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Senior Constable David Upston
Pymont Police Station
Harris Street
PYRMONT NSW 2009

Dear Senior Constable Upston

Release of Directorate of Flying Safety (DFS)—Australian Defence Force (ADF) Incident Investigation Report 10 Sqn ASOR 032/98

I have enclosed for your information a copy of the DFS—ADF Incident Investigation Report 10 Sqn ASOR 032/98 on the incident involving a breakdown in separation assurance between Royal Australian Air Force P-3C Orion A9-665 (callsign Rescue 251) and Australian Aerial Patrol Cessna 402, VH-PEH, east of Bermagui, NSW on 28 December 1998.

This report was produced by the DFS-ADF as a result of a joint investigation by the DFS-ADF and ATSB.

The report will be available to the public from 24 December 1999, and will be placed on the ATSB website. Please note that in accordance with the provisions of Section 19CU(1) of Part 2A of the *Air Navigation Act 1920*, no part of the report is to be made public before 24 December 1999.

Yours sincerely

Alan L. Stray
Deputy Director



ATSB
Formed on 1 July 1999, by the integration of:
Bureau of Air Safety Investigation (BASi)
Federal Office of Road Safety (FORS)
Marine Incident Investigation Unit (MIU)
the Rail Safety Unit (RSU)



DIRECTORATE OF FLYING SAFETY - ADF



Occurrence involving an airborne conflict between
Royal Australian Air Force P-3C Orion A9-665 (callsign RESCUE 251)
and Australian Aerial Patrol Cessna 402, registration VH-PEH,
East of Bermagui, NSW on 28 December 1998

**DFS-ADF INCIDENT INVESTIGATION REPORT
10SQN ASOR 032/98**

**OCCURRENCE INVOLVING AN AIRBORNE CONFLICT BETWEEN ROYAL
AUSTRALIAN AIR FORCE P-3C ORION A9- 665 (CALLSIGN RESCUE 251) AND
AUSTRALIAN AERIAL PATROL CESSNA 402, REGISTRATION VH-PEH, EAST
OF BERMAGUI, NSW ON 28 DECEMBER 1998**

(All times in this report are Australian Eastern Summer Time)

This report was produced by the Directorate of Flying Safety-ADF as a result of a joint investigation by the Directorate of Flying Safety-ADF and the Australian Transport Safety Bureau (formerly the Bureau of Air Safety Investigation).

Readers are advised that both the Directorate of Flying Safety – ADF and the Australian Transport Safety Bureau investigate for the sole purpose of enhancing safety. Consequently reports are confined to matters of safety significance and may be misleading if used for any other purpose. In no case is this report intended to imply blame or liability.

As the Directorate believes that safety information is of greatest value if it is passed on for the use of others, readers are encouraged to copy or reprint this report for further distribution, but should acknowledge DFS-ADF as the source. Extra copies of the report are also available by contacting The Directorate of Flying Safety – ADF, Campbell Park Offices, Canberra. ACT 2600.

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SYNOPSIS

On 28 December 1998 an extensive Search and Rescue (SAR) operation was being conducted off the south coast of NSW for missing yachts competing in the 1998 Sydney to Hobart yacht race. As part of the SAR, two aircraft, a Royal Australian Air Force (RAAF) Lockheed P-3C Orion (Orion) and a Cessna 402 (VH-PEH) operated by Australian Air Patrol, were conducting a visual search for the missing yacht "Winston Churchill". The Australian Search and Rescue Coordination Centre (AusSAR) had assigned the two aircraft to adjacent search areas. While the Cessna 402 had been tasked for the search by a pre-flight briefing, the Orion had twice been re-tasked by AusSAR while in flight. Both aircraft were flying East-West search legs at approximately 1,000ft in visual meteorological conditions.

At approximately 0900 an off-duty Orion crewmember, resting in the flight station, noticed two lights ahead of the aircraft. After identifying the lights as being from an aircraft, the pilot flying was alerted and the Orion manoeuvred clear of the other aircraft, which was subsequently identified as VH-PEH. Prior to the incident the Orion crew had been unaware that other aircraft were operating in their vicinity. While the pilot of the Cessna 402 was aware of the Orion, he understood that it was searching at 500ft. The aircraft passed with approximately 1,000 m horizontal and 200 ft vertical separation.

The AusSAR developed search plan, which both aircraft were a part of, provided a safety buffer between aircraft. However, this search plan required navigational accuracy that was beyond the capabilities of the Orion. Additionally, important elements of the plan, relating to other search aircraft and altitudes, were not passed to the crew of the Orion. AusSAR staff lacked familiarity with the capabilities and limitations of the Orion and the procedures for the in-flight re-tasking of aircraft by AusSAR were vulnerable to human error, especially under the very high workload occurring at the time of re-tasking.

Due to errors in the Orion's navigation system, the aircraft failed to remain inside its assigned search area. The navigation errors were a function of equipment limitations and inadequate monitoring of the aircraft's position by the crew. Consequently the Orion crew inadvertently searched in the area assigned to the Cessna 402. At the time of the incident most members of the Orion crew were highly fatigued, having been awake in excess of 24 hours.

1 FACTUAL INFORMATION

1.1 HISTORY OF FLIGHT

Rescue 251

- 1.1.1 RAAF P-3C Orion A9-665, callsign RESCUE 251, departed RAAF Base Edinburgh at 0258 hrs on 28 December 1998 to provide command and control and radar search for the Search and Rescue (SAR) of several yachts missing and damaged during the 1998 Sydney to Hobart yacht race. RESCUE 251 tracked via Mallacoota (MCO) to the tasked search area 37°00'S 150°00'E to 39°00'S 151°00'E.
- 1.1.2 At 0438, prior to commencing the command and control and radar search tasks, RESCUE 251 received re-tasking from the Australian Search and Rescue Centre (AusSAR) via Melbourne Flight Service (FIS). The revised tasking was for RESCUE 251 to conduct a "Parallel Track" visual and radar search at 1,000 ft along the line 37°14'S 150°19'E to 36°38'S 151°01'E with offsets 1 NM to the north-west and 2NM to the south-east. The briefed targets of interest were life rafts, wreckage and/or disabled yachts. RESCUE 251 completed this search, sighting three intact yachts that did not require further assistance.
- 1.1.3 On the completion of this search RESCUE 251 received additional tasking from AusSAR via Melbourne FIS at 0640. The message to RESCUE 251 was as follows:
- Start Point 36°35.5'S 150°03'E, leg 1 ends 36°35.5'S 152°00'E. Offset 1NM. Direction of creep - south. Exit point 36°44.5'S 149°59'E. Speed 150kts. Approximate duration 6 hours.
- 1.1.4 The crew of RESCUE 251 advised Melbourne FIS that their minimum speed would be 200kts but did not query any other aspect of the tasking. As the two areas overlapped, the aircraft captain considered the re-tasking to be an extension of the initial search area.
- 1.1.5 The re-tasking message was annotated on RESCUE 251 's navigation log. The writing of this particular message was untidy in comparison with the neat writing on the remainder of the log. The navigator may have been dozing immediately prior to receiving the message.
- 1.1.6 RESCUE 251 commenced the second visual search maintaining 1,000ft and 200kts. The search consisted of a series of East/West legs from the Southern NSW coast out to 152°00'E and return. Each leg was approximately 100NM long. At the completion of each leg the aircraft would displace 1NM to the south and fly the reciprocal track.
- 1.1.7 Due to his high fatigue state, RESCUE 251's captain left his seat during this second search, leaving two co-pilots and a flight engineer in the flight station seats. On exiting his seat the Captain directed the co-pilots to maintain 1,200ft to provide a margin over the minimum altitude permissible of 1,000ft with the captain not at the controls.¹

¹ 92WG Flying Order 3-2. Aircraft Captain in Flying Seat for P-3 Flying Operations. The flying order requires that the aircraft captain occupies a flying seat below 1000ft AMSL unless exceptional circumstances exist or specific authorisation has been received allowing the captain to vacate a flying seat.

- 1.1.8 When interviewed, the captain recalled checking the fatigue of other crewmembers after he left the flight station. He observed that the Tactical Coordinator (TACCO) and the Sensor Station 3 Operator were not very alert and the majority of the rest of the crew were tired. The co-pilot, who had replaced the captain at the controls, and the Flight Engineer on duty both reported being alert following rest periods in the aircraft's bunks. The captain decided that the crew would complete the revised search area and then proceed to East Sale because of their overall high level of fatigue.
- 1.1.9 At 0903, while on what the crew thinks was a westerly track, an off-duty flight engineer, who was resting on an equipment rack behind the pilot's seat, saw two blurred lights in front of RESCUE 251. He identified the lights as being the landing lights of a light twin engine aircraft (VH-PEH) on a reciprocal track at a similar height and alerted the pilot flying. The pilot turned the aircraft right and climbed, remaining clear of VH-PEH.
- 1.1.10 Following the incident, VH-PEH's transponder was detected using the Orion's APX-72 IFF Interrogator at Sensor Station 3 but the crew did not recall seeing any indication of VH-PEH's transponder as the aircraft converged.
- 1.1.11 The crew of RESCUE 251 contacted Melbourne FIS for traffic information but Melbourne FIS was unable to provide any details of the aircraft. After attempting radio contact with VH-PEH on several frequencies, contact was eventually made on FIS frequency 118.8Mhz. RESCUE 251 then continued the search at 1,500ft to ensure separation with VH-PEH.
- 1.1.12 At 1025, after completing eight legs of the search pattern, the captain elected to discontinue the mission due to the crew's high fatigue state. RESCUE 251 landed at RAAF base East Sale at 1132 without further incident.

VH-PEH

- 1.1.13 The captain of VH-PEH received a fax briefing from AusSAR to conduct a visual search for a missing yacht, life rafts or survivors off the NSW south coast. The search consisted of three East/West legs, commencing at 36°32'S 152°00'E thence 36°32'S 150°03'E. The subsequent legs were to be offset 1NM to the south and the search was to be completed at 36°35'S 152°00'E. The briefing advised that the search speed should be 120kts, altitude 1,000ft and that VH-APH, a Partenavia 68, was operating to VH-PEH's north maintaining 500ft and RESCUE 251, an Orion, was operating to the south, also at 500ft. Special equipment requirements were specified as GPS and serviceable communications.
- 1.1.14 The aircraft departed Wollongong and tracked direct to the initial search position at 3,000ft before descending to 1,000ft for the search. The captain stated that the aircraft's transponder was squawking Code 2000 Mode C throughout and was being interrogated at the time of the occurrence.

1.1.15 On one of the westerly tracks VH-PEH sighted an Orion slightly to the north on a reciprocal track. The Orion was observed to turn right, across VH-PEH's track, and climb before turning left onto a reciprocal track. VH-PEH attempted to establish communications with the Orion. After initial unsuccessful attempts, communications were established on Melbourne FIS frequency 118.8Mhz.

1.2 INJURIES TO PERSONS

1.2.1 Nil

1.3 DAMAGE TO AIRCRAFT

1.3.1 Nil

1.4 PERSONNEL INFORMATION

The Crew of RESCUE 251.

1.4.1 Details of RESCUE 251's crew are as follows:

Aircraft Captain

Category Held	Category C Maritime Captain
Total Flying Hours	1879
Total P-3C Orion Hours	1665
Total P-3C Orion Command Hours	456

Co-Pilot #1

Category Held	Category C Maritime Co-pilot
Total Flying Hours	1315
Total P-3C Orion Hours	630

Co-Pilot #2

Category Held	Category D Maritime Co-pilot
Total Flying Hours	590
Total P-3C Orion Hours	385

Flight Engineer occupying seat at time of incident

Category Held	Category C P-3C Orion Flight Engineer
Total Flying Hours	1340
Total P-3C Orion Hours	1340

Off-Duty Flight Engineer

Category Held	Category C P-3C Orion Flight Engineer
Total Flying Hours	3766
Total P-3C Orion Hours	2174

Tactical Coordinator (TACCO)

Category Held	Category D TACCO
Total Flying Hours	2453
Total P-3C Orion Hours	739
Total TACCO Hours	290

Navigator

Category Held	Category C Navigator
Total Flying Hours	870
Total P-3C Orion Hours	590

Sensor Employment Manager (SEM)

Category Held	Category C SEM
Total Flying Hours	2615
Total P-3C Orion Hours	2615
Total SEM Hours	312

In addition to the crew mentioned above, there were four Sensor Operators and another spare Flight Engineer. Their experience levels are not considered relevant to the incident.

Duty Times

- 1.4.2 The crew of RESCUE 251 had been the No. 92 Wing SAR standby crew for one week prior to the incident flight. Crewmembers interviewed after the incident reported getting up at between 0730 and 0930 on the day preceding the incident flight and carrying out light activities during the day. The aircraft captain had a family function on the evening of 27 December 98; this function had finished by 1900. All members interviewed reported that they had not consumed any alcohol while on standby. All members were in the process of going to bed or had just gone to bed when their pagers were activated at 2330.
- 1.4.3 During the flight the Captain, TACCO, Navigator and SEM were unable to take any rest breaks. During transit they were involved in mission planning and briefing. One co-pilot and the flight engineers were able to get some rest while not required for their primary duties.
- 1.4.4 The Captain stated that he elected to get out of his seat during the second search due to his high fatigue state. He hoped that by moving around, drinking coffee, etc he would become more refreshed. He also wanted to check the fatigue of the rest of the crew.
- 1.4.5 At the time of the incident most crewmembers of RESCUE 251 had been awake in excess of 24 hours.

The crew of VH-PEH.

- 1.4.6 VH-PEH was crewed by a pilot and three visual observers. The pilot held a valid Commercial Pilots licence, Cessna 402 rating, Command Instrument Rating and had over 2,000 hours experience.

1.5 METEOROLOGICAL INFORMATION

- 1.5.1 At 0530 the crew of RESCUE 251 recorded the weather at 36°45'S 150°53'E as:

1,000ft wind 240° True at 40kts; visibility 3km in haze; 3 Octas Cumulus base at 2,000ft.

At the time of the incident, 0900, while the weather was not specifically recorded, the visibility had improved to 8km and there was now broken Cumulus at 2,000ft.

1.6 AIDS TO NAVIGATION

Orion Navigation Equipment

- 1.6.1 The Orion's primary means of navigation while conducting a search are twin Litton 72 Inertial Navigation Units (INU) and an APN-227 Doppler Navigation Radar set. These navigation systems are then used as inputs to the aircraft's mission computer to provide a system position. The INUs and Doppler are augmented by a Magellan 7000 GPS, which is a single channel handheld unit with an improvised antenna usually affixed to the window beside the Navigator Station. The GPS cannot be used as a primary navigation device although it can be used to monitor the INUs and report datum positions.²
- 1.6.2 The Litton 72 INUs have an allowable drift rate of 2NM per hour. This drift rate is non-linear and governed by the Schuler cycle and other internal system errors. The INUs can be updated by the following methods:
- a. Via a fix from ground based navigation aids.
 - b. By flying on top a known geographic position.
 - c. Obtaining a radar fix from a known geographic position.

Orion Navigation Procedures

- 1.6.3 92WG SI(OPS) 4-14 detail Search Procedures to be used by Orion crews. It provides the following instruction on navigation accuracy:

Navigation Accuracy. Navigation accuracy is essential in SAR operations for the following reasons:

- a. Inaccurate navigation leads to haphazard track spacing and hence loss of security.
- b. The inaccurate reporting of the position of survivors hampers the efforts of other rescue units in relocating survivors. Therefore, the navigator must ensure that as far as possible, he (she) starts his (her) search from an accurate position and that the most accurate navigation mode is selected. To this end, the navigator should update his (her) navigation system with an accurate fix at the latest possible time before entering the area. He (she) should also have completed a full navigation systems check during transit, to determine the optimum mode for the search. The use of GPS to confirm a datum position is highly desirable.

² 92WG SI(OPS) 4-2, Navigation Procedures, para 4.2.6.

Search Security. If a fix is obtained during a search and the navigation system is subsequently updated, loss of security can result. To avoid this, while continuing to take fixes, the navigator should not update the system during a search leg. If possible, the navigation system should be updated only at the end of the search, but a log of the error between the fix and system positions should be maintained. This error vector may then be applied to the sides of the search area to construct the area actually searched.³

The same SI also contains a SAR checklist as a quick reference for crews conducting SAR missions. The guidance on navigation provided is:

Obtain fix as close to datum as possible but do not accept geo-correct after commencement of search.⁴

Rescue 251 Crew Actions

- 1.6.4 During the pre-flight preparation of RESCUE 251 at Edinburgh, the aircraft's parking position had been entered into the INUs by maintenance staff and the INUs set to "Align" prior to the navigator's arrival. Immediately prior to engine start, the INUs were accepted at the completion of the alignment procedure. After both INUs were accepted, the navigator observed that the position for INU 2's parking position had been entered incorrectly and was out by 10 minutes of latitude, equivalent to a 10NM error. Rather than re-align the INU, which would take 17 minutes and require that engine start be delayed, the navigator elected to continue and updated the INU on the runway threshold. This updating technique was an acceptable practice. During taxi at RAAF base Edinburgh, the Magellan GPS was providing accurate position information.
- 1.6.5 Prior to entering the search area, overhead Mallacoota at 0439, the crew carried out a navigation fix. INU 1 was found to be within 1.5NM, INU 2 had an abnormally large drift and GPS information was not available. The aircraft navigation system was not updated as the fix was within the required limits.
- 1.6.6 During the searches the crew did not update the navigation systems nor did they maintain a log of navigation system errors. INU 1 was used as the primary source of navigational information as the crew considered INU 2 unreliable due to its high drift rate. Crew attempts to check navigation system accuracy by obtaining a radar fix from the coastline was hampered by degraded radar performance due to weather. However, the crew was not sufficiently concerned about navigation system accuracy to interrupt their tasked search to obtain a system check. Throughout the sortie the GPS was not displaying positional information due to an inability to acquire sufficient satellites. The GPS antenna was fixed to the Navigator Station side observation window.
- 1.6.7 After exiting the search area, RESCUE 251 obtained two navigation fixes. A radar update indicated an aircraft system error of 153°T at 8.8NM and a NAVAID fix from the Mallacoota VOR/DME showed an error of 168°T at 3.7NM.

³ 92WGSi(OPS) 4-14, Search Procedures paras 4.14.15 and 4.14.16.

⁴ 92WGSi(OPS) 4-14, Search Procedures, Annex A.

VH-PEH Navigation Procedures

- 1.6.8 VH-PEH was fitted with a TSO C-129 certified KLN 89B GPS and all navigation in the search area was carried out using this equipment backed up by a visual check using a WAC chart at the coastal end of the search pattern. Throughout the search VH-PEH's GPS was continuously able to acquire sufficient satellites to provide accurate positional information.

1.7 COMMUNICATIONS

- 1.7.1 Melbourne FIS frequency 118.8Mhz was utilised for aircraft/aircraft communications and for the transfer of information between aircraft and AusSAR. Due to the large number of aircraft involved in the search, this frequency was very busy. An additional complication was that due to the low-level nature of the SAR operations (helicopter winching and visual searches at 500ft, 90NM from the coast) a large number of communication relays between aircraft and Melbourne FIS were required. This situation resulted in increased frequency congestion.
- 1.7.2 The captain of RESCUE 251 was aware of other traffic in the area from the transmissions on FIS frequencies but was unaware of the exact location of these other aircraft.
- 1.7.3 Communications between Melbourne FIS and AusSAR were via commercial telephone lines. At the same time as RESCUE 251 was re-tasked for the second search area (0640) repeated telephone conversations occurred between AusSAR and Melbourne FIS regarding:
- a. the winching of survivors from the yacht "Midnight Special" by the Southcare Rescue helicopter,
 - b. any information held on the yacht "Business Post Naiad" by Southcare, and
 - c. the search for a beacon by RAN Sea King "SHARK 05".

1.8 ORGANISATIONAL AND MANAGEMENT INFORMATION

AusSAR

- 1.8.1 AusSAR is responsible for the coordination of major nautical and aviation SAR activities within the Australian FIR. AusSAR:
- a. plans the SAR,
 - b. tasks civil and military aircraft and ships to conduct the SAR,
 - c. coordinates SAR activities, and
 - d. analyses search results.

- 1.8.2 A dedicated SAR Coordination Centre in Canberra is manned continuously by trained SAR Coordinators. Three eight hour shifts are normally rostered each day. On this occasion, due to the high workload, these shift times were amended so that some coordinators were on duty for up to 14 hours. This extended coverage meant that fatigue affected some individuals.
- 1.8.3 When planning search activities, AusSAR aims to maximise the chances of detecting survivors and, where practical, provide a safety buffer between search aircraft. When planning the visual searches for the missing yacht “Winston Churchill”, the SAR Coordinators initially used RESCUE 251 for a search parallel to the missing yachts presumed track. At this time (0438) RESCUE 251 was the only aircraft in the area so a safety buffer was not required.
- 1.8.4 With the initial search by RESCUE 251 proving unsuccessful, the SAR Coordinators subsequently planned a more extensive visual search from 36°03’S to 37°17’S from the southern NSW coast to 152°00’E, utilising 13 civil fixed wing aircraft, RESCUE 251 and a RAAF C-130 Hercules. Each aircraft was allocated a strip 3NM North-South and approximately 90NM East-West, stretching from the coast to 152°00’E. The areas were labelled ‘A1’, ‘B1’, ... to ‘L1’ (RESCUE 251) then ‘O1’ (VH-PEH), ‘P1’, ‘Q1’ and ‘T1’. There were no buffers between adjacent areas but search altitudes alternated between 500ft and 1,000ft to provide separation. In the search plan RESCUE 251 was assigned 500ft and VH-PEH 1,000ft. A photocopy of the search planning chart used by the SAR Coordinators is at Annex A.
- 1.8.5 When tasking aircraft on the ground, the information from the plan is transferred to a “Search Briefing” that is faxed to aircrew prior to their departure. The brief received by the crew of VH-PEH is at Annex B. RESCUE 251 did not receive a “Search Briefing”. Instead a fax, requesting Defence Support for the SAR, was sent to Headquarters Air Command. The crew was then formally tasked via a “Form Green”⁵ by 92WG Operations.
- 1.8.6 The in-flight re-tasking of RESCUE 251 involved the following steps:
- a. Pertinent details from the planning chart were transferred to a message notepad.
 - b. Melbourne FIS was contacted by telephone and the message pad information passed verbally.
 - c. Melbourne FIS relayed the information via FIS radio frequencies.

⁵ The “Form Green” is an ADF message for tasking aircraft. The “Form Green’s” content will vary with the mission but will normally include at least the mission aim, details of timings, routes / operating areas, communications frequencies and known traffic.

- 1.8.7 In the case of the second re-tasking of RESCUE 251, the planning chart at Annex A includes the altitude assigned to RESCUE 251 (500ft) plus information on adjoining aircraft. The handwritten note of the re-tasking, logged at 0648, omits the altitude assignment but contains information on adjacent aircraft, including VH-PEH. The telephone message from AusSAR to Melbourne FIS, which was recorded at Melbourne FIS, did not include the altitude assignment or any information on adjacent aircraft. Melbourne FIS correctly relayed the telephone message received from AusSAR to RESCUE 251 over the radio.

Melbourne Flight Service

- 1.8.8 In order to handle the high workload involved, two Flight Service Officers staffed the Melbourne FIS sector covering the SAR area. They provided a relay service between AusSAR and the aircraft in the area. Since aircraft were operating under VFR in the search areas, they did not have sufficient information, or the resources, to provide a Directed Traffic Information service.

RAAF Maritime Patrol Group (MPG)

- 1.8.9 MPG consists of No. 92 Wing (92WG) which operates the RAAF's fleet of Orion aircraft. 92WG Standing Instructions – Operations (92WG SI(OPS)) detail the standard operating procedures for all Orion operations, including SAR. 92WG SI(OPS) are required to comply with the requirements laid down in the RAAF wide instructions, particularly Defence Instruction (Air Force) Operations (DI(AF) OPS) along with additional requirements for Orion operations.

Crew Duty and Standby Procedures

- 1.8.10 RAAF crew duty limits are published in DI(AF) OPS 6-6. OPS 6-6 requires all Group Commanders to publish maximum crew duty limits in accordance with the guidelines in AAP 6734.001 – Flying Safety Manual.⁶ Chapter 8 of the Flying Safety Manual contains information on Crew Duty and Fatigue. The broad effects of fatigue are identified:

Generally, fatigue causes deterioration in mood, decreased powers of judgement and reasoning, slow and inaccurate performance.⁷

Chapter 8 also contains guidelines as an aid to the development of crew duty limits. The following is provided in regard to crews on standby:

It is recommended that crew members on standby be given a minimum 6 hour period of protected standby time during each 24 hour period on standby and that the crew member not be contacted or assigned duty during this period. The 6 hour

⁶ DI(AF) OPS 6-6, Crew Duty Limits, para 6.

⁷ AAP 6734.001 – Flying Safety Manual, Chapter 8, Crew Duty and Fatigue, para 3.

period should be assigned before the crew member begins standby duty and should occur at the same time during each 24 hour period. Any duty period should be completed within the 18 hour awake time.⁸

- 1.8.11 92WG SI(OPS) 1-7 details the standby crew arrangements for 92WG. The P-3C crew was assigned to twelve hour standby. Under twelve hour standby:
- a. **Response Time.** Response time will be as directed by 92WG Operations, but not greater than 12 hours after initial 92WG notification.
 - b. **Duty Requirements during Standby Period.** Crew members are to report for duty from 1000 hours until normal stand-down times.⁹
- 1.8.12 As the likelihood of a SAR callout was assessed by 92WG management to be low, and there was a desire for squadron personnel to be taking leave over the reduced activity period, senior management within the Wing elected to only maintain one standby crew during the Christmas - New Year period. This crew was not required to report to work in the week prior to the occurrence.

92WG Flight Tasking

- 1.8.13 92WG Operations issued the tasking for RESCUE 251 following a request and authorisation to carry out the task from Headquarters Air Command. In preparing the tasking the Operations Officer liaised with AusSAR who provided details of the mission.
- 1.8.14 At the time the tasking was prepared, it was envisaged that RESCUE 251 would be involved in coordinating other aircraft in the search area and providing radar search. The "Form Green" tasking message instructed the crew to act as Scene of Action Commander for the SAR, unless instructed otherwise, and advised that helicopters would be participating in the SAR and operating on Melbourne FIS frequencies. The "Form Green" contained no advice on fixed wing aircraft as no details on such aircraft had been received at the time.
- 1.8.15 The tasking message instructed RESCUE 251 to depart Edinburgh at 0230, be in the search area at 0430 and remain until 1200 before recovering to RAAF base East Sale. Total planned sortie duration was 9.5 hours.

Flight Authorisation

- 1.8.16 The captain of RESCUE 251 was authorised for the flight by the 10SQN Duty Executive Officer (DXO). The authorisation was conducted over the telephone. The DXO understood the aircraft would be employed primarily for command and control of other aircraft in the search. He was concerned about fatigue and advised the captain to use his judgement and abort the sortie if fatigue was a problem.

⁸ Op cit para 10, sub-para h.

⁹ 92WG SI(OPS) 1-7, para 1.7.4.

- 1.8.17 The authorising officer was a recent graduate of the RAAF's Flying Supervisors course but had only recently returned to the squadron following several years in a staff position in Canberra. He stated that Flying Supervisors Course had provided him with a good insight into the responsibilities of the Flying Supervisor but had not covered the relevant Defence Instructions in any depth. He was unaware of the Duty time guidance in the Flying Safety Manual.

2 ANALYSIS

2.1 AusSAR SEARCH PLAN

- 2.1.1 AusSAR's search plan was designed to cover the area of probability as thoroughly and quickly as practical. Since the visual search was for survivors in the water and life rafts, the spacing between tracks needed to be very small, in this case 1NM. To ensure the integrity of the search it was important that gaps between areas did not exist as the high wind and currents in the area may cause survivors and life rafts to drift outside any gaps before they could be searched.
- 2.1.2 As the search operation was in Class "G" airspace, there was no requirement for any formal separation standard to be applied between the search aircraft. However, as part of their planning, AusSAR coordinators endeavoured to provide a safety buffer between aircraft. The coordinators used their knowledge and experience to formulate a basic safety buffer of either 500ft vertically or 3NM horizontally between aircraft. The reasoning behind this choice of buffer was the marginal weather conditions in the search area and the large number of aircraft employed in a comparatively small area. It was not unusual for zero, 200ft or 300ft to be used during search operations.
- 2.1.3 The requirements of the search meant that the safety buffers between aircraft relied on aircraft operating at different altitudes and remaining in their assigned search areas. Since visually searching from above 1,000ft would have significantly reduced the probability of detecting survivors only two altitude assignments, 500ft and 1,000ft, were available. Assuming all aircraft remained at their assigned altitude and within their assigned areas there would be 500ft separation between aircraft in adjacent areas and 3NM horizontal separation from the nearest aircraft at the same altitude.

2.2 AIRCRAFT NAVIGATION

- 2.2.1 For aircraft to remain within their assigned area they would need to be fitted with some type of Area Navigation System. Visual fixes from the coast and Dead Reckoning Navigation could not provide the accuracy required.
- 2.2.2 Had all search aircraft been equipped with certified GPS equipment any GPS errors would have been largely irrelevant since all the aircraft would have been tracking with reference to the same satellite constellation. Any errors that did exist between aircraft would have been of a minor nature.
- 2.2.3 The Orion was incapable of navigating with the accuracy required to remain within the assigned search area or maintain search integrity. The twin Litton 72 INUs used by the aircraft for area navigation have an acceptable drift rate of up to 2NM/hr. Even if navigation updates had been carried out each time RESCUE 251 was near the coast, an error of up to 2NM could occur before the aircraft returned and could make another update.

- 2.2.4 The Magellan 7000 handheld GPS used by Orion crews is incapable of providing consistently accurate navigation information, due to internal limitations and the improvised nature of the antenna installation. Fixing the antenna to the navigators observation window limits the number of satellites which can be received. Satellite reception difficulties from this antenna installation are compounded during aircraft manoeuvres as satellites go in and out of view. The RAAF's C-130 and HS-748 fleets have fitted an interim GPS antenna to the aircraft's sextant mount providing improved satellite reception. The Orion is equipped with a sextant mount, however, the use of a sextant mount GPS antenna was not adopted for the Orion fleet.
- 2.2.5 The tasking of RESCUE 251 for a visual search requiring precise navigation showed a lack of appreciation of the Orion's navigation limitations by the SAR Coordinators at AusSAR.

RESCUE 251 's Navigation Procedures

- 2.2.6 Prior to entering the area the crew assessed INU 2s drift rate to be unacceptable and instead relied on INU 1 as their sole source of navigation information during the search. Post flight analysis assessed INU 2 to be serviceable. The 10NM misalignment of INU 2 at Edinburgh may have induced a higher than normal drift rate but not to the extent of making INU 2 unusable. The reason for INU 2s unacceptable drift rate could not be positively determined.
- 2.2.7 The crew did not comply with the 92WG SI(OPS) requirement to take regular navigation fixes, without updating the navigation system, when practical during the search.¹⁰ The proximity of the coast during the second search made it possible for the crew to take regular fixes, either visually or using radar geo-corrects. Despite some poor weather in the area, which may have degraded the radar fixing process, the proximity of portions of the track to the coast should have enabled the crew to make such an update.
- 2.2.8 The crew's failure to regularly acquire navigation fixes cannot be explained with any certainty. Possible contributing factors were:
- a. a misunderstanding or lack of knowledge of the 92WG SI(OPS) requirements,
 - b. that the majority of previous 92WG SAR missions occurred offshore where it is usually not possible to obtain navigation fixes during the search,
 - c. a lack of emphasis on navigation requirements during SAR training serials,
 - d. crew fatigue,
 - e. the lack of GPS positional information which may have prompted the Navigator into realising the magnitude of any aircraft navigation system errors,

¹⁰ 92WGSI(OPS) 4-14, Search Procedures, para 4.14.16

- f. the requirement for regular fixes not being included in the 92WG SI(OPS) SAR Checklist,¹¹ and
- g. a lack of knowledge that the second visual search area was a component of a larger search plan.

2.2.9 It is not possible to determine the exact position of RESCUE 251 when they first sighted VH-PEH because of the lack of regular fixes and the non-linear nature of INU errors. 92WG Analysis Section reviewed the records from the sortie and assessed that, at the time of the incident, RESCUE 251 was approximately 5NM north-north-west of the position indicated in the aircraft's navigation system. If this was the case, then it is highly likely that RESCUE 251 was searching in the area assigned to VH-PEH at the time of the incident and that the search area assigned to RESCUE 251 was not completely searched.

VH-PEH's Navigation Procedures

2.2.10 VH-PEH used a TSO C-129 certified GPS receiver to provide tracking guidance. While VH-PEH's GPS was not coupled with the auto-pilot, it would provide steering commands enabling the aircraft to remain on its search track. While some tracking errors may have occurred these would have been minor. It is assessed that VH-PEH remained within its assigned search area.

2.3 THE RE-TASKING OF RESCUE 251

2.3.1 The second re-tasking of RESCUE 251 was affected by several errors in the transfer of information from AusSAR to the crew. A map, a copy of which is at Annex A, was used to plan the search and contained information to provide a safety buffer between RESCUE 251 and VH-PEH. The information included search areas, search altitudes, adjacent aircraft and entry and exit positions. However, only the search area and entry and exit points were passed to RESCUE 251.

2.3.2 Since the crew of RESCUE 251 was not advised of a change in search altitude, they maintained the aircraft at 1,000ft (climbing to 1,200ft when the captain was not at the controls) thus negating the value of the planned vertical buffer with VH-PEH. This lack of vertical separation, when combined with the Orion's navigation errors, led to the confliction.

2.3.3 A copy of RESCUE 251's re-tasking note is at Annex C. The note has boxes for some pertinent information (times, phone numbers, references, etc) but the information to be passed is written freely. This meant that it was comparatively easy, especially in high workload situations, for errors to occur.

¹¹ 92WGSI(OPS) 4-14, Search Procedures, Annex A.

- 2.3.4 The re-tasking details were passed verbally from AusSAR to RESCUE 251 via Melbourne FIS. The omission in this particular message of search altitude and adjacent search aircraft occurred at AusSAR but the potential existed for details to be changed or omitted both at Melbourne FIS and on the aircraft.
- 2.3.5 The re-tasking note format does not provide any defence against the omission of key information. In contrast, the pro-forma used to provide a fax briefing to crews prior to take-off is laid out with boxes for the key information. This format provides a defence against errors and omissions as the coordinator is prompted to fill any empty boxes and the receiver of the message is also alerted to the possibility of information being missed by seeing an empty box. A similar pro-forma system for in-flight re-tasking would improve the defences against error.

2.4 COMMUNICATIONS

- 2.4.1 The volume of radio broadcasts on the Melbourne FIS frequency was such that timely communication between crews was difficult to achieve. The task of relaying messages between aircraft and AusSAR was a contributing factor to this frequency congestion.
- 2.4.2 The reliance on telephone links between flight service and AusSAR adversely affected the efficiency of information transfer.
- 2.4.3 The less than ideal communication channels led to increased workload and the possibility of errors and/or omissions on search aircraft, at flight service and within AusSAR.

2.5 FATIGUE

- 2.5.1 Throughout their flight the crew of RESCUE 251 suffered from the effects of fatigue. The departure from Edinburgh occurred at approximately 0300, a natural low point in the body's circadian rhythm and by the time the incident occurred key members of the crew had been awake for over 24 hours. The Captain was aware of the high level of fatigue but elected to continue the search. The following factors may have contributed to this decision:
- a. It is very difficult for someone who is fatigued to accurately measure their own level of fatigue. They tend to underestimate its severity.
 - b. The desire to complete the tasking they had been assigned by 92WG and AusSAR.
 - c. The pressure to continue the search as the chances of sailors surviving in the water would be reducing rapidly with time.
- 2.5.2 Fatigue probably contributed to many of the errors and reduced performance by the crew, including the following:
- a. The failure of the crew to follow the 92WG SI(OPS) navigation procedures.

- b. The failure of the crew to realise the magnitude of the errors in the navigation system.
- c. The crew's failure to question the lack of detail in the second re-tasking message.

2.6 DEFENCES AGAINST FATIGUE

- 2.6.1 The best defence against fatigue is for the crew to be well rested prior to commencement of the flight. Since the crew were on call 24 hours a day they maintained a "normal" sleep routine, that is, from late evening to early / mid morning. As a result, when called out at 2300 local time they were already in a fatigued state. The guidelines for standby crews in the Flying Safety Manual attempt to minimise this problem by recommending that such crews have a 6 hour period every 24 hours when they are not on call. To obtain the best results from such a rest period, the break should be taken during normal sleeping hours. However, in order to maintain a 24 hour call out capability that incorporates such a rest period, at least two crews would have been required to be on standby. While there is no guarantee that the crewmembers rostered on overnight would modify their sleep routine, the provision of the opportunity to maintain an adequate rest pattern should be given.
- 2.6.2 92WG standing instructions would have allowed the crew to have slept during the night of 27 December and still have met the Wing requirement to respond within 12 hours of notification. If a crew was to be despatched shortly after notification and at a time where they were about to start a normal sleep pattern for 24 hour a day standby, then fatigue management practices should ensure adequate rest for that crew or the dispatch of an alternative crew.
- 2.6.3 Responsibility for monitoring the crew's fatigue level was given to RESCUE 251's captain. The planned duration of the flight was limited by fuel rather than crew fatigue. The authorising officer discussed the issue of fatigue with the captain but it was left up to the captain's discretion to shorten the flight if he considered the crew to be overly fatigued. While the captain must always have the right to shorten or modify tasking, it is also the responsibility of the tasking and authorising agencies to impose limits when and where required. Both agencies must be aware of the limitations of relying on fatigued personnel to make sound decisions. Where the crew commences a task in a fatigued state the tasking and authorising agencies should place prudent limits on the operation of the aircraft. No extra limits were placed on RESCUE 251 in terms of operating procedures or sortie duration. To task a fatigued officer with the responsibility to assess fatigue, on a subjective basis, is likely to result in a flawed decision.

2.7 SITUATIONAL AWARENESS

- 2.7.1 The crew of RESCUE 251 had a low level of situational awareness, particularly regarding their role in the larger SAR effort and the disposition of other aircraft in their vicinity. The following factors contributed to this lack of awareness:

- a. The crew's high level of fatigue.
- b. The in-flight changes in tasking from command and control / radar search to visual search with limited detail or explanation from AusSAR.
- c. The omission of other aircraft in RESCUE 251's vicinity in the second re-tasking message.
- d. The lack of information on the level of navigational accuracy required by AusSAR for the search.
- e. The inability of the Magellan GPS to provide positional information during the search due to its improvised antennae.
- f. The failure of the crew to regularly fix the aircraft's position.
- g. The non-detection of VH-PEH's transponder.

The lack of situational awareness resulted in the captain believing that the second search area was really an extension of the initial visual search, and the crew failing to realise that this second search area was part of a wider search involving other aircraft. While the crew of RESCUE 251 was aware of other aircraft involved in the SAR, they were unaware that any were operating in their immediate vicinity.

3 CONCLUSION

3.1 FINDINGS

1. At approximately 0900 on 28 December 1998, RESCUE 251 and VH-PEH were on reciprocal tracks with little horizontal or vertical separation.
2. An off duty crew member of RESCUE 251 visually sighted the lights of VH-PEH and avoiding action was taken by the crew of RESCUE 251.

3.1.1 VH-PEH

1. VH-PEH was conducting a search tasked by AusSAR as part of the Sydney/Hobart yacht race SAR.
2. VH-PEH utilised a TSO C-129 certified GPS to provide navigation information during the search.
3. VH-PEH was in its assigned search area at its assigned search altitude at the time of the incident.

4. The crew of VH-PEH were aware that RESCUE 251 was tasked to search to the south of VH-PEH's search area but believed RESCUE 251 would be searching at an altitude of 500ft.

3.1.2 RESCUE 251

1. RESCUE 251 was initially tasked by 92WG following a request by AusSAR to provide radar search and command and control functions in support of the Sydney/Hobart yacht race SAR.
2. On entering the search area, RESCUE 251 was re-tasked to conduct a visual trackline search at 1,000ft for the missing yacht "Winston Churchill".
3. Following the completion of the trackline search, RESCUE 251 was re-tasked for a second time and asked to conduct a visual search of the area from 36°35'S to 36°45's from the coast to 152°00'E. This search area was adjacent to VH-PEH's search area.
4. RESCUE 251 was not equipped with navigation equipment capable of providing the precise navigation required by the AusSAR search plan.
5. The re-tasking process of RESCUE 251 for the second visual search did not provide the crew with the reason for the search, information about other aircraft in the vicinity or a search altitude to be maintained.
6. The crew had no standard format with which to compare the re-tasking instructions and did not query the lack of content of the re-tasking message.
7. During the second search, RESCUE 251's navigation system was in error. The exact size of the error could not be determined but was sufficient to position RESCUE 251 in VH-PEH's search area.
8. The crew of RESCUE 251 did not adequately monitor and log the accuracy of the aircraft's navigation system as required by 92WG SI (Ops).
9. Prior to the incident, the crew of RESCUE 251 was aware that other aircraft were participating in the SAR but was unaware that any other aircraft were operating in their immediate vicinity.

3.1.3 AusSAR

1. The AusSAR search plan for the missing yacht "Winston Churchill" was designed to search the greatest area in the shortest period of time while minimising gaps in the search area.
2. The search plan provided a basic safety buffer by assigning adjacent aircraft 500ft vertical separation.

3. There was no requirement for the provision of a separation standard between search aircraft.
4. The search plan required aircraft to remain in their assigned search area. The navigational accuracy required relied on the use of GPS navigation equipment.
5. AusSAR staff had insufficient knowledge of the navigational performance of the Orion aircraft.
6. AusSAR had not informed the crew of RESCUE 251 of the required navigational accuracy for the search task.
7. AusSAR initially requested RESCUE 251 be tasked to provide radar search and command and control of other search assets.
8. Once RESCUE 251 was in the search area, it was re-tasked twice to conduct visual searches for the missing yacht "Winston Churchill".
9. When RESCUE 251 was re-tasked for the second time, the SAR Coordinators were under a very high workload and, in some cases, fatigued.
10. The second re-tasking of RESCUE 251 did not include details of a revised search altitude, search aim, or details of other aircraft in the vicinity of RESCUE 251.
11. The lack of a pro-forma for the in-flight re-tasking of SAR aircraft reduced the probability of AusSAR staff detecting the omissions in the second re-tasking of RESCUE 251.
12. The lack of a standard format for the in-flight re-tasking of SAR aircraft meant that there was no easy means for the crew of RESCUE 251 or Melbourne FIS to check that they had received the full tasking details.

3.1.4 Melbourne Flight Service

1. Since search aircraft were operating VFR, Melbourne FIS lacked the information to provide a Directed Traffic Information service, nor were they required to provide one.
2. Even if Melbourne FIS possessed the required information to provide directed traffic information, they lacked the resources and facilities to do so.
3. The volume of radio transmissions on Melbourne FIS frequencies made it difficult for messages to be passed in a timely manner and made it difficult to ensure accuracy.
4. Melbourne FIS correctly relayed the information contained in the AusSAR telephone message, re-tasking RESCUE 251 for the second visual search, to RESCUE 251.

3.1.5 Australian Defence Force

1. The Australian Defence Force had not informed AusSAR of the capabilities and limitations of the Orion aircraft in respect to search and rescue operations.

3.1.6 92 Wing Procedures

1. In the week leading up to incident flight, 92WG elected to maintain one crew on standby at home.
2. 92WG standby arrangements were not in accordance with the guidelines laid down in DI (AF) OPS 6-6 or the ADF Flying Safety Manual, specifically in that they did not provide a six hour period each day when a standby crew is protected from callout.
3. When 92WG tasked the crew of RESCUE 251 it was left to the judgement of the aircraft captain to determine when and if the sortie should be terminated due to crew fatigue.
4. The 10SQN authorising officer for the flight relied on the judgement of the aircraft captain to determine when and if the sortie should be terminated due to crew fatigue.

3.2 SIGNIFICANT FACTORS

1. The crew of RESCUE 251 was highly fatigued.
2. AusSAR staff, at the time of the second re-tasking of RESCUE 251, were both busy and fatigued.
3. 92WG standby and tasking procedures did not ensure that an adequately rested crew was despatched.
4. AusSAR SAR coordinators were unfamiliar with the navigation limitations of the Orion aircraft.
5. The search plan developed by AusSAR required very accurate navigation, beyond the capability of the Orion's navigational systems.
6. When AusSAR re-tasked RESCUE 251 for the second time, there was a failure to pass details of a revised search altitude and other aircraft operating in RESCUE 251's vicinity.
7. The lack of a standard format for the in-flight re-tasking of SAR aircraft made it difficult for the crew of RESCUE 251 and Melbourne FIS to check that they had received all pertinent details.

8. The crew of RESCUE 251 lacked situational awareness of their role in the search plan and of other aircraft operating in their vicinity.
9. The crew of RESCUE 251 did not adequately monitor the navigation system errors that developed during the search.

4 SAFETY ACTION

4.1 LOCAL SAFETY ACTION

1. The RAAF have commenced trials of a sextant mounted GPS antenna in an Orion aircraft.
2. The RAAF and AusSAR have instigated meetings to discuss the standard of operational capabilities and limitations of the Orion aircraft.
3. The RAAF's Project Air 5276 will provide the Orion fleet with an upgraded navigational capability that will meet the required accuracy.
4. AusSAR have commenced a review of tasking documentation and information provided to crews.

4.2 RECOMMENDATIONS

As a result of the investigation, the Directorate of Flying Safety-ADF and the Australian Transport Safety Bureau (formerly the Bureau of Air Safety Investigation) recommend that:

R19990164

AusSAR improve the knowledge of AusSAR staff in respect to the capabilities and limitations of resources that may be required to conduct search and rescue tasks.

R19990165

The Australian Defence Force (ADF) provide AusSAR with sufficient information to ensure that AusSAR staff understand the capabilities and limitations of ADF resources utilised for search and rescue tasks.

R19990166

AusSAR develop a standard format for the in-flight re-tasking of search and rescue aircraft and ensure that all personnel involved in search and rescue operations are familiar with that format.

R19990167

No. 92 Wing Royal Australian Air Force review its flight crew standby arrangements to improve compliance with the guidelines in Defence Instructions (AF) OPS 6-6 and the ADF Flying Safety Manual.

R19990168

Maritime Patrol Group investigate means of improving Orion aircraft navigational accuracy and reliability, particularly in regard to the global positioning system (GPS), pending the implementation of Project Air 5276.

R19990169

AusSAR, in conjunction with the Australian Defence Force and Airservices Australia, investigate methods of improving communication links for search and rescue operations.

R19990170

Airservices Australia, in conjunction with the Australian Defence Force and AusSAR, investigate methods of improving communication links for search and rescue operations.

R19990171

The Australian Defence Force, in conjunction with Airservices Australia and AusSAR, investigate methods of improving communication links for search and rescue operations.

R19990200

The Civil Aviation Safety Authority, in conjunction with AusSAR and Airservices Australia, determine appropriate separation standards for the safe operation of aircraft involved in search and rescue operations.

R19990201

AusSAR, in conjunction with the Civil Aviation Safety Authority and Airservices Australia, develop appropriate separation standards for the safe operation of aircraft involved in search and rescue operations.

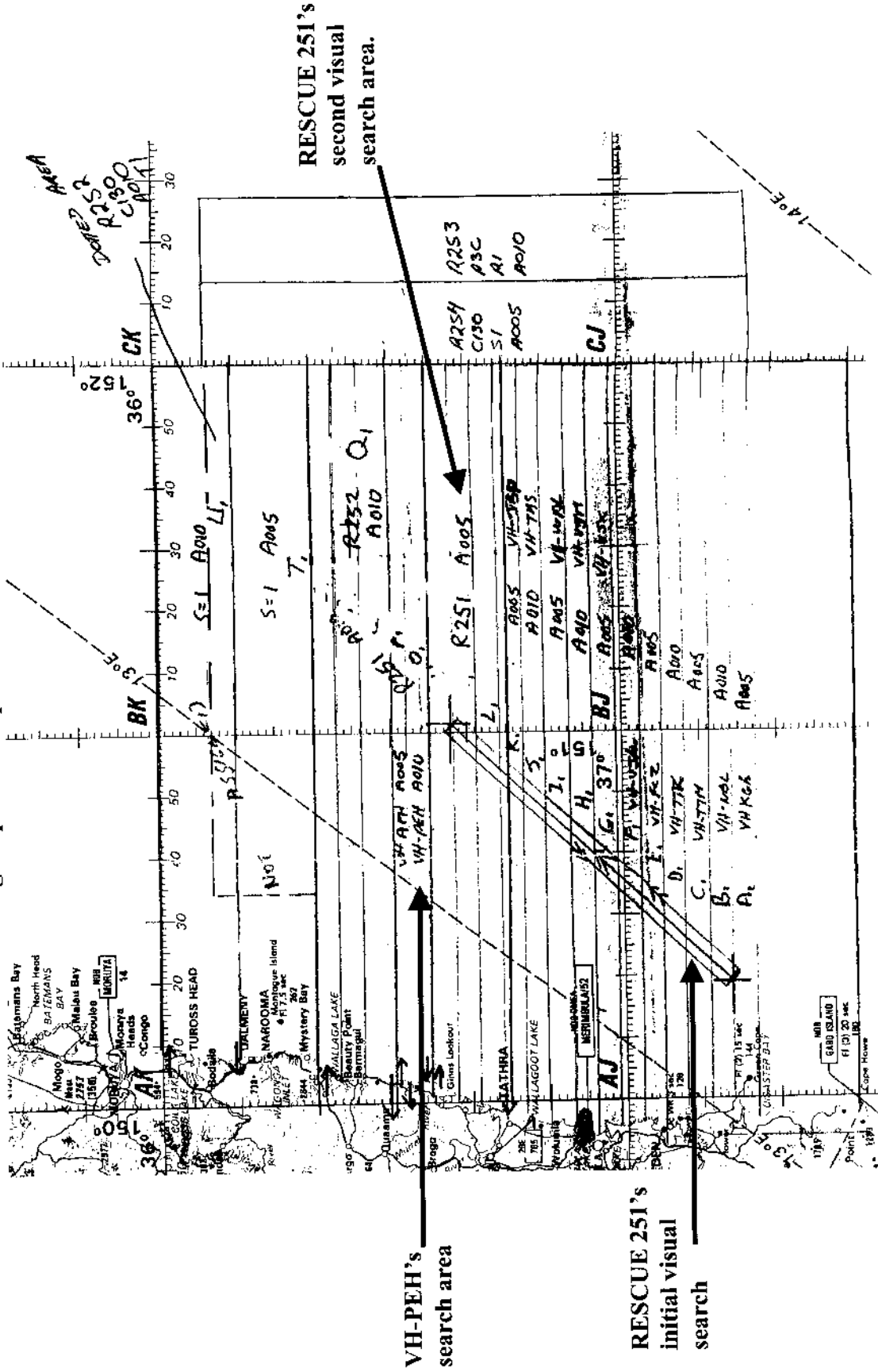
R19990202

Airservices Australia, in conjunction with the Civil Aviation Safety Authority and AusSAR, develop appropriate separation standards for the safe operation of aircraft involved in search and rescue operations.

ANNEXES

- A. AusSAR Planning Map – Search plan for the ‘Winston Churchill’ 28 Dec 98.
- B. VH-PEH’s Search Briefing Sheet.
- C. AusSAR Note of the Re-tasking of RESCUE 251 for the Second Visual Search.

AusSAR Planning Map - Search plan for the 'Winston Churchill' 28 Dec 98.



RESQ 251's second visual search area.

VH-PEH's search area

RESQ 251's initial visual search

VH-PEH's Search Briefing Sheet


AUSTRALIAN SEARCH AND RESCUE
RESCUE COORDINATION CENTRE

Page 1 of 2 pages

Date 28-Dec-98

REF No. AUS/98/

Ph 1800 815257

Fax 1800 622153

SEARCH BRIEFING

Briefing For:	VH-PEH (Aircraft Callsign)	C402 (Aircraft Type)	Search Type/Task	Visual
Departure Aerodrome	YMRV		Special Equip.	GPS, Servicable Comms.
Required ETD	ASAP		Crew/Observers	1+3

SUBMIT FULL REPORTING PLAN & MAINTAIN A CONTINUOUS LISTENING WATCH

SEARCH DESCRIPTION:	DATE OF THIS SORTIE:	27/12/98	SORTIE No.	1	
Area Designator	O1	Search Height	1000 FT AMSL	Track Spacing	S=1 NM

SEE ATTACHED COORDINATES.

Search Pattern	Parallel Search	Search TAS	120 KT	Separation in Area	VISUAL
Entry Point	36 32S/152 00E	First Track	077°M	Distance	94NM
End of Leg One	36 32S/150 03E	Direction of Creep	167°M	Number of Legs	3
Exit Point	36 35S/152 00E	Advise RCC 30 min prior to ETD Search Area			
Adjacent Aircraft	VH-APH P68 @ 500' TO SOUTH/ R521 P3 @ 500' TO NORTH				

NOTES:

- Operate with landing lights on.
- Read this sheet in conjunction with maps and other documentation.
- Monitor 121.5 / 243 MHZ for distress signals.
- Record any areas not searched.

AusSAR Note of the Re-tasking of RESCUE 251 for the Second Visual Search



Rescue Coordination Centre, Australia

Aus / 98 /

Time: 1948 UTC	Message taken by: <i>CK</i>
From/ To: <i>R251</i>	Authority/Company:
Phone No: <i>VIA ML FS</i>	Fax No:

1/2 S OFF

<i>A = 36 35 S</i>	<i>B = 36 35 S</i>
<i>150 03 E</i>	<i>152 00 E</i>
<i>C = 36 45 S</i>	<i>D = 36 45 S</i>
<i>152 00 E</i>	<i>149 59 E</i>

TO N PEH A A.010

T S TBA @ A.010

S = 1 ²⁰⁰/₁₅₀ KTS

10 LBS

Logged