1734 EST on 5 July (MR+25½) however, the Senior Co-ordinator on duty telexed Perth and Sydney Radio stations requesting that the urgency signal should be cancelled, due to it being concluded that communications difficulties with the SINGA-SEA was the cause of the missed report on 4 July and the failure to make contact on 5 July.

At 1743 EST (MR+25½) Singa Ship Management of Singapore replied to an earlier telex from the FSSC stating that the SINGA SEA was to report every two days and the last report received was 2 July, but the ship had failed to report as scheduled on 4 July. The telex went on to state that the vessel could be experiencing transmitter problems and asked other vessels in the area to attempt to contact the ship. The telex concluded with an assurance that Singa Ship Management would contact the FSSC as soon as any message was received from the ship.

Ten minutes later, a telex was received from Jebsens of Bergen, Norway, who

were the charterers of the SINGA SEA. They confirmed that their last contact with the ship was at the same time as the position report received by the FSSC on 3 July, as notified by Singapore Radio in the original checks with coast radio stations at MR+6 hours. The charterers were expecting a report that day, 5 July. They also stated that the ship's owners in Manila had been informed, by them, of the present situation. This message was sent at 0954 Norwegian time and therefore confirmation of the expected report to Jebsens should have been expected within the next eight hours, probably a little after 1700 Norwegian time or MR+34 (0200 EST 6 July).

At 1802 and 1814 EST on 5 July, (MR + 26) telexes were sent by the Senior Co-ordinator on duty to Singa Ship Management, and Jebsens, Norway stating:

> various attempts had been made to contact SINGA SEA through coast radio stations and shipping in the area
>
> Perth Radio had had great difficulty in making themselves understood and those aboard the ship apparently did not understand telegrams sent to the ship through the radio station by the Australian agents
>
> in view of these factors no further search and rescue action was to be undertaken unless further information came to hand
>
> vessel was to remain listed with Perth Radio
>
> would appreciate advice of any contact.

At 0055 EST (MR+33) on 6 July, the YAMANAKA MARU, in position 32° 43'S 097° 13'E, sent a deviation report to the FSSC, notifying of an alteration of course from 267° to 280° at a speed of 9.5 knots, due to violent sea conditions.

At 0823 EST and 0910 EST on 6 July, (MR+40) messages were sent to the YAMANAKA MARU requesting that the vessel maintain its efforts to contact the SINGA SEA by MF and VHF radio. The second message also requested the Master of the YAMANAKA MARU to activate the ship's automatic distress alarm in an attempt to initiate a response from the SINGA SEA. This message was received by the

YAMANAKA MARU at 1235 EST. At 1524 EST the Master confirmed that he had activated the auto alarm but had received no answer.

During the period from 0830 EST to 1230 EST the duty officers in the FSSC contacted the Headquarters Operational Command (HQOC), Royal Australian Air Force and established through the Search and Rescue Officer that three "P3" Orion aircraft were undertaking anti-submarine exercises off the coast of Western Australia. It was confirmed that one of these planes could be made available for maritime search and rescue. Also during this period search planning was undertaken and the necessary weather information gathered from the Meteorological Bureau, Perth. Jebsens, the ship's agents in Fremantle were contacted again to try and establish further whether there was any known radio receiving or transmitting problem aboard the SINGA SEA. Jebsens confirmed that the ship had a radio certificate valid to 23 October 1988, the ship's radio was apparently in working order and in a later phone conversation supplied a description of the ship for search aircraft briefing.

At no time during the morning was any message received from Jebsens of Norway concerning their expected contact with the SINGA SEA.

According to the duty Senior Co-ordinator, Mr P Doyle, at about 1200 EST (MR+44) on 6 July, he had a prolonged discussion with the Controller over the question of initiating an air search. The Senior Co-ordinator stated that he pointed out that the RAAF had three suitable aircraft already in Western Australia and he considered that an air search should be undertaken immediately.

The Controller discussed with the Director, whether a flight was justified and took into account:

the vessel was a large ship, apparently well found

the information from the Agents, OTC Perth Coast Radio Station, that there may be a communications failure aboard either through the operator's ability or equipment malfunction

experience from the operation of the AUSREP System that ships had,

in the past, failed to report but arrived safely in port

the ship was not carrying a volatile cargo, and that their understanding was that the mineral sands was a stable cargo.

The Controller did not pass on to the Director, Mr Doyle's views with regard to the need for an air search.

The Director decided not to seek an air search, which it was accepted would require RAAF support. The Director, after talking to the Controller, decided not to use an aircraft but to request the YAMANAKA MARU to broadcast an instruction for the SINGA SEA to operate the ship's EPIRB during the evening of 7 July, so that the QANTAS flight QF 23 could receive the signal. This broadcast was to be made "blind", as the YAMANAKA MARU would probably receive no confirmation that the SINGA SEA would have received the instruction until a positive response was detected by QF23. If the ship was safe, but unable to transmit messages it was to operate the EPIRB intermittently or if in distress to operate the EPIRB continuously. By so doing the SINGA SEA would be able to confirm its wellbeing even if the ship's transmitter had failed. This decision was recorded in a file note made by the Senior Coordinator at 1230 EST (0230Z or MR+44½ hours) which was entered in the MARSAR file as follows:

"D/O* DECIDED NOT TO TASK RAAF P-3 AS DEDICATED SEARCH AIRCRAFT. BRIEF QF PERTH - HARARE THURSDAY, BCAST BLIND TO SINGA SEA TO ACTIVATE (EPIRB) FOR 5 MINS EVERY 15 MINS IF OK. IF NOT ACTIVATE EPIRB CONTINUOUSLY."

At 1729 EST on 6 July, a telex from Singa Ship Management established that the SINGA SEA did not carry an EPIRB, however it was decided to'continue to await confirmation from the charterers.

While the decision was made not to search at this time, the aviation authorities were briefed that the SINGA SEA was missing and were given a description of the ship, together with its last known position, course and speed. It was also requested that any aircraft in the area should report any sighting or hearing of the ship and that a listening watch be kept on the

* Director Operations

aviation distress frequencies of 121.5/243.0 mHz to pick up a signal from any EPIRB the ship may have been carrying.

At 1349 EST (MR+46) the FSSC telexed the owners and charterers advising them that the SINGA SEA had had no contact with any known coast radio station since the ship's last position report to the FSSC; advising them that aircraft had been asked to keep a lookout and listen for any signals from the vessel; and seeking advice on any radio problems and as to whether the ship carried an EPIRB.

At 1728 EST (MR+49½) Singa Ship Management replied saying that they had not heard from the ship since 2 August and that it was unlikely that the radio transmitter had broken down. The telex went on that they feared that the vessel may have been lost due to extreme weather conditions. They also confirmed that the ship did not carry an EPIRB. The duty Senior Co-ordinator Mr Jackson-Calway telephoned the Director and it was agreed that no further decision should be made until a reply had been received from Jebsens, Norway and checks had been completed with Manila radio.

A little under an hour later at 1817 EST a telex reply was received from Jebsens, Norway, confirming that no contact had been made with the ship. The telex also confirmed that the ship was to proceed south of Africa to North West Europe. The telex went on that they believed that, given the time of year, an experienced master would choose a northerly course from Bunbury until reaching a latitude between 30° and 25°S then take a rhumb line course to 60° E, a course which is recommended by the British Admiralty routeing charts.

The Senior Co-ordinator stated that he again rang the Director to inform him of the developing situation, but that the Director was not at home.

A little before 1930 EST, Mr Daniel Foo, from Singa Ship Management, telephoned the FSSC and inquired as to the action being taken by the FSSC. Mr Jackson-Calway advised him that they were still checking radio communications and that a search flight would be considered when all communications checks were complete, particularly the outstanding query to Manila Radio.

During the evening an attempt to contact Manila radio through Hong Kong was made, but proved to be unsuccessful. At 2037 EST a message marked "URGENT" was sent via land line. No reply was received until 1906 EST on 9 July when notification from OTC was received that the message could not be delivered as the station had closed down in January 1987.

A little after 2300 EST on 6 July (MR+55) as Mr Jackson-Calway was handing over to the new duty Senior Co-ordinator, the Director returned Mr Jackson-Calway's earlier telephone call. Mr Payne, who was last on duty between 1500 and 2300 EST on 4 July (before MR+24), took the call, passing to the Director the content of the telex from Jebsens received earlier in the evening. Mr Payne, who had initiated the urgency signal XXX/PAN through Perth and Sydney Radio stations on 4 July, sought clarification as to why the urgency signal had been cancelled some 30 hours before. He also queried why telexes had been sent to radio stations and Singa Ship Management stating that "no further search and rescue action is being taken." The Director replied that he was unaware that the urgency message had been cancelled and that messages had been sent to the effect that no further action was being taken. The Director confirmed that the FSSC was at the alert phase as regards the SINGA SEA and stated that the urgency message would be reinstated in the morning.

During the night watch, the staff at the FSSC made further contact with the US AMVER system, Lloyds Shipping Intelligence, Sydney and Perth radio stations and the South African search and rescue authority, informing them of the situation. At 0612 EST on Thursday 7 July, the Senior Operations Controller, Perth Airport, was contacted regarding the availability of aircraft in Western Australia with the capability of searching over 1000 miles out to sea. The Senior Operations Controller confirmed that the Perth-Harare flight (QF23) was due to leave at 1515 EST and that three Orion long range reconnaisance aircraft were on exercise from RAAF Pearce.

At 0904 EST on 7 July (MR+65) the FSSC duty Co-ordinator telephoned the Search and Rescue Officer at HQOC RAAF and advised him that the Centre would shortly be making a formal request for an RAAF aircraft to search for the SINGA SEA. The approximate area of the search was discussed and the Squadron Leader stated that the RAAF would start to prepare for the flight straight away and await the formal request.

At 0921 EST all parties were informed that an RAAF long range aircraft had been requested to search for the SINGA SEA and at 0928 (MR+65½) a formal request for a trackline search was made to the RAAF direct from the FSSC. Copies were sent to other aviation contacts within Australia including the Civil Aviation Authority Central Search and Rescue organisation (SAR Central). The request contained details of the ship, the co-ordinates of a "track line" search for the missing ship and details of other ships known to be in the area. (See Appendix D)

At 1044 EST, SAR Central confirmed that no civil aircraft were available and therefore requested military assistance. At 1048 EST, an officer from RAAF Pearce rang to find out any further search intentions on 8 July in order that any adjustments necessary could be made to the anti-submarine exercise in operation off the West Australian coast. The FSSC was unable to predict the following day's requirement but undertook to inform the RAAF as soon as was possible.

At 1218 EST 7 July (MR+68) a P-3 Orion, Rescue 251, took off to undertake a radar and visual search for the SINGA SEA. Rescue 251 was briefed to fly along the reported course of the SINGA SEA from the ship's last reported position on 3 July of 33°33'S 109°31'E, to 33°4O'S 099°00'E, to 32°OO'S 087°00'E, 34°OO'S 87°E, then returning to the SINGA SEA's last reported position. This search covered the ships expected course line between 1600 EST on 3 July to 1800 EST on 7 July, a distance of over 1000 miles, taking into account any possible alteration to the north at about the same time that the YAMANAKA MARU reported a deviation. At 0651 EST the duty Senior Co-ordinator talked direct to the pilot regarding the feasibility of conducting a night flare search. The pilot stated that the visibility was extremely bad below the cloud cover and that a night flare search would be a waste of time. At this time the co-ordinates of the search for the return leg were altered slightly to the south to avoid overflying the same water, and take into account any drift that may have been experienced by liferafts. (Attachment 7)

At I323 EST, the Senior Co-ordinator phcned RAAF Pearce saying that he had been informed by his superiors (apparently the Controller) that, unless some trace of the SINGA SEA was found during the flight, no further flights wculd be requested. As the shifts at the FSSC changed, the Senior Operations Controller, Perth Airport, was telephoned that contrary to advice given to RAAF Pearce, an aircraft might be required for search the following day. At 1708 EST, the original advice that an aircraft would not be required was confirmed by a telephone call to the Search and Rescue Officer HQOC RAAF. At 2241 EST, however, Rescue 251 reported radar contact with an unidentified vessel in position 34°52'S 094°07'E, proceeding on a course of 270° at 4 knots. The aircraft was unable to investigate because of low fuel reserves.

During the period of the flight the Japanese Tuna Co-operative and their agents in Perth were asked to alert any Japanese fishing vessels in the area to keep a lookout for the SINGA SEA.

At 0251 EST on 8 July (MR+82½) the flight report from Rescue 251 was received by the FSSC. The flight sighted two merchant ships, one of which was the YAMANAKA MARU, and described type and the colours of the hull and funnel. Neither of these matched the description of the SINGA SEA. Seven other targets were positively identified as Japanese long line fishing vessels except one contact at 34°52'S 94°07'E. This latter vessel, however, painted a similar return on the aircraft's radar screen as a long line fisherman. Singa Ship Management was sent confirmation of the report by telex. The Master of the YAMANAKA MARU was also telexed confirming that RESCUE 251 had sighted his ship and asking that he maintain his attempt to contact the SINGA SEA until the vessel left the AUSREP area.

In view of the unidentified target, it was decided that a further air search should be undertaken that day and this was discussed by phone with various RAAF Officers involved. The request was confirmed by SAR Central at 1050 EST 8 July.

The aircraft was briefed to attempt to establish the identity of the unidentified target from the previous flight and, assuming this vessel was not the SINGA SEd, to conduct a flare search between 34°2O'S 108°OO'E and 34°4O'S 112°50'E. This plan required the Orion to fly the 1300 miles from Pearce to

conduct a visual/radar search for the unidentified vessel during daylight and to then proceed the 900 miles to the flare search area so that the aircraft reached the area after nightfall. The latter part of the search plan was based on computer predictions of survival craft from a ship being lost between the last known position and the estimated position that the ship should have been in when she failed to report assuming, in the absence of a deviation report, that the SINGA SEA had remained on the reported track.

The RAAF was briefed at 1207 EST in the normal manner including a request to amend the flare search area by starting the search before reaching 108°00'E, fuel and endurance permitting. The track spacing and search height was left to the judgement of the pilot being dependent on the weather and endurance of the aircraft. The aircraft, Rescue 252, took off at 1338 EST on 8 July equipped with 72 flares for the search. The Orion aircraft normally carry 16 such flares and this number is supplemented as necessary for such searches. There were few flares in store in Western Australia and the flares from other aircraft were taken to make up the number.

During this period the FSSC raised the possibility of using a second P-3 Orion to conduct a flare search of an enlarged area. There were, however, no further flares available, the nearest being at Edinburgh S.A. As the flares could not be carried on a normal commercial flight, being explosives, the possibility of chartering an aircraft to carry the flares was considered but, due to the time it would have taken to obtain the flares and charter the aircraft, this was rejected. The possibility of an aircraft conducting a night search using strobe lights and landing lights was discussed with Senior Operations Controller, Perth Airport, and it was understood in the FSSC that this would be undertaken. At 1335 EST approximately SAR Central confirmed by telephone that the second P-3 Orion was not available for the night flare search due to lack of flares and the non-availability of crew, but was available for a daylight search at first light the following day, Saturday 9 July.

It is apparent from a telex from the HQOC SAR Officer to RAAF 92 Wing, sent at 1359 EST on 8 July, stipulating one P-3 for search duties to commence first light 9 July, that the RAAF anticipated a request for a further search. A copy of this telex was received at the FSSC at 1420 EST.

At 1400 EST 8 July the Controller FSSC rang SAR Central and expressed his concern at the lack of the second flight due to lack of flares. He stated that strobe lights and landing lights would be enough to attract the attention of survivors, and that in his opinion in view of the very large search area and the small resources available, a night search was the only reasonable option. He requested that this view be put to the RAAF. SAR Central stated that the non availability of the aircraft was through the unavailability of crews and crew hours. The Controller accepted this and went on to state that unless survivors were sighted during the night flare search, the FSSC would not require aircraft for 9 July. The non-availability of aircraft until 0850 EST on 9 July was confirmed by telex from SAR Central.

The decision not to undertake a further search in the absence of any positive evidence of survivors was passed to the Senior Operations Controller, Perth, at about 1430 EST by telephone. The decision was also confirmed with SAR Central. These conversations were followed by a telex timed at 1522 from HQOC RAAF that the request for a search on 9 July was cancelled.

At 2151 EST 8 July Senior Operations Controller, Perth Airport, telephoned confirming that Rescue 252 had 2 hours fuel remaining, had expended all flares and was returning to base. Unless there were any instructions to the contrary, the aircraft was to return to RAAF Edinburgh, near Adelaide, at first light on 9 July. This message was followed up directly by a telephone conversation with Squadron Leader Bently of RAAF Pearce at 2215 EST, who advised that the P-3 would depart Pearce for Edinburgh at 0900 EST and that if the plane was required for a further search, 2 hours notice would be required, making a decision to fly necessary by 0700 EST 9 July at the latest.

At 2230 EST Singa Ship Management were contacted by telephone and told that nothing had been seen and no further action was intended, unless the aircraft's debrief contained some positive information.

At 2235 EST the duty Senior Co-ordinator rang the Director informing him that no sighting report had been received from the aircraft and that the aircraft would return to South Australia unless requested otherwise. The Director expressed the view that the aircraft was not needed and that under the circumstances the air search had been sufficient.

At 2345 EST the debrief from Rescue 252 was received by FSSC. The aircraft had conducted a radar search for the unidentified vessel detected by Rescue 251 and had made no contact. They contacted a radar contact by VHF radio who stated that they had had no contact with the SINGA SEA. The Pilot estimated that the radar search was effective 100 miles either side of track.

The aircraft had then flown to the flare search area and commenced the search at 1920 EST, using one flare every five minutes to attract the attention of any survivors, and completing the search at 2154 EST. The weather conditions reported by Rescue 252 during the flight was of a low cloud base and visibility below the cloud of less than half a mile. In these conditions the pilot estimated the search effectiveness to be 10 to 15 miles either side of track depending on cloud in local area.

At 0015 EST on 9 July a situation report was sent to the Singa Ship Management, the AMVER system and other relevant organisations and radio stations stating the action that had been taken and that no contact had been made with the SINGA SEA. The message confirmed that no further dedicated search would be undertaken unless additional information was received but that the alert to shipping would continue and aircraft in transit would be briefed. Additionally, South African authorities were again asked to contact the FSSC if the SINGA SEA arrived in or contacted any South African port. The Master of the YAMANAKA MARU was also thanked and asked to contact the FSSC if he came across any information that might have been of use.

In the period 9-12 July the FSSC continued to consider options for search action with regard to the SINGA SEA, and after discussions with an expert from the CSIRO regarding the 'Leeuwin Current' which would affect any survival craft in the area of the ship's last known position, various drift computations were carried out, all of which indicated that any life saving applicance or debris would come ashore somewhere along the coast of the south west corner of Australia. On 12 July, a civil aircraft was chartered by the FSSC to search the south west coast for any sign of survivors or debris from the SINGA SEA. The search was completed without any evidence of the SINGA SEA.

On 19 July the South African agents for the SINGA SEA reported the ship overdue and no trace of the ship was found by South African Search and Rescue Authorities.

SINGA SEA SEARCH AND RESCUE ACTION - COMMENTS

Given the information reported by the survivors of the sudden sinking of the vessel on 4 July, whatever action had been taken by the staff of the FSSC and at whatever time the action had been taken, no further lives could have been saved from the crew of the SINGA SEA, considering the Chief Officer is reported to have died within 24 hours of the casualty (by MR+22). It is not possible to assess the likelihood of detection of the survivors' lifeboat had an air search been ordered 24 hours after the missed report or had a visual search been undertaken on 9 July or subsequent days.

The likelihood of detection was greatly diminished by the Master's decision to alter course at about 1800 WST on 3 July without notifying the FSSC of the deviation. This course took the ship to the extreme of any aircraft search area based on the previously reported course. A small fibreglass target such as the lifeboat would have been impossible to detect from long range and the boat could only have been detected by radar at short range or visual contact, through a flare search or dedicated closely tracked day search pattern.

The action taken by the Senior Co-ordinators on duty between 1600 EST 4 July (MR+O) and 1300 EST 5 July (MR+21) to establish contact with or the whereabouts of the SINGA SEA was in accordance with the AUSREP procedures laid down in information to mariners and the Department of Transport and Communications Operational procedures, relating to Marine Search and Rescue. Checks with Coast Radio Stations for "hearing reports" were effectively complete, an all ships urgency broadcast was in force, the ship was listed on Coast Radio traffic lists and ships known to be in the area were alerted and calling the SINGA SEA on MF and VHF radio. It had been established that no coast radio station, or the ships Australian agents had had any contact since 3 JulY. At MR+26 (1800EST) it was known that the ship managers' last contact with the ship had been on 2 July and the SINGA SEA had failed to report as scheduled on 4 July.

At 1800EST on 5 July (MR+26) the FSSC was in a position, with normal communications checks complete, to take a decision regarding the most effective way of initiating the search action.

At about 1600 EST (MR+24), the Controller discussed the situation with the Senior Co-ordinator. After the discussion, the Controller felt that he had not received any firm recommendation to initiate an air search and the failure of the SINGA SEA to report was attributed to radio problems. The Senior Co-ordinator appears to have interpreted the conversation to mean that no further search or rescue action would be taken and therefore cancelled the urgency signal broadcasting through Perth, Sydney Stations. The ship's managers and Scheveningen and Capetown Radios were also informed of the decision.

In the view of the Controller, search action was continuing with the YAMANAKA MARU attempting to make contact with the SINGA SEA and he decided to wait for further communications checks, particularly from Jebsen's Norway, who had a scheduled contact with the SINGA SEA due on 5 July, Norwegian time.

Whilst there is no absolute commitment under the AUSREP system to undertake an air search where a ship has been overdue for 24 hours, and where no other contact has been made or other confirmation of its well-being, it is difficult to reconcile any decision not to conduct an air search with the primary objective of the AUSREP system. The primary objective is "to limit the time between the loss of a vessel and the initiation of search and rescue action, in cases where no distress signal is sent out". See Appendix F.

Another factor that should have been taken into account when considering the timing of a search by aircraft was the possibility that the SINGA SEA carried an emergency position indicator radio beacon (EPIRB). Such beacons (not all ships will be required to carry EPIRBs until 1991) are required by international convention to have a battery life of 48 hours. In the absence of any positive information that the ship was safe, an assumption must be made that something could have happened to the ship immediately after the transmission of the last position report. While it is accepted that experience has shown that EPIRBs normally transmit well beyond the required 48 hour battery life, the ship or its crew could have been at risk for 24 hours

before the time of the missed report and therefore at MR+24 the battery life of any EPIRB could have expired. It was known in the FSSC that no scheduled aircraft would be in that geographical area until the Qantas Perth to Harare flight sometime after 1700 on Thursday 7 July, some 74 hours after the missed report.

Even allowing for these factors it must be appreciated that it was already late afternoon in Canberra and considering the time it would take to arrange and brief the crew of any aircraft in Western Australia, any airsearch which required daylight could not realistically take off before about 0530 EST 6 July. No arrangements were made for such a flight.

By 0830 EST 6 July (MR+40½) no word had been received from Jebsens of Norway that the ship had contacted them as scheduled to do so on 5 July. The MARSAR file records that earlier communications had been passed from the SINGA SEA to Jebsens, Norway, at 0559z 3 July via Singapore radio. The SINGA SEA would have passed its radio messages through a coast radio station, and those that the ship was most likely to utilise - Perth, Sydney, Singapore, Capetown, Scheveningen, Rogaland - were aware that the FSSC was trying to trace the SINGA SEA and could be expected, as normal practice, to notify the Centre of any contact. No coast radio station reported to the FSSC passing such a message from the SINGA SEA in accordance with normal practice. Further it was known that the YAMANAKA MARU had still made no contact and also had been forced to deviate to the north through bad weather.

Neither the Controller nor the Director made any positive decision with regard to an airsearch during the-morning of 6 July. In this time it was established that three RAAF P-3 Orion Aircraft were on exercise based in Western Australia and therefore a suitable search resource was available.

The duty Senior Co-ordinator stated that at about 1200 EST 6 July, he had a long discussion with the Controller making his views known that he considered that an airsearch should be initiated immediately. The Controller however has no recollection of such a view being put to him. Whatever happened, the Director and Controller discussed the option of an air search and at 1230 EST 6 July, (MR+44½) the Director made the decision not to task the RAAF. The Senior Co-ordinator, Mr Doyle, specifically recorded this decision on the MARSAR file.

The Director decided to undertake further checks. It would appear that both the Controller and the Director had formed a view that the SINGA SEA had radio problems and the Director was reluctant to commit the resources of an airsearch based on two main considerations

(i) The ship was a large merchant ship carrying a safe cargo and they regarded it as improbable that such a ship could be overwhelmed without some distress message being transmitted.

(ii) It is not uncommon under the AUSREP scheme for ships to fail to report and in such cases communications problems were cited as the reason for failing to report. This view was apparently influenced by the reported difficulties Perth Coast Radio Station had in passing traffic to the SINGA SEA and the comments made by Singa Ship Management in their telex of 1743 WST on 5 July.

It was on this basis that it was decided to use the YAMANAKA MARU to pass a message "blind" to the SINGA SEA to activate any EPIRB for detection by the Perth/Harare Qantas flight on 7 July leaving Perth at 1715 EST 7 July, some 29 hours later.

In formulating this view, certain important facts which accumulated between MR+24 and MR+33, do not appear to have been fully taken into account as part of the overall picture as follows:

(i) The SINGA SEA had participated effectively in AUSREP before arrival Geraldton. (It was not realised at this time that the ship had failed to participate between Geraldton and Bunbury, when it was mandatory to do so.)

(ii) Merchant ships carry an emergency radio transmitter capable of working on main or emergency power or on batteries (battery life 6 hours under continuous normal working conditions) for use in radio telegraphy. Ships are also required to keep a continuous listening watch on the bridge on radio telephony frequency 2182 kHz, and also on VHF Channel 16. The failure of the WROCLAW and the YAMANAKA MARU to attract some

response, in view of these requirements, would not appear to have been given sufficient weight.

(iii) Since 1 January 1986 only on four occasions has the system failed to establish the safety of a vessel within 24 hours, and of those four ships, only one went beyond 36 hours without a positive report as to its safety. In this period only one air search was undertaken for a ship under the AUSREP scheme.

(iv) The SINGA SEA was known to be on a westerly course with the next port of call some two weeks later. If the vessel's radio had broken down, confirmation of the vessel's safety could not have been expected before then. Unless disabled or experiencing engine problems, the ship was proceeding away from Australia at the rate of between 240 and 260 miles every 24 hours, thus proceeding further and further out of the range of aircraft.

(v) If the ship had been overwhelmed, the possible search area for survivors was increasing rapidly.

(vi) By early morning of 6 July, no contact had been made with the ship. The SINGA SEA had failed to keep the scheduled contact with the FSSC or Singa Ship Management on 4 July and Jebsens Norway on 5 July. No other coast radio station had any contact.

(vii) In the early hours of 6 July, the YAMANAKA MARU had deviated due to very rough weather.

Neither the Controller nor Director were aware of recent incidents involving losses of bulk carriers worldwide other than the loss of the 'ore/bulk/ore' carriers BERGE ISTRA in 1975, BERGE VANDA in 1979 (both Norwegian flag) and the DERBYSHIRE (U.K. flag) in 1980, where in the first two incidents it is possible that the volatility of previous cargoes contributed to the losses.

Officers of the FSSC operate in accordance within written "Standard Operating Procedures". When a vessel is known to be in distress, these procedures contain clear guidelines delegating responsibility to the Senior Co-ordinator and to the Controller of the FSSC with regard to initiating search by aircraft. Where however, a vessel becomes overdue under the AUSREP system and the safety of the ship and its crew have not been established by the time it is 24 hours overdue, the responsibility for initiating an air search is not specifically detailed, due to the relatively long period of time involved before an air search is considered. In the event, the Director assumed the responsibility for the decision not to initiate an air search on 6 July.

By 0900 EST on 6 July, it had been established that the SINGA SEA had not passed any message to the ship managers, the charterers or the FSSC. Only possible messages from the SINGA SEA through Manila coast radio station were not accounted for. It was recorded on file, however, that Jebsens of Norway had informed the owners of the situation in their telex of 1759 EST on 5 July. None of the other coast radio stations the ship might reasonably have been expected to use had had any traffic with the ship. It should be noted that the SINGA SEA appeared to be using Singapore radio and passed the first of its scheduled messages to Norway on 3 July through Singapore. Neither the YAMANAKA MARU nor the WROCLAW had made any contact.

At about 0900 EST 7 July (MR+65) the Director decided to request the RAAF to undertake an air search.

In the absence of any identifiable distress message, and under the circumstances of the SINGA SEA incident, the initial search for an overdue AUSREP vessel has to be a track line search along the expected route. A search for the SINGA SEA would have had to use radar to achieve a full area coverage to the maximum distance the ship could have travelled in the period. If this search fails to establish the ship is afloat, it is logical to then search for survival craft.

A track line search on 7 July detected 2 ships and a number of fishing vessels within the search area without sighting the SINGA SEA. Of nine radar targets only one, probably a fishing vessel, was not positively identified. The search on 8 July was in part an attempt to establish whether the unidentified

vessel was the SINGA SEA. As it was thought that this was very unlikely, the flight (Rescue 252) was also required to undertake a search by night, dropping flares in an attempt to attract attention of any survivors so that they could respond by use of survival pyrotechnics.

A further night flare search on 8 July of a much larger area was requested by the Centre but could not be undertaken by the RAAF due to the non-availability of flight crews.

Despite the uncertainty of the fate of the SINGA SEA, the large potential search area and the weather conditions prevailing, any endeavour to undertake a visual search should not have been abandoned before some reasonable attempt to detect any survival craft had been made. The RAAF had a plane available for the search, but in this incident the FSSC apparently lacked an overall search strategy. Given the circumstances of this particular AUSREP incident and the availability of an RAAF aircraft, the decision not to conduct a daylight visual search of the most probable area for survival craft on 9 July was questionable.

Throughout the incident from MR+24, there appears to be a lack of detailed analysis of the MARSAR file and of proper liaison between the Senior Co-ordinators, the Controller, and the Director. The significance of the battery life of any EPIRB, the fact that coast radio stations would have handled all traffic from the SINGA SEA and were alerted to its overdue state, and the failure of the YAMANAKA MARU and WROCLAW to make contact did not seem to be thought through or presented as an overall picture.

The circumstances surrounding the decision to cancel the urgency signal on 500kHz and 2182 kHz arose out of confusion between the acting Senior Co-ordinator on duty at 1730 EST 5 July who stated he considered that he was ordered to cancel the message, and the Controller, who has no recollection of giving such an order. The cancellation could have resulted in vessels not in the AUSREP scheme, including fishermen in the area, being unaware of the missing vessel. A NAVAREA warning was instituted 19 hours later at MR+44 on the HF band, but this band is not normally monitored by fishing vessels.

CONCLUSIONS

The actions and procedures of the Federal Sea Safety Centre between the time that the position report from the SINGA SEA became overdue and the time 24 hours had elapsed were correct and in accordance with the AUSREP guidelines.

By deciding not to initiate an air search after the scheduled position report from the SINGA SEA was 24 hours overdue, having established that the ship had not been heard by ships specially tasked to attempt radio contact, or by coast radio stations handling traffic from the ship, the stated objective of the AUSREP scheme was compromised.

The decision by the Director not to fly an air search for the vessel on 6 July was made in the face of mounting evidence that something may have been amiss with the vessel and was not consistent with the primary objective of AUSREP.

The air searches carried out on 7 and 8 July were conducted properly and in accordance with sound and established search and rescue practices.

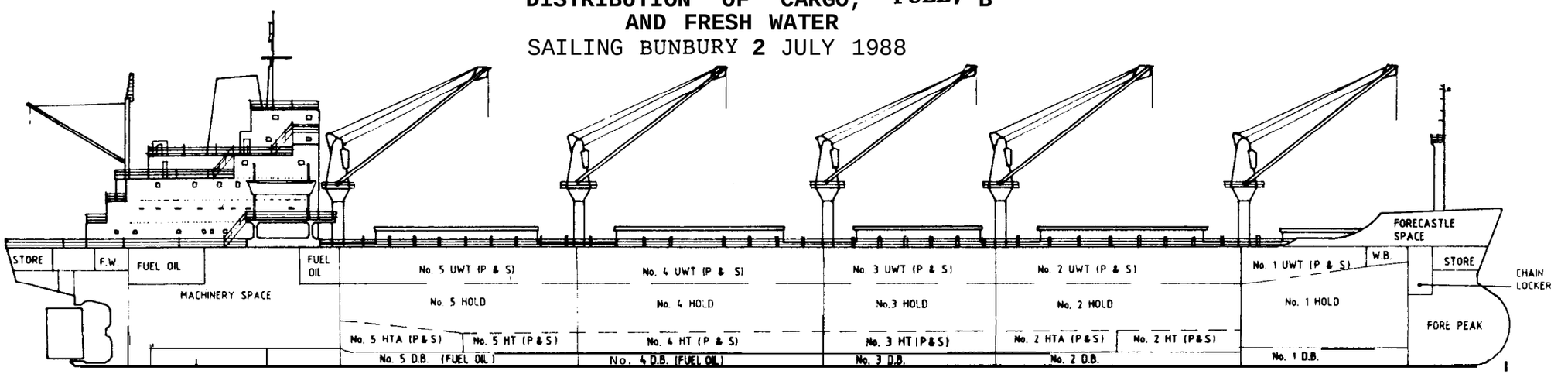
Given the circumstances of this particular AUSREP incident and the availability of an RAAF aircraft the decision not to fly a daylight visual search for survival craft on 9 July, or subsequent days, was questionable, following the unsuccessful flare search of 8 July.

Following notification of the rescue of survivors from the SINGA SEA on 3 August, an air search for survivors was undertaken. The decision not to conduct further searches after 3 August was correct, and made on the information available.

SINGA SEA

DISTRIBUTION OF CARGO, FUEL, BALLAST AND FRESH WATER

SAILING BUNBURY 2 JULY 1988



- 50 -

CARGO

P PORT
S - STARBOARD
UWT- UPPER WINGTANK
H.T HOPPER TANK
D.B DOUBLE BOTTOM

Hold No	Hold Capacity m/3	Tonnes Loaded	Stowage Factor t/cu m	Cubic Metres loaded	% Hold full
1	4058	3201	2.33	1374	34
2	8028	3504	2.8	1251	15.6
3	5798	5433	1.8	3018	52
4	8264	9905	2.8	3537	43
5	7840	2825	2.33	1212	15.5

WATER BALLAST

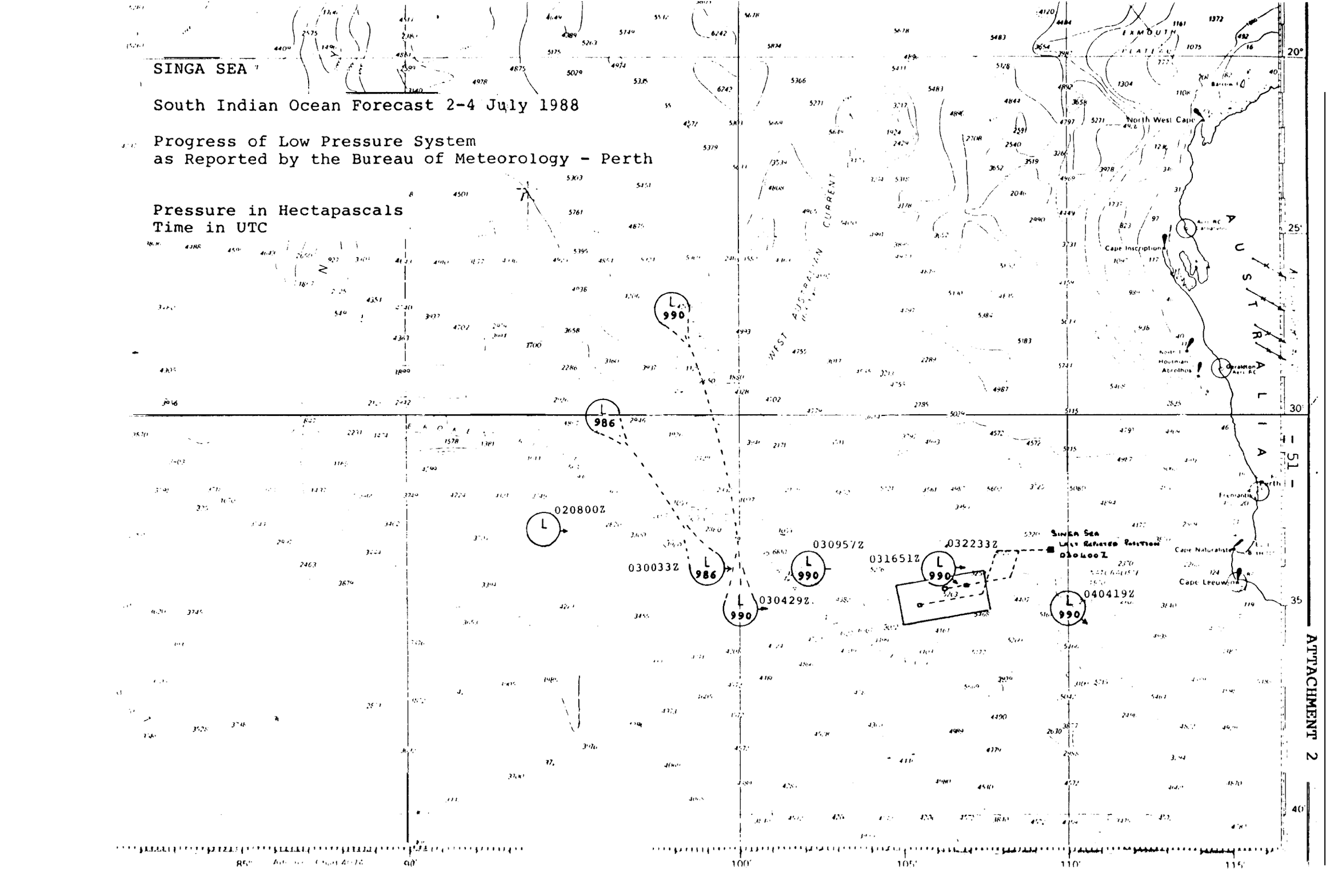
Tank	Tonnes
1 DB	19
2 DB	54
3 DB	46
2 Hopper F P&S	90
2 Hopper A P&S	70
3 Hopper P&S	46
5 Hopper P&S	97
Total	422

FUEL & DIESEL OIL (Approx)

Tank	Total
4 DB	204
5 DB	252
Engine room tanks F.O & D.O	330
Total	787

FRESH WATER
116 Tonnes

ATTACHMENT


SINGA SEA
South Indian Ocean Forecast 2-4 July 1988
Progress of Low Pressure System
as Reported by the Bureau of Meteorology - Perth
Pressure in Hectapascals
Time in UTC
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986
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030033Z
030429Z
030957Z
031651Z
032233Z
040419Z
Singa Sea
Last Reported Position
030400Z
North West Cape
Cape Inscription
Geraldton
Cape Naturaliste
Cape Leeuwin
Perth
EXMOUTH
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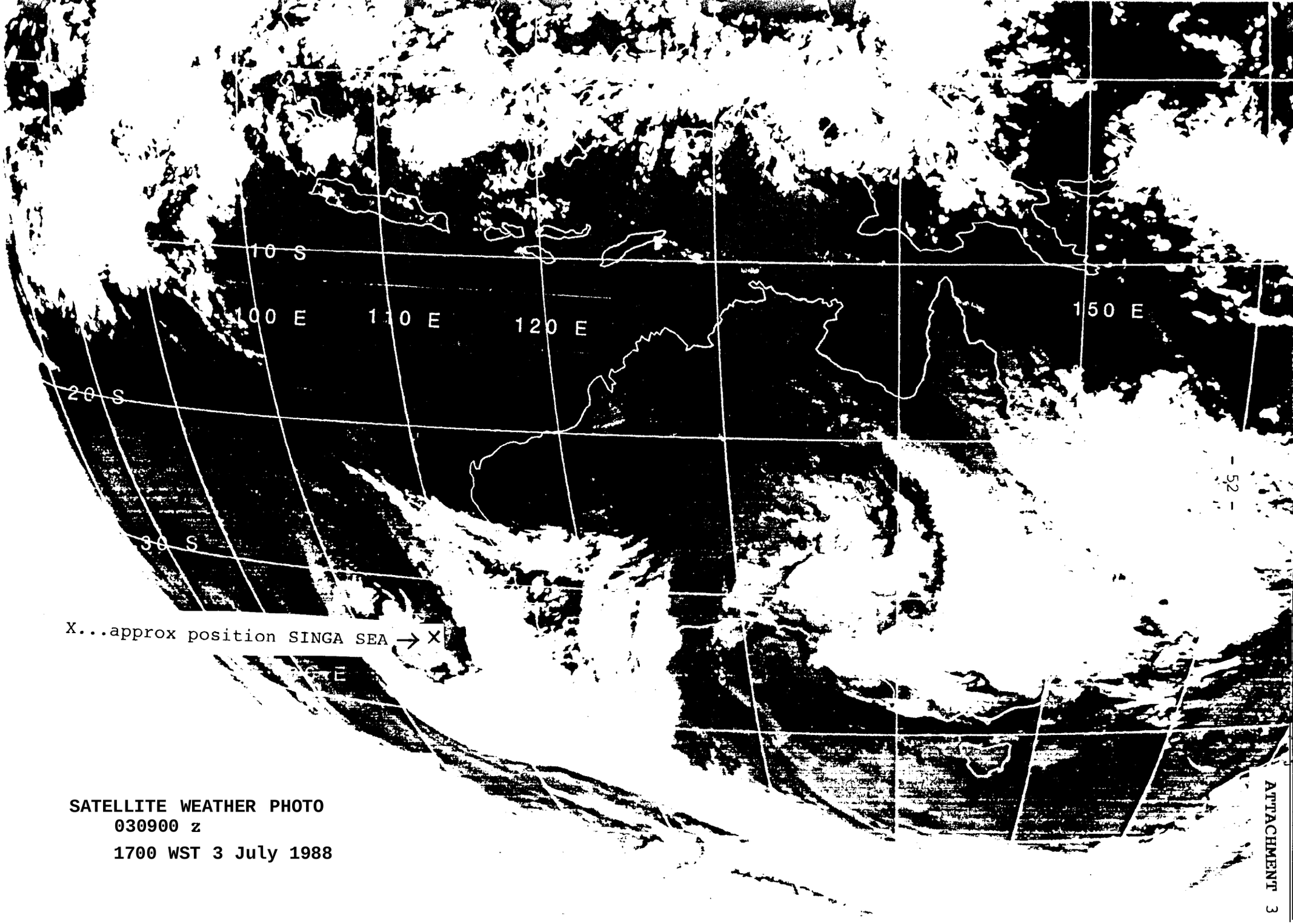
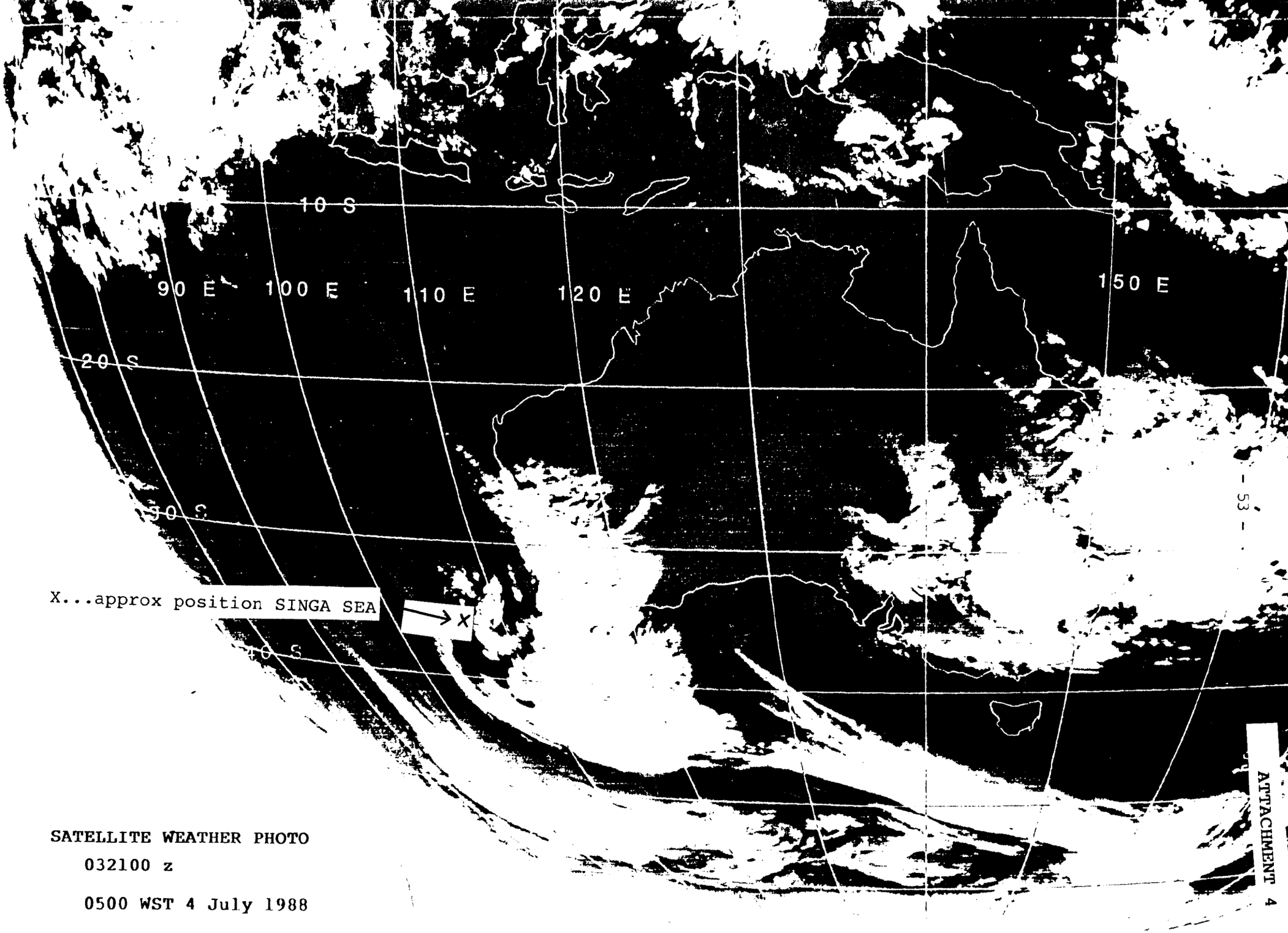


SATELLITE WEATHER PHOTO
030900 z
1700 WST 3 July 1988

ATTACHMENT 3

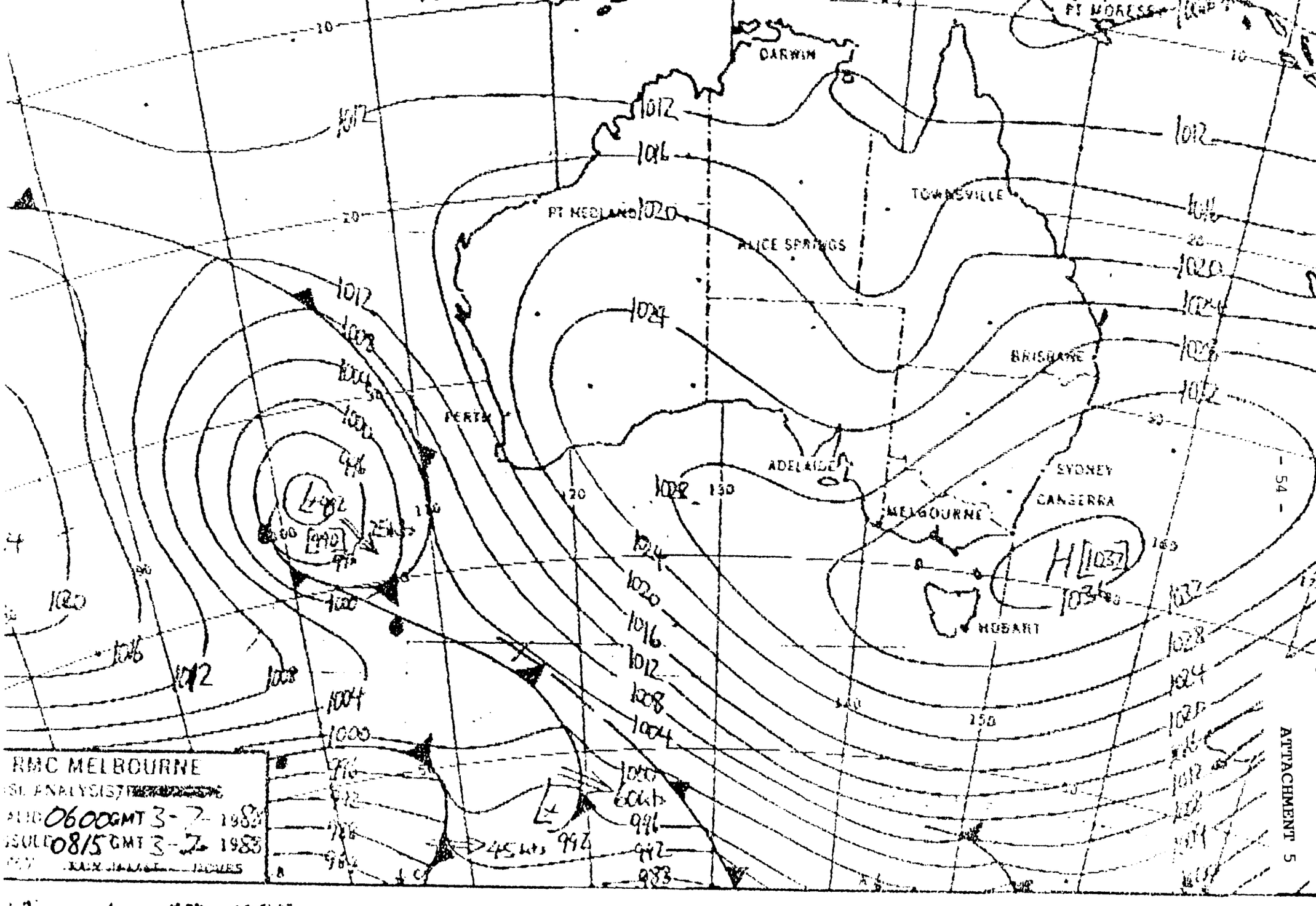


SATELLITE WEATHER PHOTO

032100 z

0500 WST 4 July 1988

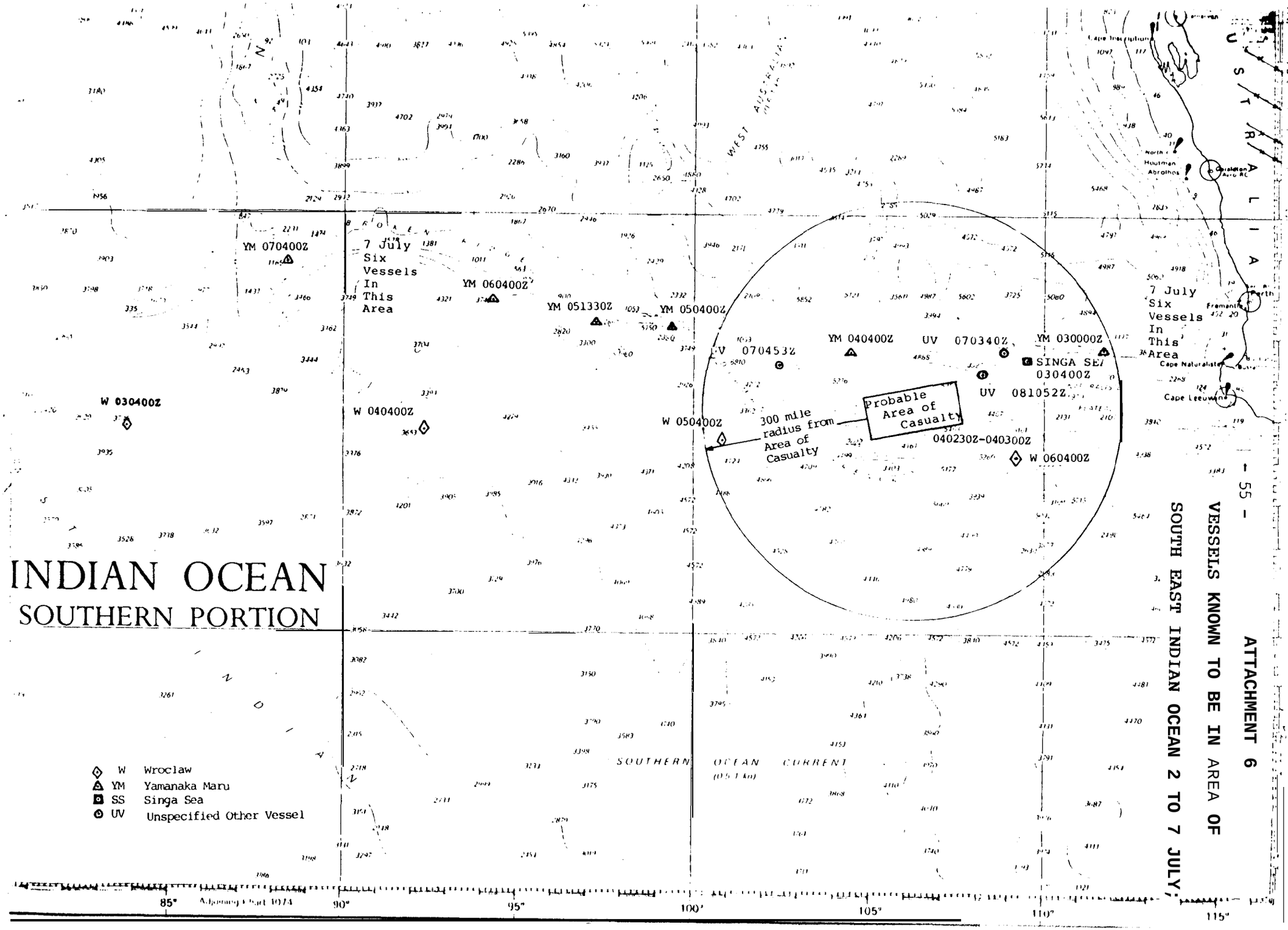
ATTACHMENT 4

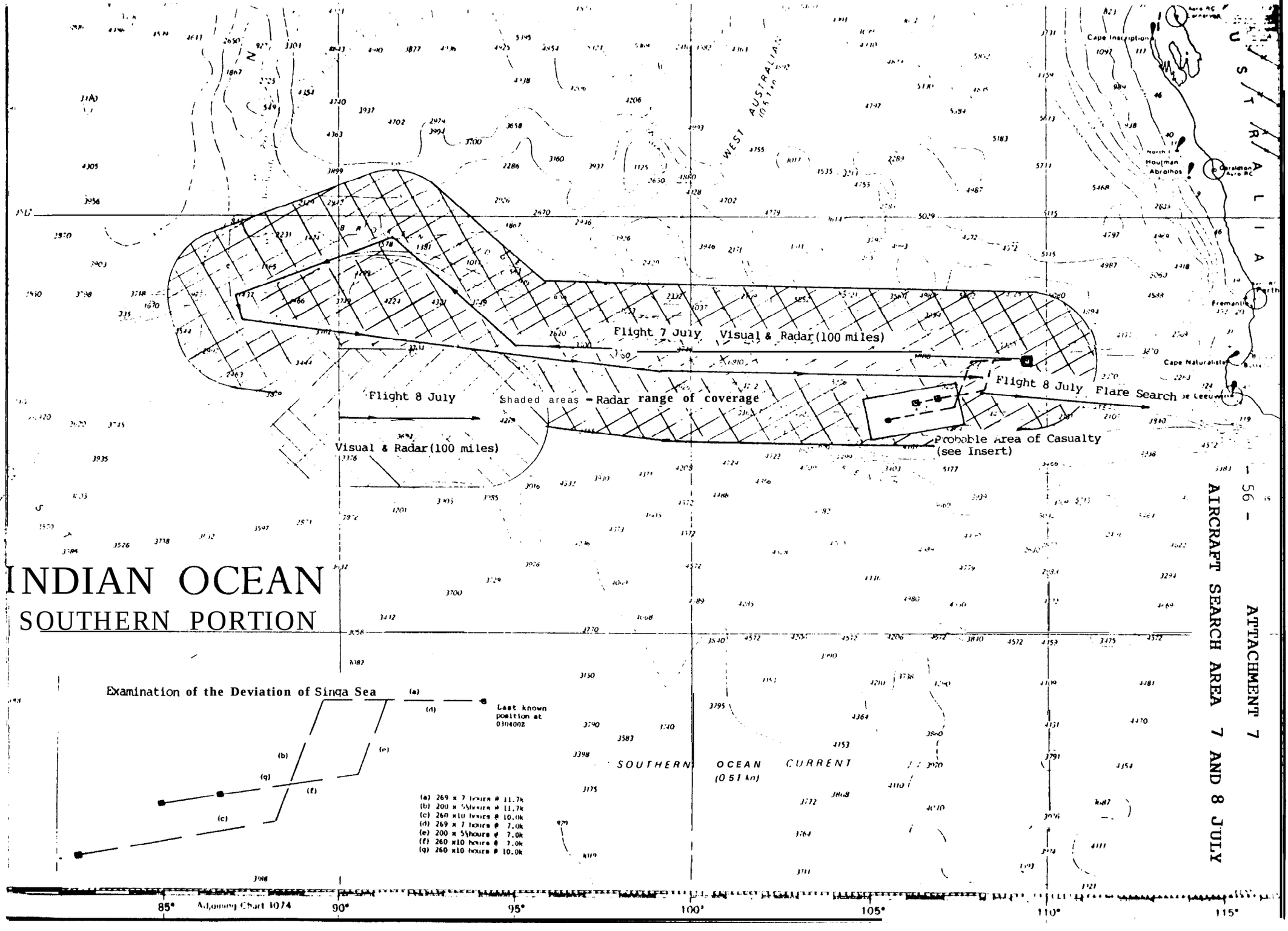


ATTACHMENT 5

ATTACHMENT 6

VESSELS KNOWN TO BE IN AREA OF SOUTH EAST INDIAN OCEAN 2 TO 7 JULY





ATTACHMENT 7

AIRCRAFT SEARCH AREA 7 AND 8 JULY

APPENDIX A

TIMES

In describing this incident, it has been unavoidable to use several time-zones and standard times for the vessels and authorities involved. The following is a brief explanation of the times used in the narrative.

Greenwich Mean Time - abbreviation GMT or z

the standard time at Greenwich England, through which the prime meridian or 0" Longitude passes. Longitude and time are measured East or West from this meridian.

Universal Coordinated Time - abbreviation UTC or z

used since 1982, UTC is derived from atomic clocks and eliminates very small unpredictable irregularities which occur with GMT however in general, UTC can be said to be equivalent to GMT.

Western Standard Time - abbreviation WST

the standard time zone in Western Australia which corresponds to GMT +8 hours.

Eastern Standard Time - abbreviation EST

the standard time of the Eastern States of Australia including Canberra, which corresponds to GMT + 10 hours.

DANIEL C. GRIFFITH & CO. [illegible]

CERTIFICATE

APPENDIX B

OF

SAMPLING AND MOISTURE

VESSEL	:	M.V. SINGA SEA
FROM	:	GERALDTON, WESTERN AUSTRALIA
TO	:	HAMBURG, WEST GERMANY
COMMODITY	:	COPPER ORE IN BULK
SUPPLIER	:	BARRACK MINE MANAGEMENT PTY. LTD.
STORAGE	:	HOLD NO. 3.

THIS IS TO CERTIFY:

At the request of Barrack Mine Management Pty. Ltd., 824 Newcastle Street, Leederville, Western Australia, Griffith W.A. Services, did carry out the Sampling and Moisture determination of 5,430.2 tonnes of Copper Ore in bulk loaded on board the M.V. SINGA SEA at Geraldton on the 28th June, 1988.

Samples were drawn during loading from the moving conveyor system near the weightometer by the use of a hand held scoop every 25 tonnes. Lot samples were thoroughly mixed and divided using a large stainless steel riffles every 500 tonnes.

Each lot sample representing 500 tonnes was divided into four, one of which was reduced to one kilo using the increment division method and dried in an air circulated oven at 105 degrees centigrade until constant mass was achieved.

Sample preparation was carried out in accordance with AS 2705.3 and Moisture determination was carried out in accordance with AS 2830.

The remaining three bulk representative samples were divided and distributed as follows:-

1 set of lot samples to Horseshoe Lights Gold Mine.
1 bulk sample to Horseshoe Lights Gold Mine.
1 x 2 kg sample to Belfour Maclaine International Ltd., New York.
1 x 2 Kg sample to Belfour Maclaine International Ltd., New York.
1 Bulk sample held by Griffith, for umpire purposes.

Ref: 88/S-17/6
30th June, 1988.

for and on behalf of
GRIFFITH W.A. SERVICES
8 HIGH STREET,
FREMANTLE 6160
Telephone: 335 6697
Telex: 199805 GRYFYD

DANIEL **C. GRIFFITH & CO. LTD.**

CERTIFICATE

OF

SHIPPERS DECLARATION

APPENDIX **B**

VESSEL : M.V. SINGA SEA
FROM : GERALDTON, WESTERN AUSTRALIA
TO : HAMBURG, WEST GERMANY
COMMODITY : 5,600 TONNES COPPER ORE IN BULK
SHIPPER : BARRACK MINE MANAGEMENT PTY. LTD.

THIS IS TO CERTIFY:
That Griffith W.A. Services, as agents for Barrack Mine Management Pty. Ltd., have established that the Copper Ore in bulk proposed for shipment on the above vessel has the following properties.

Stowage Factor	:	1.8 tonnes/M3
Angle of Repose	:	37 degrees.
Transportable Moisture Limit	:	10.96%.
Average Moisture Content	:	7.11%

The above was determined by the use of recognised international procedures as specified in the IMDG Bulk Cargoes Code.

Provided that the moisture content does not exceed the transportable moisture limit, this commodity is not considered to be a cargo which may liquify during the voyage. If the transportable moisture limit is exceeded by whatever means, this cargo could liquify.

Testing has revealed that the maximum temperature before spontaneous combustion is greater that 600 degrees C.

There are no indications that the corrosive nature of this material is any greater than that of the residual water contained within the Copper Ore. This water is mildly alkaline.

This material could deplete oxygen. It is therefore recommended that all ventilation both natural and mechanical to the hold carrying this ore be avoided during the voyage. To prevent asphyxiation, the hold should be throughly ventilated before permitting entry of personnel.

There are no indications that this material has any toxic nature unless it is exposed to extreme heat. In this event a gaseous derirative of sulphur could result.

All known relevent hazards attendant upon the marine transportation of this ore have been described and the information given is based upon the latest available including experience in storage prior to shipment.

Ref: 88/S-17/6
15th June, 1988.

For and on behalf of
GRIFFITH W.A. SERVICES
8 HIGH STREET,
FREMANTLE **6160**
Telephone: 335 6697
Telex: 196805 GRYFYD

DANIEL C. GRIFFITH & CO. LTD.

CERTIFICATE

OF

APPENDIX B

WET AND DRY TONNES

VESSEL	:	M.V. SINGA SEA
PORT	:	GERALDTON, WESTERN AUSTRALIA
TO	:	HAMBURG, WEST GERMANY
COMMODITY	:	COPPER ORE IN BULK
SUPPLIER	:	BARRACK MINE MANAGEMENT PTY. LTD.
STORAGE	:	HOLD NO. 3.

THIS IS TO CERTIFY:

At the request of Barrack Mine Management Pty. Ltd., 614 Newcastle Street, Leederville, Western Australia. Griffith W.A. Services, did carry out the Weighing and Moisture determination of 5,433.2 tonnes of Copper Ore in bulk loaded on board the M.V. SINGA SEA at Geraldton on the 29th June, 1982.

The following is a summary of the individual lot weights and moisture results.

LOT NOS	GROSS WET TONNES	MOISTURE RESULTS	MOISTURE LOSS MT.	NETT DRY TONNES
1	500.0	6.9%	34.5	465.5
2	500.0	6.3%	31.5	468.5
3	500.0	7.0%	35.0	465.0
4	500.0	7.0%	35.0	465.0
5	500.0	6.7%	33.5	466.5
6	500.0	6.5%	32.5	467.5
7	500.0	6.9%	34.5	465.5
8	500.0	6.5%	32.5	467.5
9	500.0	6.9%	34.5	465.5
10	500.0	6.5%	32.5	467.5
11	433.2	7.0%	30.3	402.9
Totals:	5,433.2		366.3	5,066.9

Average Moisture Contents:- 6.7%

Ref: 82/S-17/S
30th June, 1982.

For & donbehalfoi
GRIFFITH W.A. SERVICES
8 HIGH STREET,
FREMANTLE 6166
Telephone: 335 8697
Telex: 166605 GRYFYD

APPENDIX C

WEATHER PATTERNS 3 & 4 JULY 1988
SOUTH INDIAN OCEAN

GALE WARNINGS ISSUED TO SHIPPING - SOUTH WEST AREA (AUS)

3 July 1988

0023 WST
021623Z E OF 90 EAST AND W OF LINE 25 SOUTH 100 EAST TO 40 SOUTH 105 EAST BETWEEN 25 SOUTH AND 40 SOUTH. LOW CENTRE NEAR 33 SOUTH 94 EAST AT 12002 MOVING EAST AT 20 KNOTS IS CAUSING SE/SW WINDS 35/45 KNOTS TO WEST OF LOW AND NW/NE WINDS 25/40 KNOTS TO EAST OF LOW. EXPECT VERY ROUGH SEAS RISING TO HIGH IN SQUALLS AND A HEAVY SWELL.

0121 WST
021721Z FINAL GALE WARNING.
AREA AFFECTED: SOUTH OF 45 SOUTH 95 EAST TO 48 SOUTH 125 EAST
WINDS IN THIS AREA ARE NO LONGER EXPECTED TO EXCEED 40 KNOTS.

0833 WST
030033Z PRIORITY GALE WARNING
AREA AFFECTED: BOUNDED BY LONG. 90 EAST AND LINE TO 25 SOUTH 90 EAST TO 25 SOUTH 105 EAST TO 30 SOUTH 115 EAST TO 40 SOUTH 120 EAST TO 40 SOUTH 90 EAST.
COMPLEX LOW MAIN CENTRES 986 HPA NEAR 30 SOUTH 96 EAST AND 34 SOUTH 99 EAST MOVING EAST AT 20 KNOTS MAINTAINING SOUTHERLY WINDS 35/45 KNOTS TO WEST OF LOW AND NORTHERLY WINDS 25/40 KNOTS TO EAST OF LOW WITH VERY ROUGH TO HIGH SEAS AND HEAVY SWELL.

1228 WST
030428Z GALE WARNING
AREA AFFECTED: BOUNDED BY LONG. 90 EAST AND LINE TO 25 SOUTH 90 EAST TO 25 SOUTH 105 EAST TO 30 SOUTH 115 EAST TO 40 SOUTH 120 EAST TO 40 SOUTH 90 EAST.
COMPLEX LOW MAIN CENTRES 990 HPA NEAR 35 SOUTH 100 EAST AND 27 SOUTH 98 EAST MOVING EAST AT 20 KNOTS MAINTAINING SOUTHERLY WINDS 35/45 KNOTS TO WEST OF LOW AND NORTHERLY WINDS 25/40 KNOTS TO EAST OF LOW WITH VERY ROUGH TO HIGH SEAS AND HEAVY SWELL.

1756 WST
030956Z GALE WARNING
AREA AFFECTED: BOUNDED BY LONG. 90 EAST AND LINE TO 26 SOUTH 94 EAST TO 26 SOUTH 110 EAST TO 30 SOUTH 115 EAST TO 40 SOUTH 120 EAST TO 40 SOUTH 94 EAST.
LOW 990 HPA NEAR 34 SOUTH 102 EAST MOVING EAST AT 20 KNOTS MAINTAINING SOUTHERLY WINDS 35/45 KNOTS TO WEST OF LOW AND NORTHERLY WINDS 25/40 KNOTS TO EAST OF LOW WITH VERY ROUGH TO HIGH SEAS AND A MODERATE TO HEAVY SWELL.

4 JULY 1988

0051W S T
031651Z

GALE WARNING
AREA AFFECTED: BOUNDED BY LONG 94 EAST AND LINE TO 29 SOUTH 94 EAST TO 24 SOUTH 110 EAST TO 30 SOUTH 115 EAST TO 46 SOUTH 125 EAST TO 40 SOUTH 94 EAST.
LOW 990 HPA NEAR 34 SOUTH 106 EAST MOVING SE AT 20 KNOTS MAINTAINING SOUTHERLY WINDS 35/45 KNOTS TO WEST OF LOW AND NORTHERLY WINDS 25/40 KNOTS TO EAST OF LOW WITH VERY ROUGH TO HIGH SEAS AND A MODERATE TO HEAVY SWELL.

0633 WST
032251Z

GALE WARNING
AREA AFFECTED: BOUNDED BY LONG 96 EAST AND LINE TO 29 SOUTH 96 EAST TO 28 SOUTH 114 EAST TO 35 SOUTH 120 EAST TO 46 SOUTH 125 EAST TO 40 SOUTH 96 EAST.
LOW 990 HPA NEAR 34 SOUTH 106 EAST MOVING SE AT 20 KNOTS MAINTAINING SOUTHERLY WINDS 35/45 KNOTS TO WEST OF LOW AND NORTHERLY WINDS 35/45 KNOTS TO EAST OF LOW WITH VERY ROUGH TO HIGH SEAS AND A MODERATE TO HEAVY SWELL.

1218 WST
040418Z

AREA AFFECTED: WITHIN LINE 40 SOUTH 100 EAST TO 27 SOUTH 100 EAST TO 27 SOUTH 114 EAST TO 35 SOUTH 120 EAST TO 50 SOUTH 120 EAST TO 40 SOUTH 100 EAST.
LOW 989HPA NEAR 35 SOUTH 110 EAST MOVING SE AT 20 KNOTS MAINTAINING SOUTHERLY WINDS 35/45 KNOTS TO WEST OF LOW AND NORTHERLY WINDS 35/45 KNOTS TO EAST OF LOW WITH VERY ROUGH TO HIGH SEAS AND A MODERATE TO HEAVY SWELL.

1840 WST
041040Z

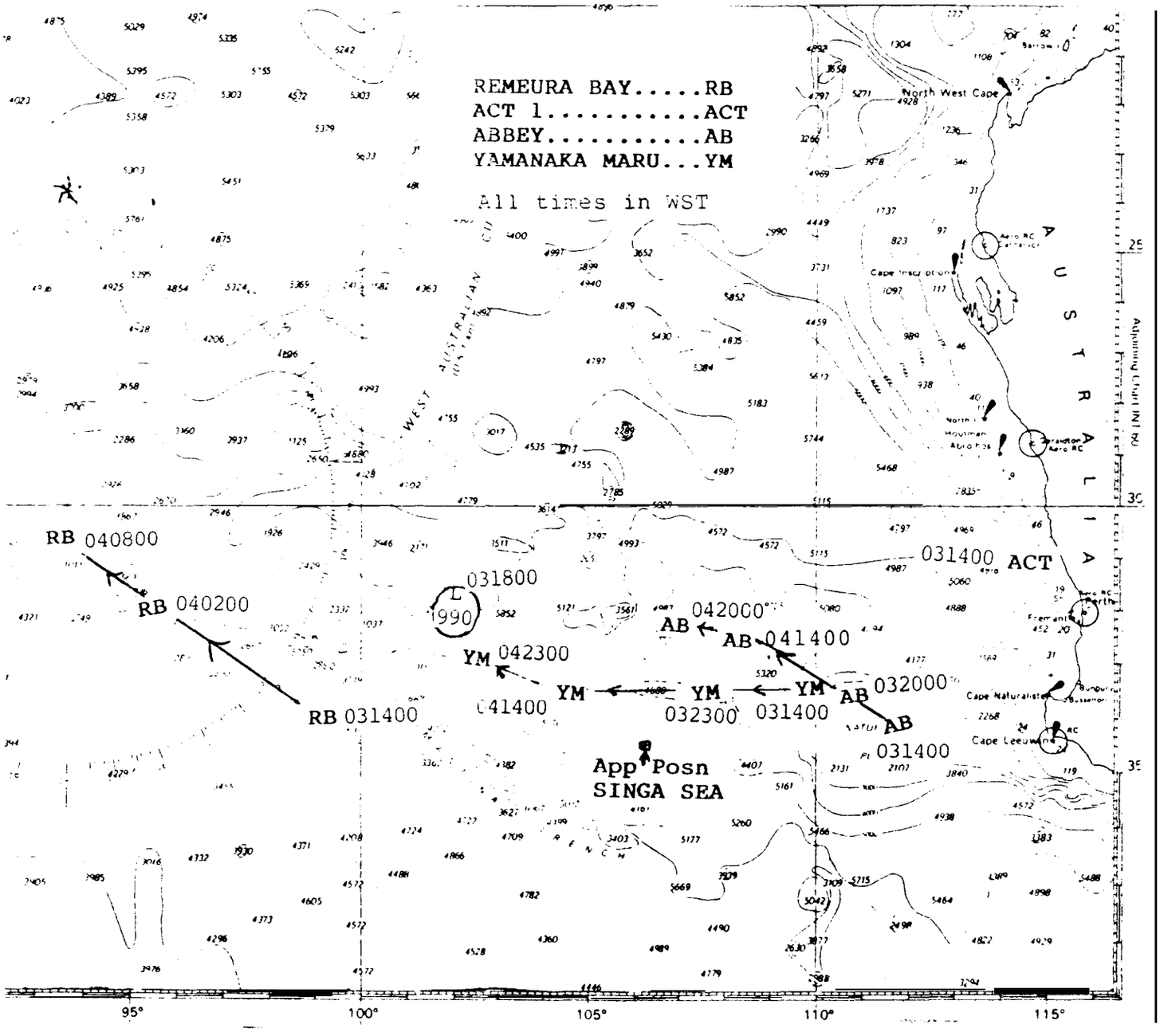
AREA AFFECTED: WITHIN LINE 40 SOUTH 90 EAST TO 35 SOUTH 160 EAST TO 28 SOUTH 114 EAST TO 35 SOUTH 122 EAST TO 50 SOUTH 125 EAST
LOW 990 HPA NEAR 38 SOUTH 112 EAST MOVING SE AT 20 KNOTS AND LOW BELOW 975 HPA NEAR 50 SOUTH 100 EAST MOVING ESE AT 30 KNOTS ARE MAINTAINING WEST TO SW WINDS 35/45 KNOTS TO THE WEST OF 112 EAST AND NORTHERLY WINDS 35/45 KNOTS TO THE EAST OF 112 EAST, WITH VERY ROUGH TO HIGH SEAS AND A MODERATE TO HEAVY SWELL.

SHIP WEATHER STATIONS

Four ships south of 30 Sand east of 90 E were reporting regular surface weather observations to the Bureau of Meteorology. These were the container ships REMEURA BAY and ACT 1 and the bulk carriers YAMANAKA MARU and ABBEY.

The REMEURA BAY to the west of the low pressure system was reporting southerly gale force winds of 44 knots at 1400 WST on 3 July . By early morning of 4 July the REMEURA BAY was reporting winds of 18 knots (see chartlet).

The remaining three ships were to the east of the system and were reporting gale force winds of up to 30 to 40 knots until the evening of 4 July when the wind strength was reported as falling to 21 knots.



APPENDIX II

SEARCH AND RESCUE OPERATIONS

Authorities involved

There are no dedicated long range search and rescue aircraft in Australia and, due to the diverse nature of the craft involved, there are often a number of authorities participating in any one particular incident.

As regards the SINGA SEA incident the responsibility of the various authorities was as follows:

(a) The Federal Sea Safety Centre, Department of Transport and Communications, Canberra. As the Maritime Rescue Coordination Centre, the centre was responsible for the overall coordination of the air and sea search, including the calculation and definition of areas to be searched, the type of search to be used and the decision to continue or terminate the search. The centre was also responsible for continuing communication checks in an attempt to contact the missing vessel and was the focal point for gathering all information concerning the vessel. All staff responsible for the search are qualified as Search and Rescue Mission Coordinators (SARMC).

(b) (Aviation) Rescue Coordination Centre (RCC) Perth, Civil Aviation Authority. This centre was responsible for providing aviation assistance to the overall coordinator, the Sea Safety Centre. The Senior Operations Controller (SOC), a qualified SARMC, was responsible for the arrangement for, or provision of search aircraft in order to fulfil the search plan designated by Sea Safety, and for briefing search aircraft in all aspects of the task.

(c) (Aviation) SAR Central, Canberra, Civil Aviation Authority. Again manned by officers with SARMC qualifications, this unit in addition to being responsible for the training of SARMC's and equipping of RCC's, is responsible for the coordination of aviation assistance, equipment and facilities to the search. The unit maintains a liaison role between the Sea Safety centre, the regional RCC and the RAAF, although it can overide the search instructions of the regional RCC if necessary.

(d) Headquarters Operational Command (HQOC) RAAF Glenbrook. The Search and Rescue Officer, also a qualified SARMC, was responsible for arranging RAAF assistance, in the form of long range maritime patrol aircraft and facilitating the diversion of appropriate resources, aircraft, crews and equipment from the operational flying wing, 92 Wing Edinburgh SA, to the search.

(e) Perth Coast Radio Station (Call Sign VIP) Overseas Telecommunications Commission (OTC) Perth. Responsible for radio communication with vessels at sea. Ausrep messages are received from participating vessels and forwarded to Sea Safety. In the incident, VIP was responsible for broadcasting radio messages, initiated by Sea Safety, to ships at sea, for attempting to contact the SINGA SEA and for all communication with vessels in the relevant area. In accordance with SOLAS requirements, VIP and other coast radio stations, were also responsible for the continuous monitoring of designated International distress frequencies.

Types of Search

Trackline or Track Crawl. This is an initial search action conducted by one or more aircraft. It is based on the assumption that the missing craft is on, or adjacent to, its proposed route and is easily discernible - or that there are survivors capable of signalling if they hear or see the aircraft. In this specific incident, radar coverage by the aircraft increased the area of search to 100 nautical miles either side of the track

Flare or Night Search. On night searches for survivors who are known or considered to have pyrotechnics, a flare search may be used. This procedure covers a relatively large area and can be more effective than a visual search, depending on conditions, by increasing the probability of detection of survivors.

The searching aircraft will fly through the designated search area at a height of three to five thousand feet, or below cloud if the base is lower, and fire a green Very cartridge or flare every five minutes and on each turning point. Tracking spacing for the aircraft may be as much as 20 miles apart. The objective of the search is to attract the attention of survivors to the search aircraft. Survivors are advised, through training and instruction manuals such as the IMO Merchant Ship Search and Rescue Manual, to wait until the aircraft's green flare has completely died and then activate a flare, preferably red, or other signalling device. If the survivors have other flares then these should be fired at intervals of about one minute in order to guide the search aircraft to them.

An RAAF aircraft which locates survivors in this way would drop a radio beacon in order to pinpoint the position, would probably drop extra liferafts and rations to the survivors and would remain cirling overhead until further assistance arrived on scene or to the limits of fuel endurance of the aircraft. If the aircraft had to depart the scene due to low fuel state before assistance arrived, the radio beacon would home subsequent aircraft to the scene.

Visual Search, A search conducted during daylight hours by one or more aircraft. As the objective of this type of search is to sight the survivors from the aircraft, the track spacing is by necessity small, probably one or two miles apart, and the total area covered is far less than a night flare search. There are several factors which may reduce the track spacing of the aircraft, including the weather, the size of target being searched for and the capability of the search aircraft. Depending on the size of target, several visual searches of the same area may be necessary in order to increase the probability of detection of survivors.

The choice of search pattern to use is the responsibility of the overall SARMC, in this case officers of the Sea Safety Centre, who may elect to use one or several types of search simultaneously. The SARMC will be guided in his choice of search by several controlling factors such the availability of search resources, the possible area where survivors could be and the weather conditions prevailing at the time.

In very simplistic form, some of the factors which had to be taken into account by the Sea Safety Centre regarding the SINGA SEA were as follows:

(a) The vessel may well be proceeding normally, with possibly defective radios.

(b) The vessel may have broken down and be drifting, disabled.

(c) The vessel may have diverted in any direction and not reported her deviation to AUSREP in order to avoid or lessen the effects of the heavy seas and inclement weather being experienced. Depending on the time of deviation the vessel could be as much as 280 miles off her intended route.

(d) The possibility that the ship could have sunk immediately after the last communication with the vessel - ie approximately 4pm EST 3 July. This is known as the last report position.

(e) The possibility that the ship could have sunk immediately before the next position report was due - ie approximately 4pm EST 4 July. This is known as the missed position report.

(f) The possibility that the ship could have sunk at anytime between these

two points. As the vessel was proceeding at a speed of 11.71 knots at her last reported position the distance between the last report and the missed report would be some 281 miles.

(g) Or any combination of the above.

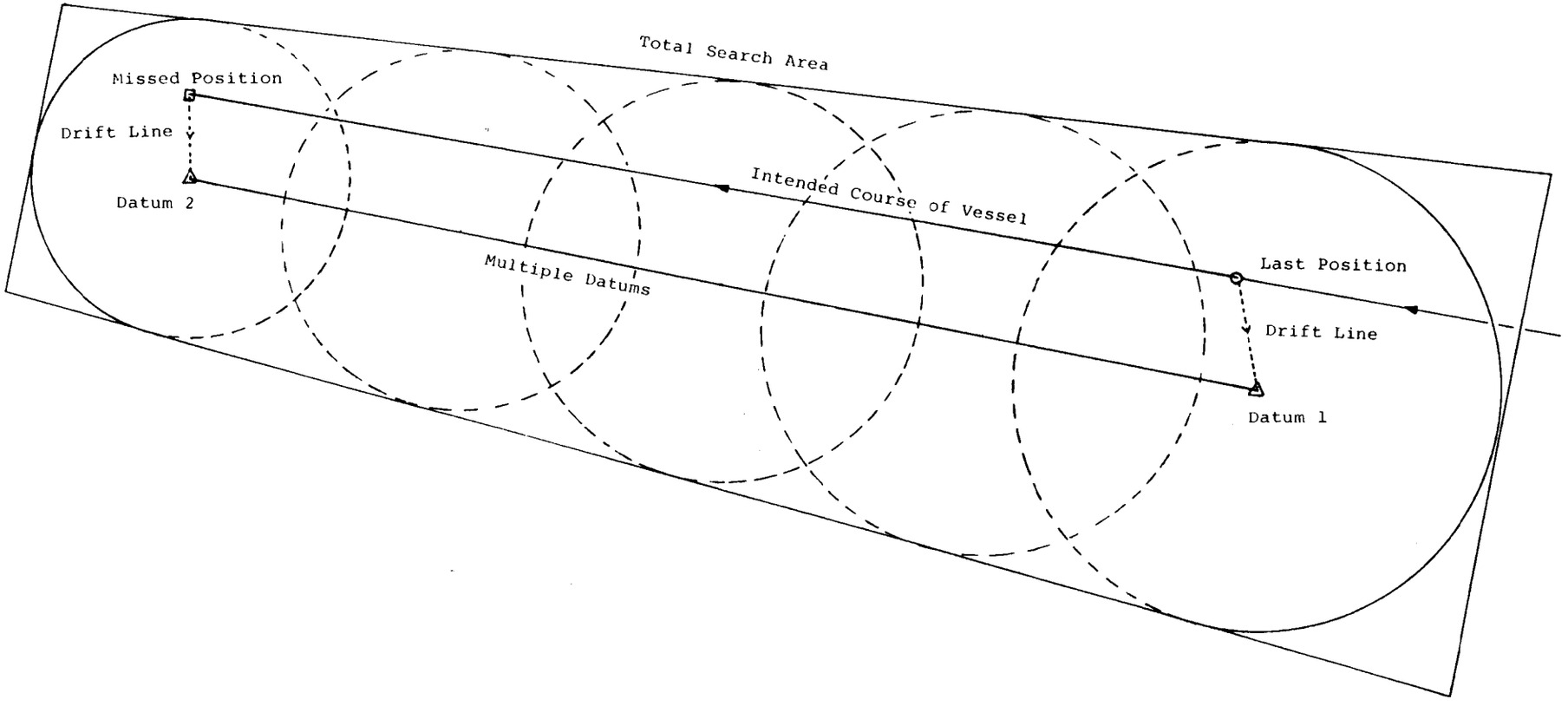
(h) If the vessel had sunk any survivors would be in liferafts or lifeboats and these craft would be subject to large amounts of drift and leeway as a result of the prevailing winds and sea currents. Thus the life saving craft will be subject to greater and greater dispersion from scene of the wreck as time passes.

Much research has been undertaken by international search and rescue authorities, notably the US Coast Guard, as to the patterns of drift of various lifesaving craft. Unfortunately a variety of factors affects the drift of a life craft and the specific direction of drift for any particular craft is not narrowly defined. As a result of this research several variables are taken into account when calculating the search datum or the most probable position of the lifesaving units.

In addition there are several variable factors to be taken into account, including but not confined to the life craft not drifting as expected, the navigational standards of the missing vessel and the navigational accuracy of search aircraft navigational systems. These are safety factors which have to be allowed for.

Having taken all these factors into account, the SARMC calculates a search radius around the datum point to find the possible search area. In the case of SINGA SEA there were two datum points and two search radii calculated from the last position/missed position points but also there were numerous datums along a line joining the two datum points, and also numerous search radii. This is shown in diagrammatic form below.

EXAMPLE OF LAST REPORT-MISSED
REPORT SEARCH AREA



APPENDIX E

BASIC RESPONSIBILITIES OF SEA SAFETY STAFF

1. Marine Operations Officer

member of shift-working staff
whilst on duty, responsible to the Senior Coordinator for the routine operation of the AUSREP system, including collection, storage and retrieval of position reports
also responsible for manual telex communications in and out of centre.

2. Coordinator

member of shift-working staff
whilst on duty, responsible to and assisting the Senior Coordinator with all aspects of the operations of the centre, including search and rescue, navigational warnings etc.
qualified Search and Rescue Mission Coordinator.

3. Senior Coordinator

member of shift-working staff
whilst on duty, the shift supervisor, responsible to the Controller for all aspects of the operations of the centre
also the national maritime search and rescue authority for the duration of his shift with appropriate financial delegation for initial reaction to any search and rescue incident
qualified Search and Rescue Mission Coordinator.

4. Controller

member of day-working staff
responsible to the Director for the day to day management of shiftworking staff and all aspects of the 24 hour operations of the centre
authorised to commit funds for a more extended search and rescue incident

qualified Search and Rescue Mission Coordinator.

5. Director Operations

member of day-working staff
responsible to the Branch Head for the overall management of all aspects of the 24 hour operations of the centre
appropriately authorised to commit funds for extensive search and rescue incidents
qualified Search and Rescue Mission Coordinator.

APPENDIX F

THE AUSTRALIAN SHIP REPORTING SYSTEM (AUSREP)

The Australian Maritime Search and Rescue area is extremely large and covers approximately one ninth of the world's surface. The designated AUSREP area is coincident with the Search and Rescue area. See page 75.

The AUSREP system has been in operation since December 1973, following the loss of the coastal vessel BLYTHE STAR, which sank without any distress message being sent out, off Tasmania in October 1973.

General Instructions on the Australian Ship Reporting System (AUSREP) are issued to Masters of ships upon first arriving in Australia. Full details of the scheme are also contained in the Australian Annual Summary of Notices to Mariners, the Admiralty List of Radio Signals Volume 1 and have been promulgated through IMO.

The objectives of the scheme are -

i) to limit the time between the loss of a vessel and the initiation of search and rescue action, in cases where no distress signal is sent out

ii) To limit the search area for a rescue action

iii) To provide up-to-date information on shipping resources available in the area in the event of a search and rescue incident.

Whilst participating in the scheme, ships are required to file a sailing report either up to 24 hours before sailing or up to 2 hours after sailing, a daily position report and, when leaving the area or arriving at a port within the AUSREP area, a final report. Additionally, should a vessel at any time be in a position more than two hours steaming from the position that would be predicted from the last Sailing Plan or Position Report, then a Deviation Report must be sent.

When a ship fails to report on schedule and the report becomes overdue mariners are advised that the following action will be undertaken.

1. During the first two hours internal checks will be carried out.

2. Vessels will be listed on traffic lists requiring the master to furnish the overdue report and a CQ enquiry may be initiated.

3. At six hours overdue, broadcasts of ship's call sign with JJJ/Report Immediate Indicator* will be inserted in the traffic list indicating concern due to non receipt of position or final report.

4. Extensive communications checks with Australian and overseas coast radio stations, owners, agents and other vessels are carried out to trace the last sighting or a contact with the vessel with the aim of confirming her safety.

5. At twenty one hours overdue, the JJJ/Report Immediately broadcast will be upgraded to the Urgency Signal XXX/Pan indicator. Search planning will be in progress.

6. By the time the report is 24 hours overdue, search action will have been initiated. This action can include the launching of aircraft.

AUSREP is the only "positive" reporting system to be operated by any government under the International Convention of Safety of Life at Sea (SOLAS). When a vessel fails to report, positive action is undertaken to establish the ship's wellbeing. In other schemes, including AMVER, if no report is received from participating vessels, it is assumed all is well until the ship either becomes overdue at her destination or some distress message is received.

Since the system was established in December 1973 and up to July 1988, some 7154 ships have participated in the scheme, with an average of 220 ships per

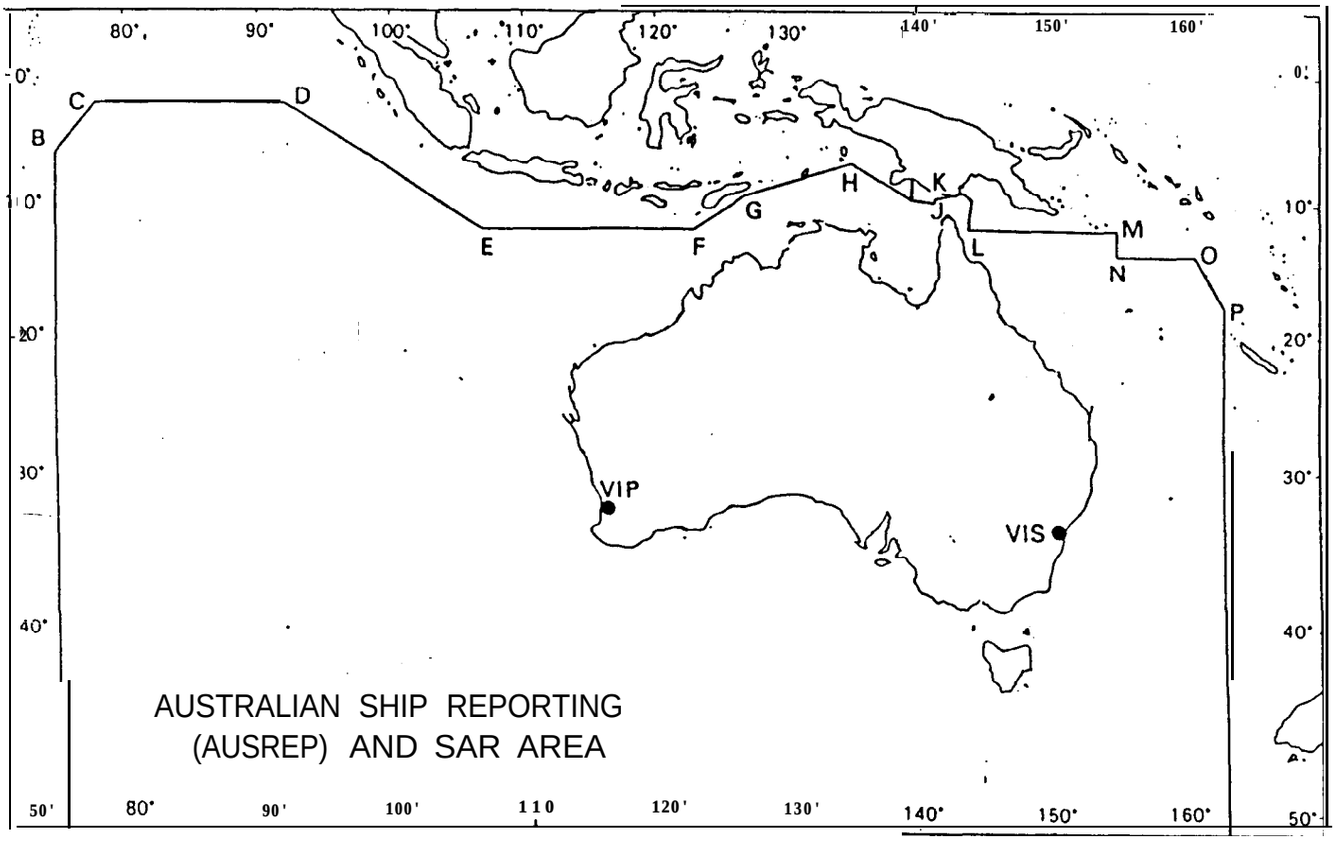
* JJJ - a signal prefix unique to the AUSREP system which is broadcast with the callsign of the subject vessel at the beginning of, and in, an Australian coast radio station's traffic list to indicate (a) to the subject vessel - report immediate (b) to other vessels - vessel (callsign) overdue AUSREP position report, sighting or hearing reports requested.

day participating. This involves the centre processing some 10,000 individual reports in any one month.

In the year 1 July 1987 to June 1988 the Centre monitored on average 225 ships involving 10672 reports per month. Of these 1.8% or 192 reports per month required some follow-up action.

Since 1 January 1986, 11 ships have not been positively accounted for within 21 hours. Of these only 4 went beyond 24 hours and only 1 went beyond 30 hours.

Internal review has lead to a slight modification of procedures. In the light of experience, the listing of overdue vessels has now been extended to 4 hours rather than two hours overdue, and the MARSAR file is raised at twelve hours overdue and the operation is passed from the AUSREP officer to the Search and Rescue Officer. All other timings for the overdue action remain the same. The operational guidelines are not absolute instructions and the timings may be brought forward if the Senior Co-ordinator on duty thinks it necessary.



Co-ordinates of Australian SAR and AUSREP Region

A. The coast of the Antarctic Continent in longitude 75° 00′ E.
B. 6" 00′ S., 75" 00' E.
C. 2° 00′ S., 78" 00' E.
D. 2" 00' S., 92" 00' E.
E. 12" 00′ S., 107° 00′ E.
F. 12° 00′ S., 123° 20′ E.
G. 9" 20′ S., 126" 50' E.
H. 7° 00′ S., 135'00' E.
I. 9" 50' S., 139° 40' E.
J. 9" 50′ S., 1413 00' E.
K. 9° 37′ S., 141° 02′ E., then following the territorial boundary (See NOTE) to
L. 12° 00′ S., 144'00' E.
M. 12° 00′ S., 155" 00' E.
N. 14° 00′ S., 155° 00' E.
0. 14° 00′ S., 161° 15′ E.
P. 17° 40′ S., 163° 00′ E.
Q. The coast of the Antarctic Continent in longitude 163" 00' E.

NOTE: As the territorial boundary in this area cannot be readily defined by co-ordinates, the following co-ordinates may be used for AUSREP purposes only.

K (1) 9° 37′ S., 141° 02′ E., (2) 9° 08′ S., 143° 53′ E., (3) 9° 24′ S., 144° 13′ E. (L) 12° 00′ S., 144" 00′ E.