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DESPATCHED
COMAUSNAVAIR

Dear Mr van Kretschmar

1998 SYDNEY HOBART RACE REVIEW COMMITTEE MAY 1999 REPORT

1. I write to you about this subject because I am accountable for the performance - including safety, of RAN aircraft including the Sea King and Seahawk helicopters that took part in MARSAR operation which occurred during the 1998 Sydney Hobart Yacht race.

2. Having read the CYC Review Committee's report I am concerned that the risk rescue helicopters were exposed to during the MARSAR does not appear to have been quantified nor have all potentially effective risk mitigating measures been identified in the Recommendation section of the Committee's report.

3. The terms of Reference for the review of the 1998 Sydney Hobart Yacht Race (SHYR) were not promulgated with the report arising from it. It is therefore not practicable to know precisely what the CYC's objectives are with regard to the review of the SHYR but the Foreword of the report states that the recommendations identified by the Committee would, if they were implemented, improve the safety of competitors. The Foreword goes on to say that it would be 'unreasonable' to believe that any changes could ensure the ultimate safety of every participant. I am not a yachtsman but from my knowledge of SAR and sea survival I assess that if both the 'compulsory' and 'recommended' improvements promulgated in the Recommendations section of the report were implemented general safety of the race would be substantially improved well beyond that level that would be achieved by implementing merely the 'compulsory' changes. But I propose that safety would not however be improved to the maximum extent practicable. At this point I have difficulty with understanding what level of safety CYC seeks to facilitate or impose but by segregating changes into the two categories of priority indicates (and perhaps I misunderstand) that there are other considerations influencing the required outcome.

4. At the outset I indicated that my concern was primarily about the helicopter rescue dimension of the SHYR and the risks borne by the aircraft involved. That is not to say that I am unconcerned by risks to the race competitors themselves - I am. Particularly so because, as was the case during the 1998 SHYR and has been implied by the Review Committee's report, when yachts find themselves in a distress situation, the rescue services including Naval helicopters are likely to be called. Therefore the safety of, in this case, the SHYR yachts and competitors has a direct relationship with the safety of and risk borne by the rescue services. It follows that if we can improve, to the maximum extent practicable, the safety of the competitors we probably have also achieved that outcome for the SAR services.

5. It is possible using the information contained in the Review Committee's Report and statistical data promulgated in marine and meteorological references (Appendix 1) to assess that future SHYR fleets will encounter similar conditions to those experienced in 1998. It is also possible to reasonably estimate in terms of boat damage, injury, and fatalities, what the consequences to the SHYR fleet might be. COMCARE (Australia)'s booklet OHS-BK-10, Identifying Hazards, Managing Risks (Appendix 2) offers guidance which indicates that the SHYR is a High Risk activity ie major injuries are 'likely' and even that given the recent history of the SHYR, fatalities are 'very likely'. The CYC has identified measures that would reduce the exposure and the consequence of hazards encountered during the SHYR but even if the compulsory <u>and</u> recommended improvements were made there would still, during future SHYR's, be yachts, designed primarily for racing with substantially unqualified (in a formal sense) crews probably heading into very bad weather. Even recreational aviation does not seem to have a comparable risk accepting regulatory framework applying to its activity.

6. From a helicopter rescue perspective I propose the following:

a. Formal and certified training in standardised rescue should be conducted for all competitors.

b. The dress standards for competitors should reflect the risk of exposure and hypothermia - I have included (Appendix 3) average air temperature, wind velocity chill factors and estimated survival times for the SHYR route. These illustrate that, although not covered in the Review Committee's report, hypothermia was likely to have been a contributing factor in a number of the fatalities experienced during the 1998 race.

c. Survival equipment should be optimised to provide an acceptable probability of survival <u>overnight</u>, as night rescue by helicopter is, I propose a very high risk activity indeed. Thermally protective clothing is available as are internationally accepted (eg US Coast Guard approved) liferafts which would probably offer a higher success rate than perhaps those liferafts used or procured by some of the competitors in the SHYR.

7. In summary I propose that:

a. The CYC Review Committee in its report has not assessed and sought to manage the hazards and risks of the SHYR to the maximum extent possible and to the level established by general best practice in the broader community.

b. The risks borne by rescue helicopters and the yacht persons they were rescuing were at times very great indeed and probably extreme during night rescues. By better management and mitigation of the hazards involved, less risk would be presented and favourable outcomes made more likely.

c. An acceptable, in terms of Risk Management, risk to SHYR competitors - and through them, the rescue services is unlikely to be achieved without formal, and rigorous assurance of the equipment, training, and competence standards of <u>all</u> competitors.

8. I emphasise that this should not be taken as criticism of the CYC or competitors of the SHYR. I am seeking to manage the risk factors applying to Naval helicopter crews by attempting to influence the hazards and risks of the SHYR. I am keen to continue that process if I can be of any assistance in this pursuit.

Yours sincerely

C.F.GEORGE AM
Captain
Commander Australian Aviation Force

Tel: (02) 4421 1349

12 July 1999

Appendices:

1. Meteorological Data from MHQ Directorate of Oceanography and Meteorology
2. COMCARE (Australia) Guide OHS-BK-10 : Identifying hazards, managing risks
3. Survival Data - Chill factors, estimated survival times.

Appendix 1

CLIMATOLOGICAL BRIEF

SYDNEY - HOBART

DATA

1. The data is obtained from two separate and independent sources. Wind and current roses come from the *US Navy Marine Climate Atlas of the World*. This data is produced using mainly ship data collected between 1854-1969 and averaged into one degree lat-long bins. The analysis of the data provides mean winds and currents by direction but does not provide percentile occurrence or exceedence. The averaging fails to indicate the magnitude or frequency of extreme events.

2. The exceedence data is sourced from the *Atlas of the Oceans: Wind and Wave Climate*. This CD-ROM was compiled by Ian Young of Adelaide University and Greg Holland of the Bureau of Meteorology and contains a global dataset of satellite derived wind and total wave height. Satellite data is preferred to in-situ observed data due to the strong bias towards benign conditions in local data as ships avoid heavy weather and extreme conditions. The satellite data is averaged over two degree lat-long bins but the statistical techniques used also fail to capture the full magnitude of extreme events.

3. The total wave height provided is a combined sea and swell and represents the significant wave height which is defined as the average height of the largest one-third of all waves. The maximum wave height is usually taken to be 1.8 times the significant height, so a 3m mean significant wave height implies the mean of the largest waves is 5.4 m. The apparent discrepancy between the sea states derived from wind speed and from the total wave height is due to the inclusion of swell data in the wave height. Hence, a section may have a mean wind of 15 knots, equivalent to sea state three and a combined significant wave height of 1.9 m which is sea state four. Determination of the swell component involves a root mean square calculation as follows.

$$Hs = \sqrt{Hc^2 - Hw^2}$$

where Hs is the swell wave height , Hc the combined wave height and Hw the wind wave height.

For example: A 15 knots wind is equivalent to a 1.2m sea and if the combined significant wave height is 1.9 m then the swell component is 1.47 m

3. The Australian Oceanographic Data Centre provided sea and air temperatures, the wind and current roses, wind speed and wave height. The exceedence data was processed by METOC Services by selecting five representative sections between Sydney and Hobart, with data extracted for wind and wave height for each section. The format of the data on the CD-ROM does not allow full along track statistics to be easily obtained. All data is for the month of December. January data would be similar.

KEYS

4. **Exceedence tables.** The percentage given is the number of observations that exceed the given figure. For example in Table 3, wind exceedence for 10% is 28kts - this means that only 10% of observations exceed 28kts. The 90% figure is 8kts ie 90% of observations exceed 8kts.

5. **Sea State.** Sea State is given in brackets for both wind and wave height. The Beaufort tables for each are provided below.

Sea State	Description	Height (m)
0	calm	0
1	rippled	0 - 0.1
2	smooth	0.1 - 0.5
3	slight	0.5 - 1.25
4	moderate	1.25 - 2.5
5	rough	2.4 - 4.0
6	very rough	4.0 - 6.0
7	high	6.0 - 9.0
8	very high	9.0 - 14.0
9	phenomenal	> 14

Table 1: Beaufort Sea State

Sea State	Description	Speed	Outlook
0	Calm	< 1kt	calm
0	Light air	1-3 kt	light
1	Light breeze	4-6 kt	light
2	Gentle breeze	7-10 kt	light
3	Mod. breeze	11-16 kt	mod
4	Fresh breeze	17-21 kt	fresh
5	Strong breeze	22-27 kt	strong
6	Near gale	28-33 kt	near gale
7	Gale	34-40kt	gale
8	Strong gale	41-47 kt	severe gale
9	Storm	48-55 kt	storm
9	Violent storm	56-63 kt	
9	Hurricane	>/= 64 kt	

Table 2: Beaufort Wind Speed

6. **Wind Roses.** On the wind roses, wind is shown as the direction it is coming from. Each dot represents a 5% occurrence by direction, and a full barb represents 10kts, a half barb 5kts of speed. For example, the wind rose for square 37-38S 150-151E shows 25% of winds come from the south with a mean speed from the south of 15kts. The number at the centre of the rose is the mean speed for the month from all directions.

7. **Current Roses.** Current is shown as the direction flowing to. Each dot represents 5%. Each full barb represents 0.2kt, a half barb 0.1kt and a flag (or diamond shape) represents 1kt. The number on the vector indicates frequency of current. For example, the current rose for square 36-37S 150-151E shows 20% of observations flow to the South with a mean strength of 0.3kt; 20% of observations flow to the south west with a mean speed 0.8kt; 20% of observations flow to the East with mean speed 0.5kt; and 40% of observations flow to the north east with mean speed 1.5kt.

d. **Section:** 39.31S 150.44E to 41.26S 149.4E

	Wind Exceedence (kts)		Wave Height (m)	
90%	7.5	ss2	1.25	ss 3-4
80%	10	ss2-3	1.4	ss 4
70%	12.5	ss3	1.6	ss 4
60%	14	ss3	1.8	ss 4
50%	16	ss3-4	1.9	ss 4
40%	18	ss4	2.1	ss 4
30%	21	ss4-5	2.35	ss 4
20%	24.5	ss5	2.7	ss 5
10%	28	ss6	3.3	ss 5

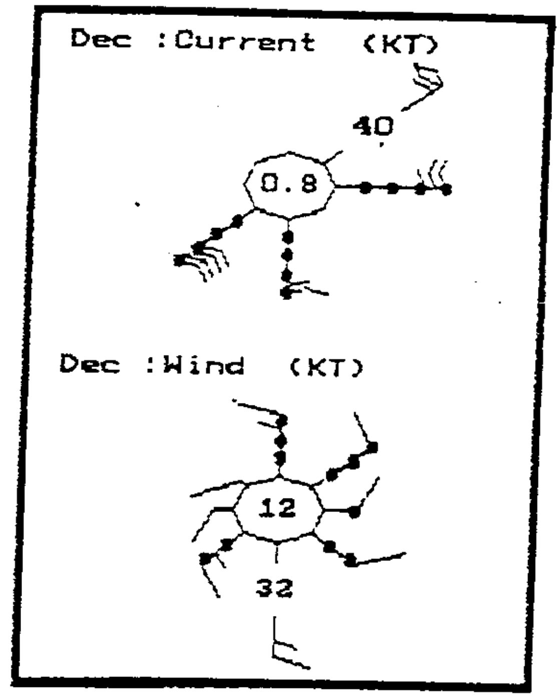
Mean Wind Speed 16 kts Mean wave height 1.9 m

e. **Section:** 41.26S 149.4E to 43.36S 148.28E

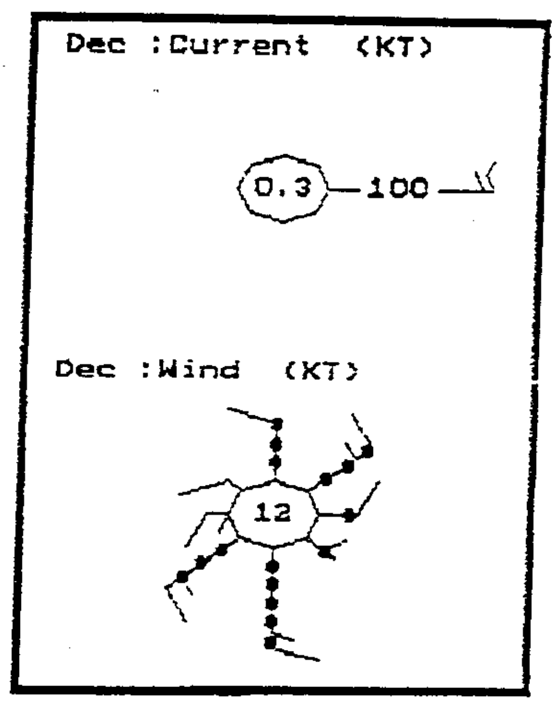
	Wind Exceedence (kts)		Wave Height (m)	
90%	8	ss2	1.6	ss 4
80%	10	ss2-3	1.8	ss 4
70%	13	ss3	2.0	ss 4
60%	14	ss3	2.2	ss 4
50%	16	ss3-4	2.4	ss 4-5
40%	18	ss4	2.6	ss 5
30%	21	ss4-5	2.7	ss 5
20%	24	ss5	3.1	ss 5
10%	28	ss6	3.7	ss 5

Mean Wind Speed 16 kts Mean wave height 2.4 m

Wind and current roses for chart square
36 - 37°S, 150 -151°E



Wind and current roses for chart square
37 - 38°S, 150 -151°E



8. Exceedence Statistics.

a. Section: 34.83S 151.56E to 36.15E 151.07E

	Wind Exceedence (kts)		Wave Height (m)	
90%	6	ss1	1.2	ss 3-4
80%	9	ss2	1.4	ss 4
70%	11.5	ss2-3	1.55	ss 4
60%	13.5	ss3	1.7	ss 4
50%	15	ss3	1.9	ss 4
40%	17	ss4	2.1	ss 4
30%	20	ss4	2.3	ss 4
20%	24	ss5	2.5	ss 4-5
10%	28.5	ss6	3.2	ss 5

Mean Wind Speed 15 kts Mean wave height 1.9 m

b. Section: 36.15E 151.07E to 37.46S 151.07E

	Wind Exceedence (kts)		Wave Height (m)	
90%	6	ss1	1.2	ss 3-4
80%	9	ss2	1.4	ss 4
70%	11.5	ss2-3	1.55	ss 4
60%	13	ss3	1.7	ss 4
50%	15	ss3	1.9	ss 4
40%	17	ss4	2.0	ss 4
30%	20	ss4	2.3	ss 4
20%	23.5	ss5	2.5	ss 4-5
10%	28	ss6	3.2	ss 5

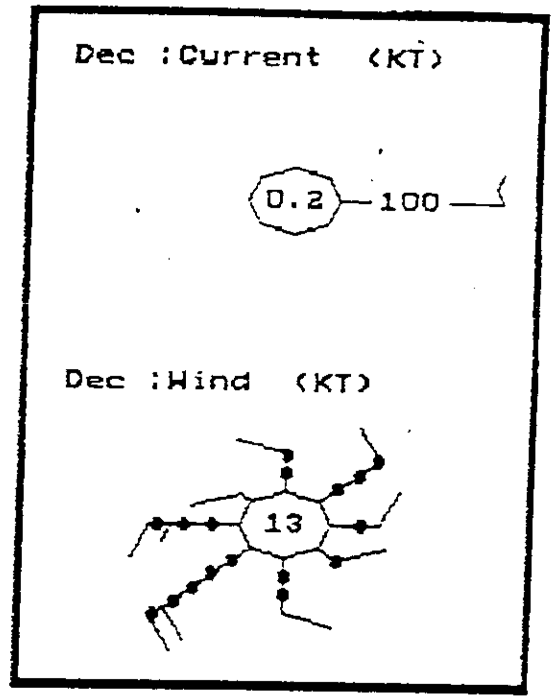
Mean Wind Speed 15 kts Mean wave height 1.9 m

c. Section: 37.46S 151.07E to 39.31S 150.44E

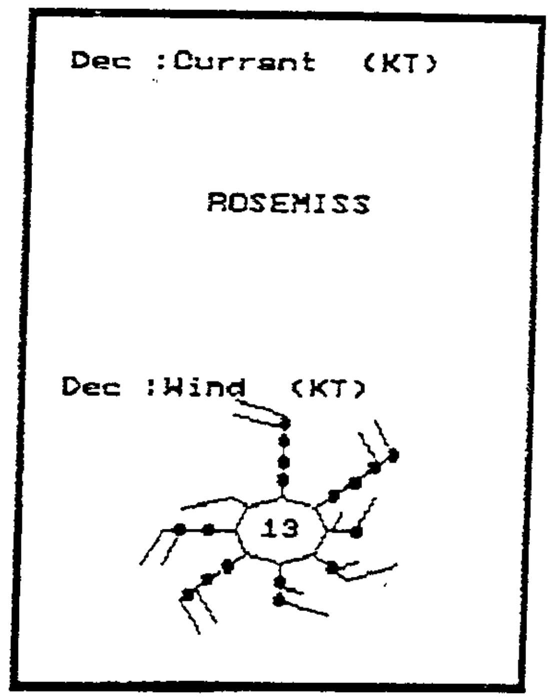
	Wind Exceedence (kts)		Wave Height (m)	
90%	7	ss1-2	1.3	ss 3-4
80%	10	ss2-3	1.4	ss 4
70%	12	ss3	1.6	ss 4
60%	14	ss3	1.8	ss 4
50%	15.5	ss3	1.9	ss 4
40%	17	ss4	2.1	ss 4
30%	21	ss4-5	2.3	ss 4
20%	25	ss5	2.7	ss 5
10%	28	ss6	3.3	ss 5

Mean Wind Speed 15.5 kts Mean wave height 1.9 m

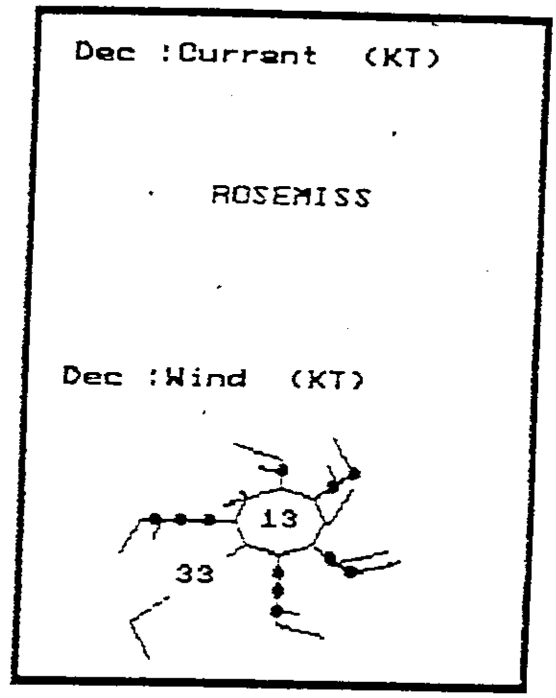
Wind and current roses for chart square
38 - 39°S, 149 -150°E



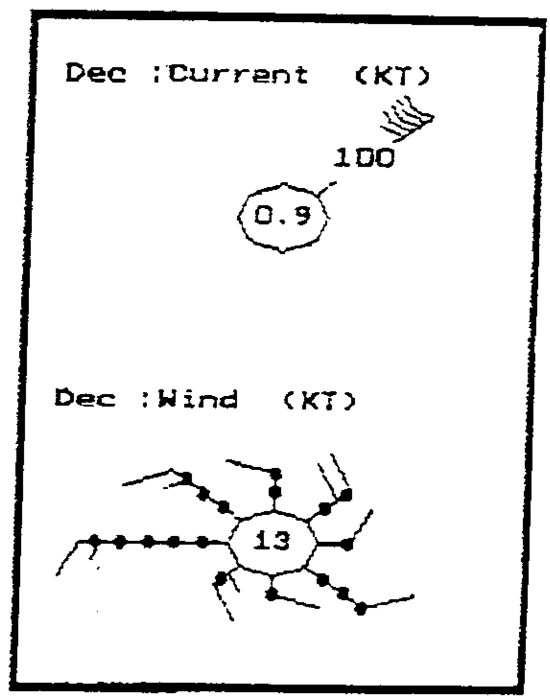
Wind and current roses for chart square
38 - 39°S, 150 -151°E



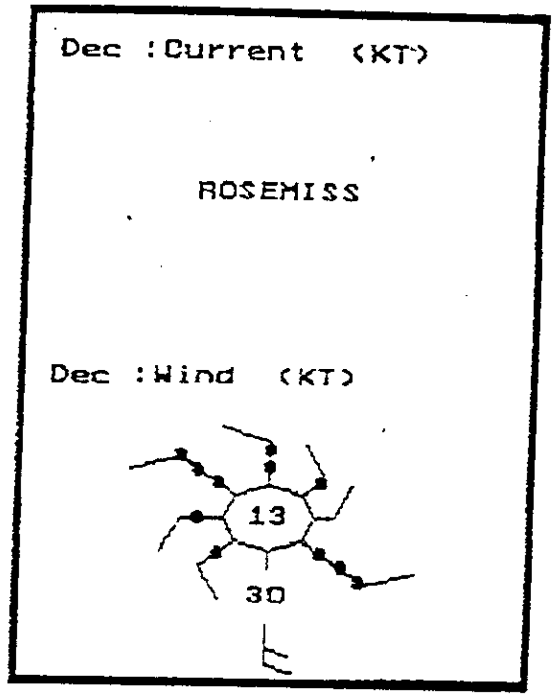
Wind and current roses for chart square
39 - 40°S, 149 -150°E

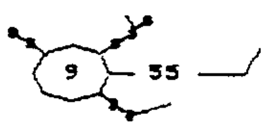


Wind and current roses for chart square
40 - 41°S, 149 -150°E



Wind and current roses for chart square
41 - 42°S, 148 - 149°E

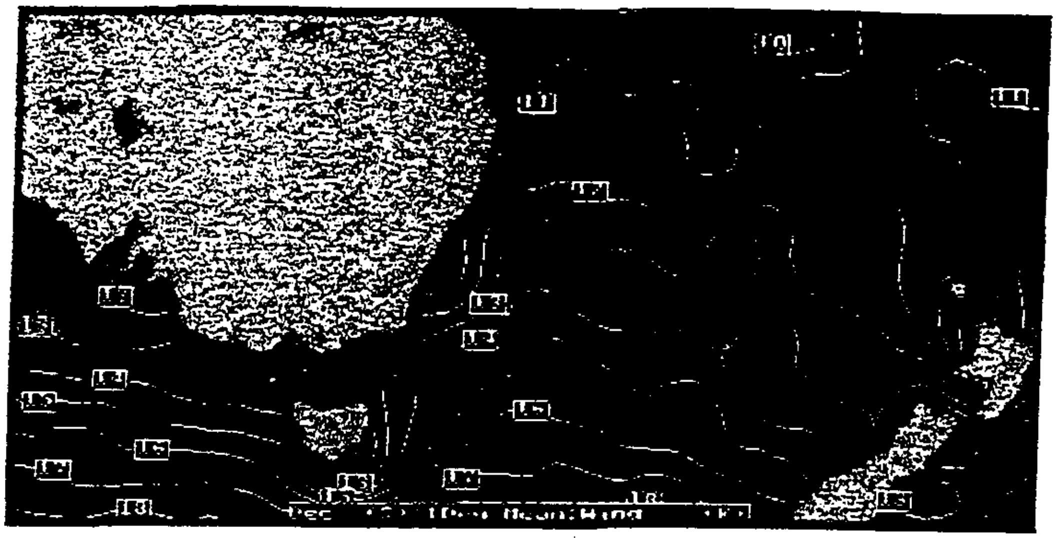




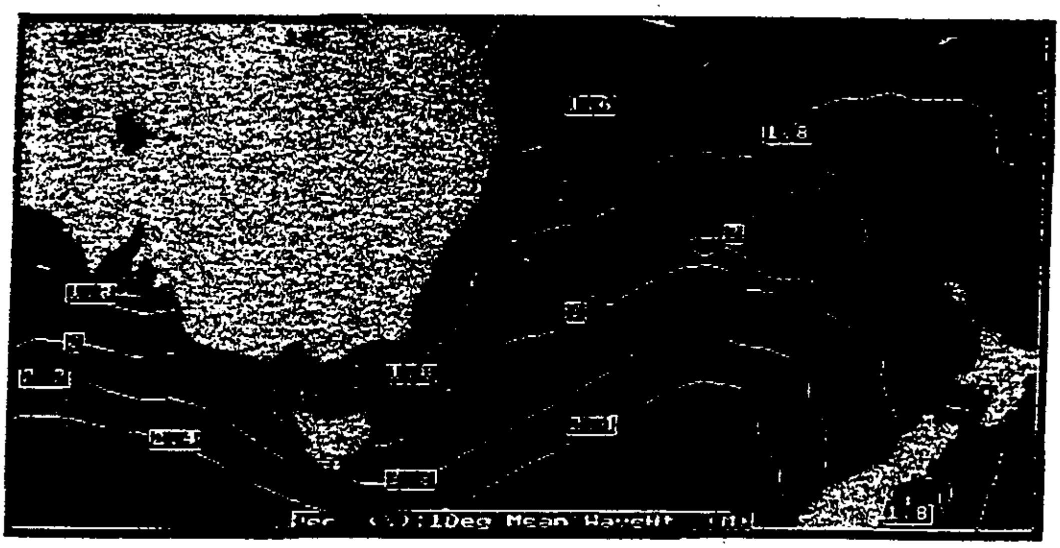
Explanation of Wind Rose

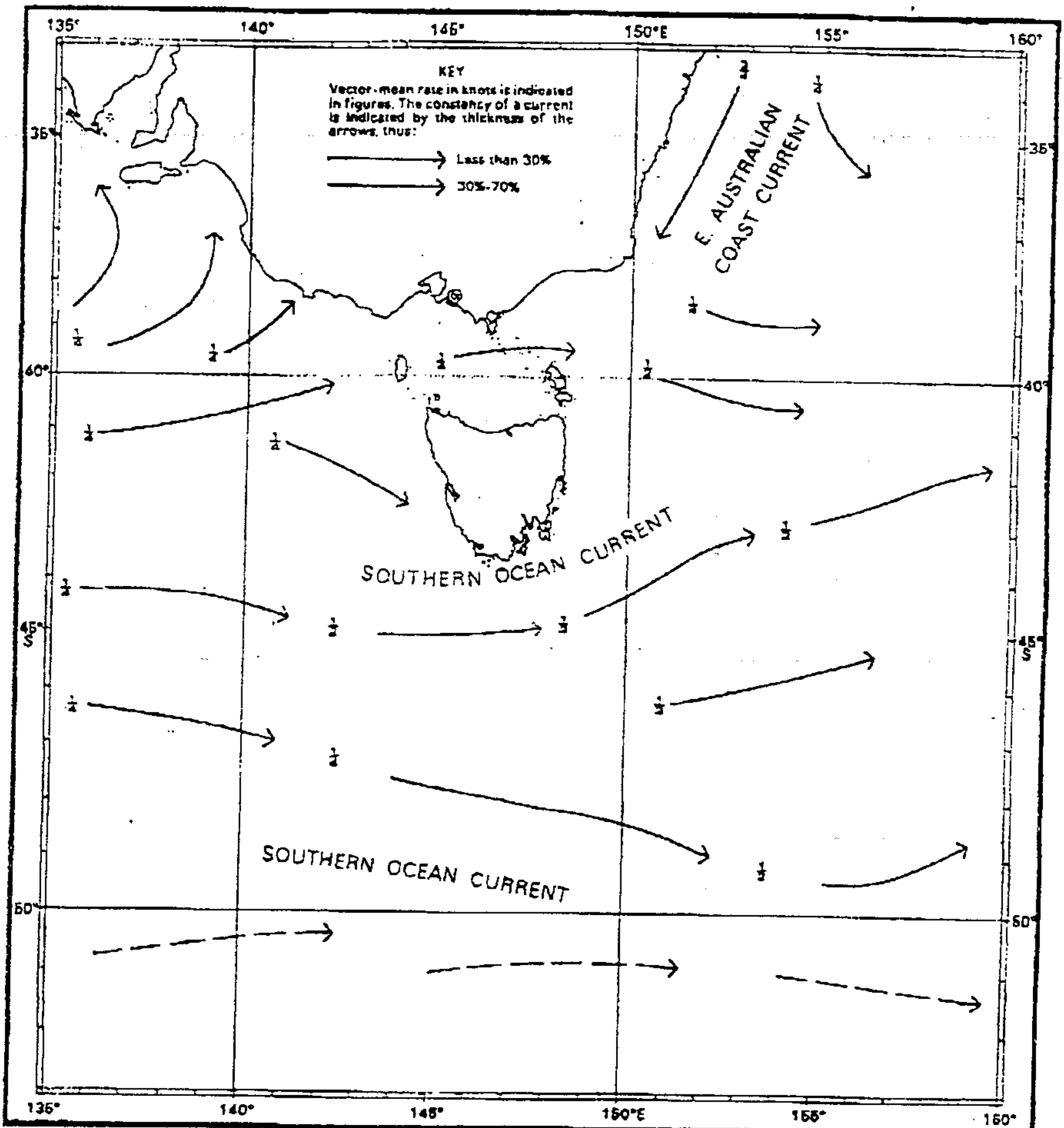
Wind blows from a compass point
Dots on each wind vector indicate 5% frequency increments
Half barb on vector = 5 kts, Full barb = 10 kts
Number in centre of rose shows mean windspeed in knots for month
Number on vector indicates frequency of wind (55% in this case)

Mean windspeeds (knots) in the Tasman Sea for December are shown below.



Mean significant waveheights (metres) in the Tasman Sea for December are shown below.





(1.66.2) Vector-mean currents — DECEMBER to FEBRUARY (Southern Summer)

Southern Ocean Currents (1.66). Strong streams may, however, be experienced close inshore off headlands and at harbour entrances, notably at the entrance to Port Phillip and Westernport; details of these are contained in the relevant portions of the book.

SEA AND SWELL

1.69

Over the vast expanse of ocean to the W of the limits of this volume the prevailing winds from between S and NW blow strongly quite often and bring rough seas and spells of moderate to heavy swell to these waters. Conditions are especially rough at times in Bass Strait, assisted by funnelling of the wind through this Strait.

Any depressions in the area can generate substantial sea disturbance. In winter months, June through September, rough seas can persist for several days at a time. To the S of 40° S there is increasing frequency of confused swell around the centres of the main E moving depressions.

The intense tropical cyclones experienced in more N latitudes lose much of their vigour when moving S of 30° S. However any of these weakened tropical storms, approaching the S coast of Victoria or Tasmania from the W, or moving S to SE to the E of New South Wales, can cause high seas and considerable swell some distance in advance of their centres. Heavy seas are also found near frontal troughs and depressions moving E or ENE over the Tasman Sea.

The frequency for heavy swell may be of the order 15–20% in summer and in excess of 30% in winter and spring.

Swell from the sector between S and WSW is more frequent than from other sectors, especially in the Bass Strait; about 50 to 70% of occasions with swell of 2 m or higher is attributable to swell from this sector.

SEA SURFACE TEMPERATURE

1.70

Diagrams 1.70.1 to 1.70.4 give the average sea surface temperature distribution for February, May, August and November. The highest temperatures occur in February and March and the lowest in August and September. The isotherms lie very roughly W to E; a marked ridge in the isotherms some 150 miles off the E coasts shows the presence of the warm S-going current flowing parallel with the New South Wales coastline. Within this current temperatures are 1° to 2°C higher than in the same latitude near the coast.

On most occasions (about 90%) the actual sea temperatures are within 3°C of the appropriate monthly average. Prolonged S winds result in subnormal temperatures and sustained N winds in above normal temperatures.

Mean temperatures of the sea surface are usually slightly higher than those of the over-lying air: this difference is around 0·5°C in most months. In May, June and July, however, greater differences occur, especially NE of Cape Howe where they may be more than 2°C.

CLIMATE AND WEATHER

General remarks

1.71

Information under this heading should be studied in conjunction with that contained in *The Mariner's Handbook*.

Routine weather reports and forecasts are broadcast by specified shore stations, which also issue warnings of hazardous weather (see *Admiralty List of Radio Signals*).

The climate over this area ranges from the mainly fine, warm subtropical climate of the more N parts in summer to the cooler and highly changeable conditions experienced in the S in winter associated with boisterous W winds ("The Roaring Forties") of the temperate zone of the S hemisphere. In summer when these W winds are less strong even the more S parts enjoy spells of fair anticyclonic weather.

The largest range of temperature occurs on the mainland S coast from near 40°C in places in summer (January, February) to around 0°C on cold winter nights in July.

Rainfall on these coasts is adequate for a wide range of agriculture and is reasonably reliable in occurrence. Sea fog is infrequent and any land fog affecting ports and harbours is only moderately frequent and is usually shortlived.

Gales, force 8 and above, are rather frequent off the more S coasts of the mainland and around the coasts of Tasmania, but the frequency falls off NE-wards. The bad weather is usually associated with the frontal systems of E-moving lows.

Tropical storms can on infrequent occasions move near the extreme NE of these waters, travelling on SE to SW tracks. On rarer occasions they can penetrate into the area but as they move and accelerate away SE or S they usually lose much of their vigour and degenerate into middle latitude depressions with associated fronts.

Pressure

1.72

Diagrams 1.72.1 and 1.72.2 give the average barometric pressure distribution for January and July.

The sub-tropical high pressure belt is a feature on all the average monthly pressure charts and marks the region then affected by the almost continuous procession of E-moving anticyclones separated by troughs of low pressure or shallow depressions. This high pressure belt is one of the controlling influences on weather and climate: its axis shifts seasonally some 10 degrees of latitude from its most S limit (around 38° S) at the end of January and in February to its N limit, of about 28° S, in August. Consequently this feature affects some part of the region, whatever the season. The axis of the belt lies roughly W to E and the central pressure fluctuates also with the season, being lowest around 1013 mb in January and February and highest 1020 mb or more from May through August.

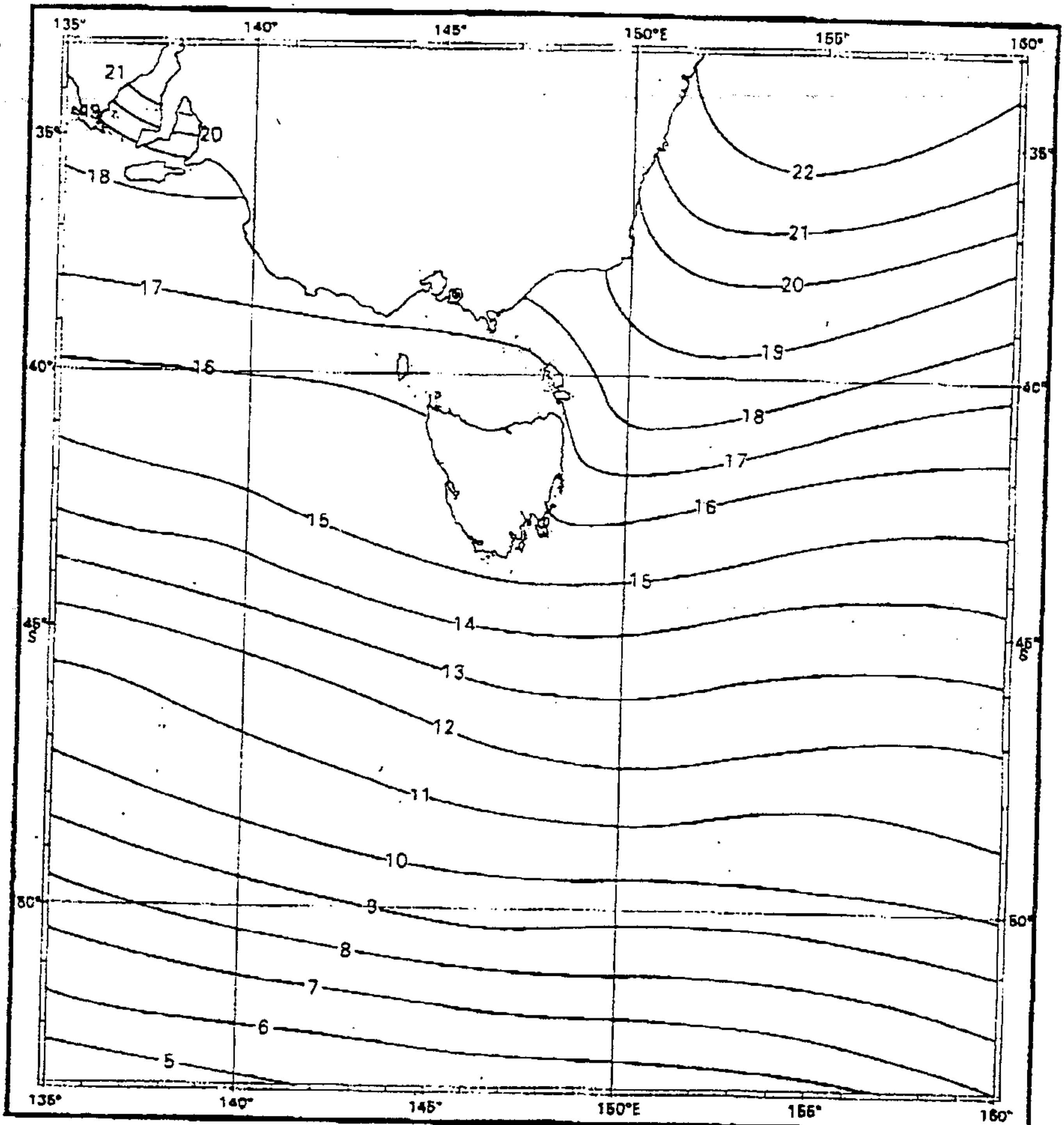
To the S of the high pressure belt the pressure gradient increases progressively S. The corresponding fresh winds form part of the wind system known as the "**Roaring Forties**". As the high pressure belt retreats N in winter so these W winds extend N to affect most of these coasts for a time, but they retreat S again with the approach of summer.

Winds

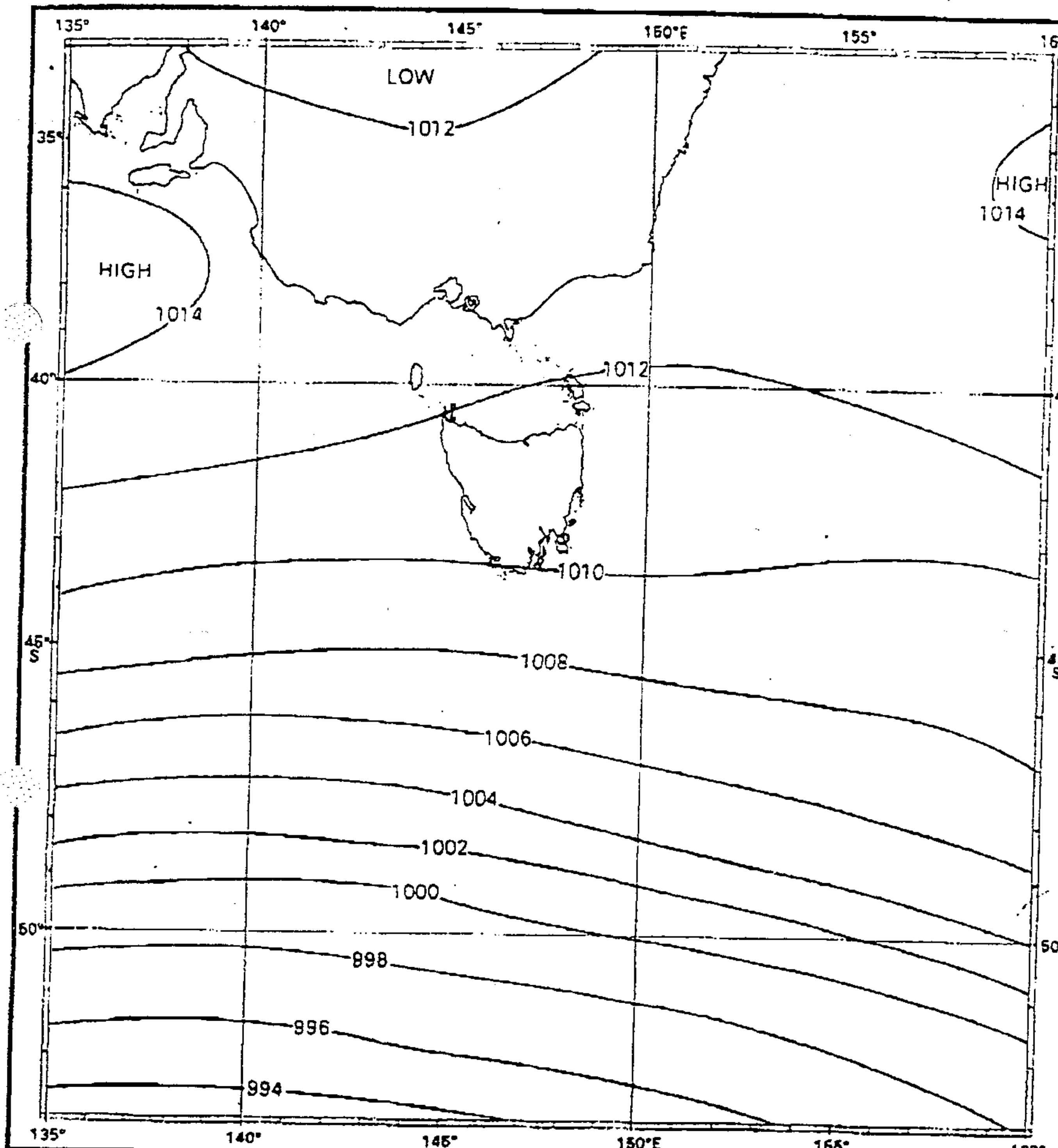
1.73

The frequency distribution of wind force and direction at sea for January, April, July and October are shown in diagrams 1.73.1 to 1.73.4 by wind roses, based on ship observations.

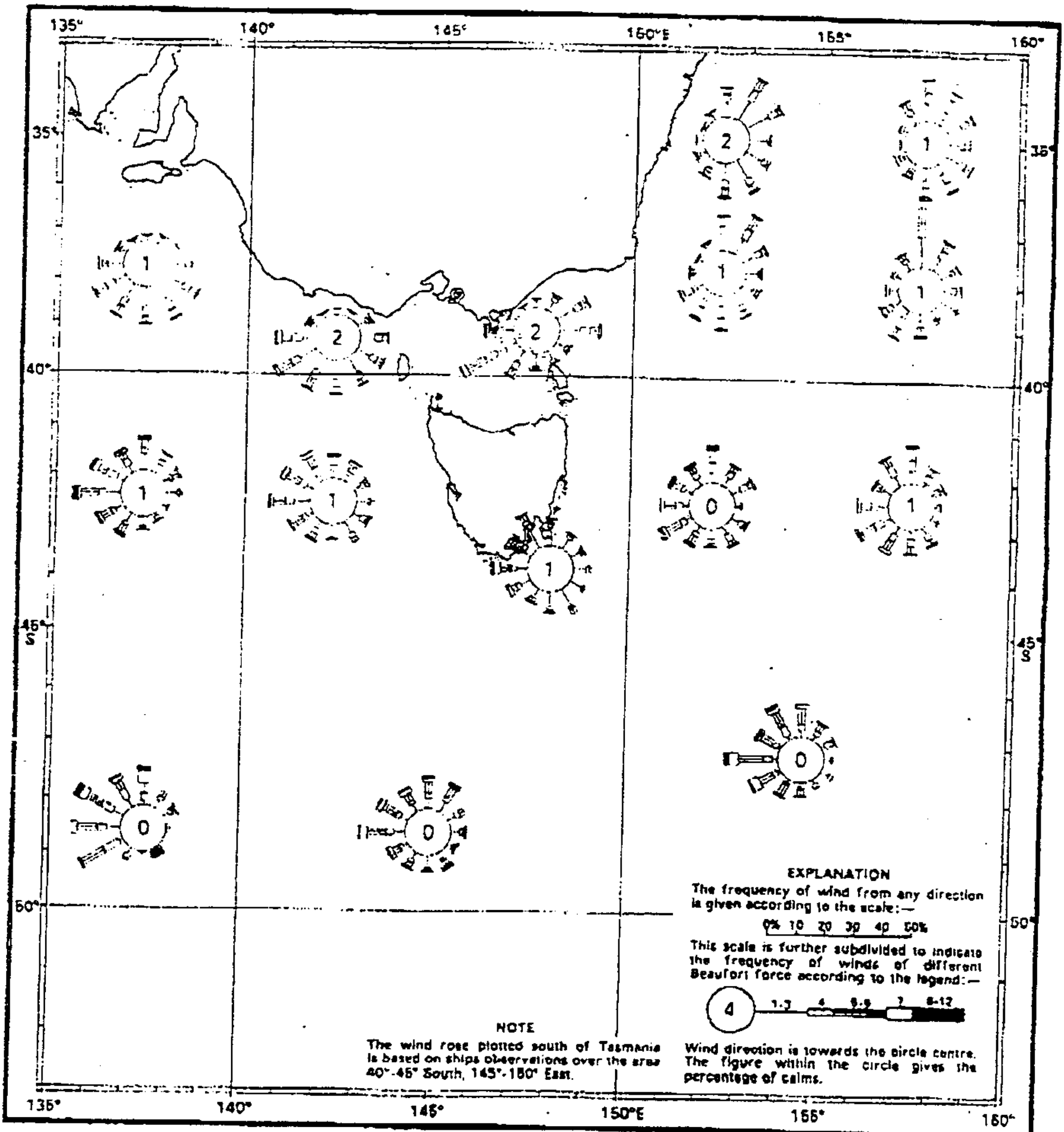
During most of the winter half-year, April to September, the predominant winds blow from between SW and N over most of these waters. To the E of 150° E



(1.70.1) Mean sea surface temperature (°C) — FEBRUARY



(1.72.1) Mean barometric pressure (mb)— JANUARY.



(1.73.1) Mean wind distribution —JANUARY and N of 40° S, however, the winds in autumn and early winter are mostly from between SE and W; during the rest of the winter the winds are mostly between S and W. In the N part of these waters the frequency of N winds is also quite high. Most of the winds are moderate to strong in winter, averaging force 4 to 7.

During the summer half-year wind directions vary considerably and, over much of these waters there is little evidence of one dominant direction; infrequent directions are:

Off S coast of Victoria—winds with a N component.
Off E coast of New South Wales—W and NW winds.
Off W coast of Tasmania—NE and E winds.
Off E coast of Tasmania—N and NE winds.

The average strength in summer is force 4 to 5.

Throughout the whole year the wind seldom blows from any one direction for more than a few days at a time. This is largely due to the almost continuous procession of highs and lows crossing the area from W to E. On average the interval between successive anticyclones is about a week. Typically the N winds which blow for a time, as the anticyclone retreats E, gradually increase until the passage of the cold front trough; colder S winds set in behind these troughs and then decrease gradually as the succeeding high spreads across.

Wind shift sequence

1.74

To the S of the anticyclonic belt the normal sequence of wind is, from W then veering NW with the approach of the trough, backing sharply SW at its passage followed by a slow reversion to W winds.

To the N of the belt the sequence is; from E backing NE with approach of the trough, veering SE as the trough moves E, followed by a slow reversion to E winds.

Frequently, more especially in winter, depressions rather than the weak pressure troughs move across between successive highs and then the wind sequence will depend on the particular track which the depression takes relative to the observer.

Gales

1.75

The wind roses give an indication of the frequency of gales from specific directions. Gales, force 8 and above, are more frequent in winter than in summer and then the most likely directions are between W and N in the W waters, between SW and NW off Victoria and Tasmania and between S and W off the E coasts of the mainland, the frequency decreasing to the N.

The frequencies are lower in summer, most gales blowing from between S and W; in waters well E of Tasmania NW and N gales occur. Again the frequencies fall off N along the mainland coast.

The following table, based on ship observations, gives the monthly percentage frequency of gales for 5 degree latitude and longitude squares N of 45° S but for larger areas S of 45° S where data are rather sparse.

Monthly percentage frequency of gales
(force 8 and above, based on ship observations)

Lat S	*Long E*	J	F	M	A	M	J	J	A	S	O	N	D	*Period of observation (years)*
30°/35°	150°/155°	1	1	2	2	3	5	4	3	2	3	1	1	2
30°/35°	155°/160°	1	1	1	3	5	8	7	5	7	4	1	2	4
35°/40°	135°/140°	1	2	1	2	3	4	6	5	5	4	3	1	3
35°/40°	140°/145°	2	2	2	2	3	4	5	6	4	3	3	2	3
35°/40°	145°/150°	2	2	2	4	4	5	4	2	4	3	4	2	3
35°/40°	150°/155°	3	3	4	4	5	8	7	5	5	4	3	3	4
35°/40°	155°/160°	1	1	1	5	8	6	11	11	9	6	4	3	5
40°/45°	135°/140°	7	5	2	7	8	5	7	7	13	6	3	7	6
40°/45°	140°/145°	3	7	3	4	5	8	6	12	12	10	8	7	6
40°/45°	145°/150°	3	3	4	3	3	8	9	12	6	8	5	3	5
40°/45°	150°/155°	7	6	7	11	4	9	9	12	11	7	5	7	8
40°/45°	155°/160°	4	4	4	5	4	4	2	9	7	10	2	4	5
45°/53°	135°/140°	6	5	4	6	9	9	9	13	10	7	7	12	8
45°/53°	140°/150°	4	10	5	9	9	10	7	8	13	13	6	8	8
45°/53°	150°/160°	6	8	9	12	8	13	7	9	14	5	13	6	9

Storms

1.76

These very strong winds (force 10 and above) can occur around tropical storms moving on SE tracks near NE waters during the hurricane season (see 1.80). Rather more frequently and mostly during winter and spring, middle latitude depressions can also become sufficiently intense to give storms as they move E to SE over the S half of the area of this volume.

The following table, based on ship observations, gives the monthly frequency of storms for the same sea areas as the preceding table. In most months the frequency is 1% or less but the frequency increases with increasing latitude and reaches 5% in one or two months.

Monthly percentage frequency of storms
(force 10 and above, based on ship observations)

Lat S	*Long E*	J	F	M	A	M	J	J	A	S	O	N	D	*Period of observations (years)*
30° /35°	150° /155°	+	+	+	+	+	1	1	1	+	+	+	+	+
30° /35°	155° /160°	+	+	0	+	1	1	1	1	1	+	+	1	1
35° /40°	135° /140°	0	+	0	+	+	+	+	1	+	1	+	0	+
35° /40°	140° /145°	+	0	+	+	+	+	1	1	1	1	1	+	+
35° /40°	145° /150°	0	0	+	1	+	1	1	+	+	+	+	+	-
35° /40°	150° /155°	+	1	1	1	1	1	2	1	1	+	+	+	1
35° /40°	155° /160°	+	0	0	+	2	1	1	1	3	2	1	+	1
40° /45°	135° /140°	1	1	+	1	2	1	1	1	1	1	0	+	1
40° /45°	140° /145°	1	1	1	+	1	3	0	3	2	5	2	+	1
40° /45°	145° /150°	0	+	+	+	1	2	2	3	1	2	1	+	1
40° /45°	150° /155°	1	1	1	3	1	2	1	1	2	2	+	1	1
40° /45°	155° /160°	1	+	+	0	0	1	0	0	2	2	0	1	1
45° /53°	135° /140°	0	0	1	1	1	2	0	3	3	3	0	0	1
45° /53°	140° /150°	1	2	1	2	+	2	1	+	3	5	1	1	1
45° /53°	150° /160°	+	1	1	1	2	1	2	0	1	1	2	1	1

+ indicates less than 0·5%

Coastal winds
1.77

Wind regimes over the open sea are modified progressively when closing the coasts as described in *The Mariner's Handbook*. The two main effects are topographic and thermal. The former includes diversion of flow round and over land barriers and also the intensification of winds in narrow channels. The second main effect includes the daily alternation of land and sea breezes arising from the differing thermal properties of land and sea.

The first effect is responsible for the high gale frequency in Bass Strait due to W or E winds.

Sea breezes have a marked effect in summer when pressure gradients are usually weaker. Some of these effects on parts of the coast can be seen in the wind distribution tables for morning and afternoon in the Climatic Tables at the end of the chapter.

On the E coasts the summer NE winds are for the most part associated with fine weather. Occasionally stronger NE winds occur resulting from high pressure over the Tasman Sea and lower pressure over land; then the weather is overcast and gloomy with rain; these conditions are referred to as "the black north-easters".

Tornadoes, which are relatively small but violent vortices, are reported on very hot, thundery occasions over land; they can give localised gale force winds within a radius of a few hundred feet of the vortex. Recent research on the tornado shows that tornadoes may be more frequent and relatively more intense than previously thought; not all tornadoes, however, are extremely violent.

The waterspout, the marine counterpart of the tornado, has been reported at times in coastal waters. Several tornadoes or waterspouts may occur during the same day when conditions favour their formation.

Fronts
1.78

The depressions moving across the area have the normal warm and cold fronts associated with middle latitude depressions elsewhere. The cold fronts are usually the more violent. The warm fronts are relatively weak and are at times rainless due to the dry air drawn into the warm sector.

Near the S coasts of Australia the "Southerly Buster" is a well-known phenomenon; it is the name given to the line squall which quite often accompanies the passage of a cold front. In a matter of minutes hot, N winds in advance of the front, blowing from the continental interior, give way to cold blasts from S. The corresponding fall in temperature is dramatic, reaching 15°C or more on occasions. Since the cold front is aligned roughly NNW to SSE its E progress along the coast of Victoria proceeds steadily. On reaching the vicinity of Cape Howe, however, the change in the orientation of the coastline causes the line squall to advance extremely rapidly along the New South Wales coast. The weather then in advance of the front changes from hot and dry to damp weather with mist or drizzle brought along by NE winds.

The "Buster" is often accompanied by a long line of roll cloud extending from horizon to horizon—a familiar feature of line squalls in other parts of the world.

Depressions.
1.79

The deeper depressions of the Southern Ocean, giving gale or storm force winds, move from W to E on tracks which are well to the S of these coasts, though frontal troughs linked to these depressions continuously affect the area, being more pronounced in the S than in the N. There are occasions when deep, vigorous depressions invade these waters and such depressions fall into two types.

Depressions in the first category, sometimes known as southern depressions, approach SW Australia from the W or SW and follow a track between NE and SE; most of these move SE keeping S of Tasmania but in winter some may pass through the Bass Strait.

Depressions of the second type are those which form off the E coast or intensify there, having moved across from the N. At this stage they are slow moving but subsequently move off S or SE. These can intensify sufficiently to cause gale force winds, accompanied by high seas, rain and low cloud, giving rise to some of the worst conditions affecting these coasts, especially those of New South Wales.

Diagram 1.79 gives the tracks of some depressions in recent years; these include one or two which had tropical storm characteristics whilst in more N latitudes.

Tropical storms
1.80

The waters covered by this volume lie outside the tracks taken by tropical depressions, especially the more

Appendix

AUSTRALIA

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mences its response to an incident. Once the SAR system has been notified of the existence of an incident, the complete resources of the system may be used to resolve that incident.

309 Initial Action Events

There are five operational events which may occur within the initial action stage:

- (i) incident evaluation;
- (ii) emergency phase classification;
- (iii) SAR facilities alerted;
- (iv) preliminary communication search; and
- (v) extended communication search.

310 SARMC Designation

The Operation Centre may designate a SARMC shortly after the awareness stage is completed. However, under no circumstances should the lack of a specific SARMC designation stop or delay the response of any individual, unit or facility from responding to an incident of which they become aware and for which they can render assistance.

311 INCIDENT EVALUATION

312 General Considerations

Evaluating incidents to determine the urgency and the extent of required SAR system response, or the termination of its response is a function requiring information, judgement and experience. In emergency situations requiring immediate assistance, the action taken must be accomplished quickly and positively. Where uncertainty exists, evaluation is usually more difficult and time consuming because of the many variable factors involved.

Perhaps the most difficult task the SARMC undertakes is the evaluation of these factors. They usually become apparent between the time the incident is reported and the execution of the search, a time when speed and reliability may be most important, but also a time when incident reports may be incomplete or confused. The most serious limitation is time itself. When persons are injured or are subjected to adverse climatic or water conditions, the chances of survival decrease rapidly. Time limitation also may be dictated by the number of hours left for a daylight search, although the SARMC should not arbitrarily rule out night search.

The facilities available to conduct a search may be limited by lack of available personnel and search vehicles. The SARMC must be aware of availability of SAR facilities within his region.

Terrain, weather and oceanographic conditions can affect all areas in SAR planning and operations. Search visibility, aircraft limitations, search effectiveness, safety of flight and time available to complete the search are some of the factors that will affect search capability. Legal factors may also have to be considered.

Whenever practicable, pertinent data should be plotted on a chart to aid in evaluating related factors.

Normally the controller or SARMC determines the urgency and extent of SAR services required for an incident. A rapid but systematic approach is essential since prompt response to emergency incidents is the essence of the SAR system.

313 Time Factors

a. General Time Factors

The probability of finding survivors and their chances of survival diminish with each minute after an incident occurs. All SAR Authorities should therefore take prompt positive action so that no life will be lost or jeopardised through wasted or misdirected effort. Records have indicated that the life expectancy of injured survivors decreases as much as 80 per cent during the first 24 hours following an accident while the chances of survival of uninjured survivors rapidly diminish after the first 3 days. These figures are averaged from overall experiences. Individual incidents will vary with local conditions such as terrain, climatic conditions, ability and endurance of survivors, emergency equipment available and SAR units available to the SAR system.

In the case of seriously injured survivors or survivors in a hostile environment, the reaction time of the SAR system must be measured in minutes.

Records show that critically injured survivors of any accident usually die within the first 24 hours if not given emergency medical care.

b. Daylight Factor

For survivors without any type of detection aids daylight visual search is usually the only search method available to the SARMC. If darkness is approaching this would be another limiting factor for the SARMC to consider.

c. Night-time Factor

If it is known or suspected that the survivors have detection aids such as pyrotechnic flares or other night signalling devices or can display other lights, night searches should always be conducted. Night searches are particularly effective at sea, over sparsely populated areas, flat terrain and deserts.

Night aural and visual search with surface craft, however, is effective when survivors have no detection aids. Usually both a visual and an aural search can be combined by the surface SRU.

d. Weather/Oceanographic Factors

Adverse weather prevailing in or approaching an area where survivors are located may also limit the time available to conduct a SAR operation. Not only are survivors of a distressed craft more difficult to detect under adverse weather conditions, but SAR units themselves operate at lower efficiency due to the added turbulence, rough seas and higher stresses on both the search personnel and their craft.

Accurate knowledge of weather conditions and the prudent judgment based on it will enhance the likelihood of a successful mission. Knowledge of the prevailing weather conditions will also play an important role in the safety of the search units.

If current weather will not allow a search without endangering additional lives, the search effort should be deferred.

If weather is currently good but forecast to deteriorate in a short time, more rapid action is required and detailed planning may suffer due to the time available. If weather is good and forecast to remain so, more extensive planning may be accomplished.

Wind, visibility and cloud cover influence the search track spacing. Therefore, the better the weather information, the more realistic will be the derived track spacing. Maintaining accurate search patterns is difficult in adverse weather. Aerial units are particularly vulnerable. For this reason the patterns selected should allow for more precise navigational accuracy.

Safety may sometimes be prejudiced by actual weather conditions, which must, therefore, be monitored continuously by the SARMC.

Low cloud base and restricted visibility are particularly hazardous during searches which cover large areas where many aircraft are employed. Should air search be conducted under adverse weather conditions in an area served by few navigational aids, then air search may have to be suspended due to the difficulty of maintaining adequate aircraft separation. In cases where an OSC has been appointed he/she has the prerogative in such a situation, to suspend air search on his own volition.

In situations where survivors are adrift in regions of high velocity water current, searches should be mounted without delay. The probability of locating survivors is high during the early stages of survival craft drift as the drift factor allowed for in search calculations will be of reasonable accuracy over a short time period.

When missions involve overdue craft, the weather situation should be evaluated to determine what effect it may have had upon the craft's operating capabilities and/or the actions of the craft's operator prior to SAR system activation.

To obtain an overall weather picture an attempt should be made to complete the following questionnaire:

(i) What was the weather at the departure point, destination and along the planned track at the time the overdue craft should have been in those areas? If no established weather facilities are available, the information should be obtained from local sources in the areas concerned if possible.

(ii) What was the en route and forecast weather briefing given to the crew of the missing craft, and what was the operator's reaction to the weather briefing?

(iii) What was the weather in the area where the missing craft is presumed to be? If the time of emergency is known, what were the actual weather conditions at the craft's estimated position?

(iv) Were there any marked changes in wind or sea currents that might have resulted in navigation errors?

(v) Were there any areas of low ceiling, poor visibility, precipitation, thunderstorms, frontal activity, turbulence, icing, that may have caused the craft to attempt circumnavigation, or that could have exceeded either the crafts or operator's capability?

(vi) Were there any areas of marked pressure changes which may have caused aircraft altimeter errors?

e. Weather Reports by Survivors

Occasionally missions will occur during which radio contact can be established with survivors who do not know their exact position. If survivors can report sufficient weather information, the SARMC and meteorological personnel may be able to develop an approximation of the survivor's position by fitting the survivor's weather into the current synoptic picture. The following weather information should be requested immediately, and on a scheduled basis thereafter, if possible:

(i) Percentage of cloud cover.

(ii) Estimated height of clouds.

(iii) Type of description of cloud.

(iv) Estimated surface wind velocity.

(v) Winds aloft direction, if discernible by cloud movement.

(vi) Prevailing weather phenomena such as snow, rain, fog, sea state, etc.

(vii) The times of sudden changes in wind or weather such as rapid clearing, quick deterioration, sudden changes in wind direction, noticeable change in temperature, blowing dust or any other condition that might indicate frontal passage.

(viii) Outside air temperature.

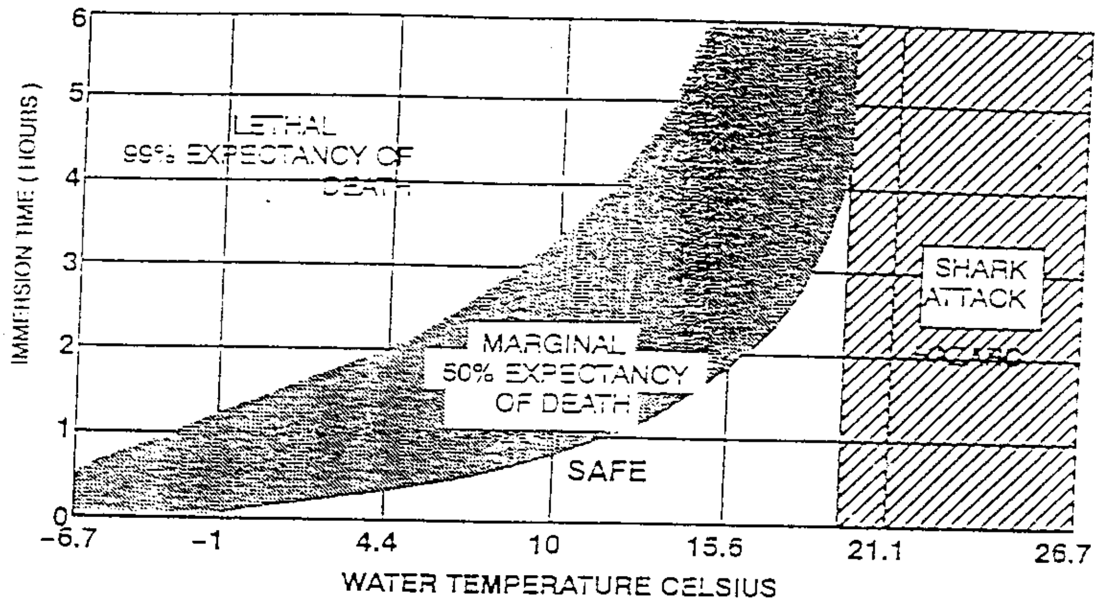


Figure 3.1 Water Chill without Anti–exposure Suit

(ix) Pressure reading of barometer, or altitude reading of altimeter set for 1013 mb.

(x) Pressure trends from altimeter or barometer.

(xi) Observed times of sunset and/or sunrise.

314 Survival Environment Factors

a. General

The environment in which the survivor is exposed is another factor which limits the time available to complete his rescue. In some cases, environment will be the most time critical of all. Climatic atlases are useful to evaluate probable climatic conditions in regions where few or no weather reporting facilities are available. The relation of survival time to water temperature, air temperature, humidity and wind velocity is not a simple one. These and other factors often exist in combination to complicate the problem of estimating life expectancy of survivors. Each individual will vary in his reaction to cold and heat stresses. Additional factors which will vary a survivor's life expectancy include the type of clothing worn, the clothing's wetness, the survivor's activity during his exposure, initial body temperature, physical conditions, thirst, exhaustion, hunger, and various psychological stresses such as isolation, loneliness and remoteness, and the all–important individual will to live.

The graphs of Figure 3.1 to Figure 3.5 are provided to assist the SARMC in determining the urgency required to remove survivors from the environment, and to assist in evaluating the practicality of terminating a search. These graphs are based upon case histories, field tests, laboratory experiments and analysis of all known data. However, the SARMC must understand that some individuals will exceed the life expectancy or tolerance times indicated in these figures, and therefore should consider these figures as helpful guidelines rather than absolute controlling factors.

b. Hypothermia

Hypothermia is the abnormal lowering of internal body temperature (heat loss) and results from exposure to the chilling effects of cold air, wind or water. Death from hypothermia may occur during either land survival or water survival situations. Hypothermia is the leading cause of death for survivors of maritime disasters.

Internal body temperature is the critical factor in hypothermia. If the body temperature s depressed to only 35°C, most persons will survive. If the body temperature is depressed to approximately 33°C, most persons will return to useful activity. At about 32°C, the level of consciousness becomes clouded, and unconsciousness occurs at 30°C. Only 30 percent would be expected to survive these temperatures. At body temperature depressions of 26°C and below, the average individual will die, and ventricular fibrillation (heart attack) will usually occur as the final event. However in some cases individuals have survived with body temperatures as low as 17°C.

c. Water Hypothermia

The body will cool when immersed in water having a temperature of less than 33°C. The warmest ocean water that can be expected at any time of year is 29°C. Approximately one–third of the earth's oceans have water temperatures of 19°C or above.

The rate of body heat loss increases as the temperature of air and water decreases. If a survivor is immersed in water, hypothermia will occur very rapidly due to the decreased insulating quality of wet clothing and the fact that water will displace the layer of still air that normally surrounds the body. Water allows a rate of heat exchange approximately twenty five times greater than that of air at the same temperature.

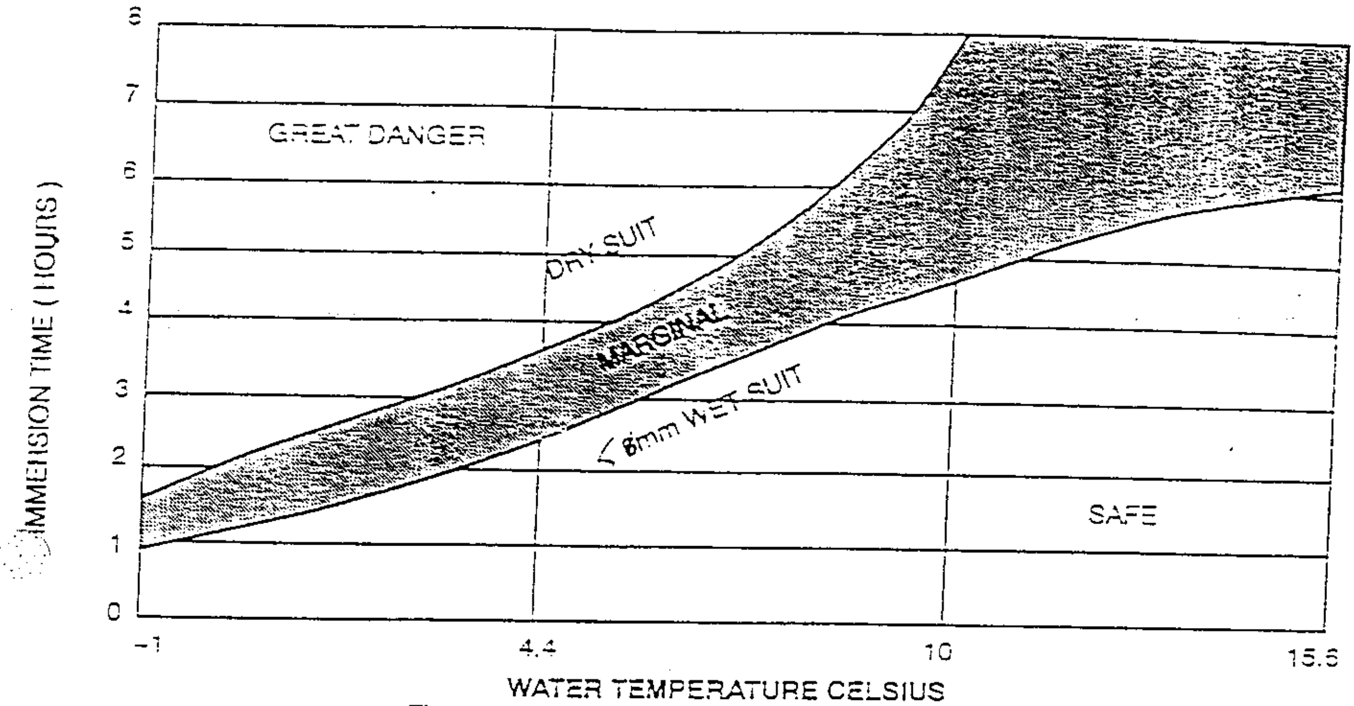


Figure 3.2 Water Chill with Anti-exposure Suit

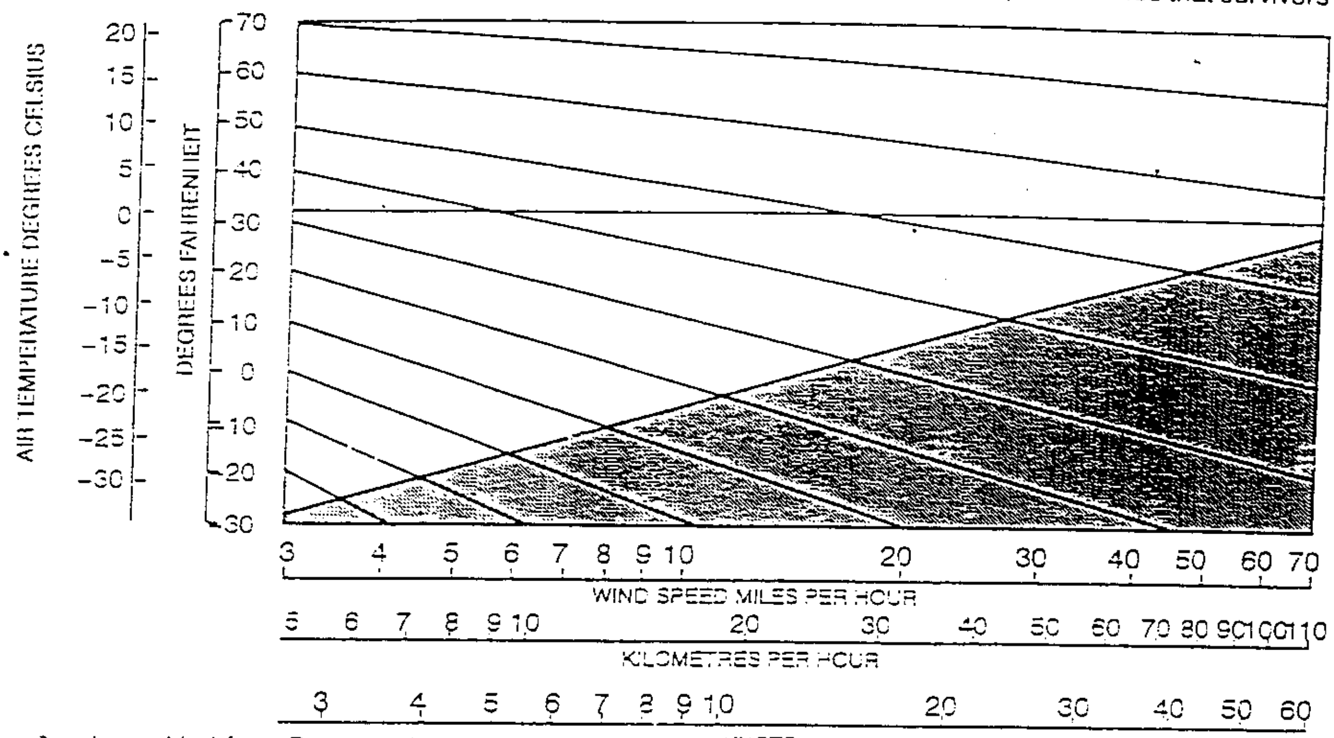
In water temperatures above 21°C, survival time depends solely upon the fatigue factor of the individual, some individuals having survived in excess of 80 hours at these temperatures. Staying afloat and fighting off sharks are the major problems at these temperatures.

Between 15°C and 21°C an individual can survive up to 12 hours. At 15°C, skin temperatures will decrease to [illegible] water temperature within 10 minutes of entry and shivering and discomfort is experienced immediately upon immersion. Dunking and submersion difficulties become increasingly distressful to the survivor. From 10°C to 15°C the survivor has a reasonably good chance if rescue is completed within 6 hours. Faintness and disorientation occur at water temperatures of 10°C and below. violent shivering and muscle cramps will be present almost from the time of entering the water and intense pain will be experienced in the hands and feet. This very painful experience will continue until numbness sets in. All skin temperatures decrease to near the water temperature in about 10 minutes. In the temperature range from 4°C to 10°C, only about 50 per cent of a group can be expected to survive longer than 1 hour. In water temperatures of 2°C and below the survivor suffers a severe shock and intense pain on entering the water. This shock in some instances may be fatal owing to loss of consciousness and subsequent drowning.

Water survivors who die within 10 to 15 minutes after entry into frigid water apparently do not succumb because of reduced body temperature, but rather from the shock of rapid entry into cold water. Fifteen minutes is too short a time for the internal body temperature to fall to a fatal level, even though the outer skin temperatures are at the same temperature as the water. In addition, the temperatures of the hands and feet fall so rapidly that such immersions are frequently less painful than those in 4°C to 10°C water.

Figure 3.1 'Water Chill without Anti-exposure Suit', depicts the life expectancy of survivors immersed in water wearing typical clothing. The survival times indicated in Figure 3.1 are for uninjured survivors; injured survivors will die in less time. This graph is a guide for estimating life expectancy, but it should be realised that there will be exceptions. For example, a female will generally survive longer than a male due to the fatty tissue layer underlying her skin which acts as an insulator. Also fat people will tend to survive longer than thin people, and those in good physical condition will survive longer than those in poor physical condition. The spread of time indicated in the marginal portion of the graph is the period in which survivors will usually lose consciousness and then drown.

Figure 3.2 'Water Chill with Anti-exposure Suit', depicts the tolerance time of survivors immersed in water while wearing either a 5mm foamed neoprene wet suit or a survival dry suit. Survivors wearing wet suits will lose body heat only three times as quickly in water when compared to heat loss in air of the same temperature. (This is about one-eighth the rate of loss if only regular clothing were worn by the survivor.) Figure 3.2 will provide the SARMC with expected times that survivors will



Graph provided from Data provided by
AUSTRALIAN BUREAU OF METEOROLOGY

Figure 3.3 Wind Chill Graph – Equivalent Temperature Curves

become either unconscious or will be experiencing such severe leg cramps, stomach cramps or pain in the hands and feet that continued endurance is reduced drastically. Although the dry suit curve indicates a longer tolerance time, these suits leak appreciably and their effectiveness is decreased. Therefore dry suit effectiveness would more likely be near the wet suit curve in actual practice. In addition some experiments have shown that anti-exposure dry suits have only afforded one half the protection of wet suits combined with thermo-boots.

d. Wind Hypothermia

Although the body will lose heat approximately twenty-five times slower in calm air than when immersed in water, the body heat loss will be accelerated with increasing wind velocities. This is an additional factor to consider for exposed survivors. Figure 3.3 'Equivalent Temperature Graph', depicts the effects of various wind speed and air temperature combinations, indicating the equivalent temperature felt on a person's skin. The straight line relationship between air temperature and the logarithm of D wind speed allows simple interpolation of the intermediate temperatures. The shaded area represents wind speed and temperature combinations which would cause freezing of any exposed skin. For example, if a 20 km/h (10 knot) breeze is blowing and a survivor walks into wind at 5 km/h (3 knots) the net effect is a 25 km/h wind blowing. If the air temperature is 10°C the equivalent temperature felt by the skin is 0°C and the heat loss is equivalent to the loss at 0°C with no wind.

e. Hypothermia, Heat Stress and Dehydration

Hyperthermia, heat stress and dehydration are dangers in hot climates, particularly in desert areas. The most severe form of heat stress is heat stroke, during which the body temperatures rises due to the collapse of the temperature control mechanism of the body. If the body temperature rises above 42°C, the average person will die. Milder forms of heat stress are heat cramps and heat exhaustion. Another limiting factor both in hot climates and in survival situations at sea is dehydration. A person totally without water can die in a few days, although some have survived for as long as a week or more.

A combination of high temperatures and lack of water can aggravate the problem of heat stress. The life expectancy of survivors in a desert environment is depicted in Figure 3.4 for stationary, non-walking survivors, and in Figure 3.5 for survivors who walk only at night. Note that survival time is not appreciably increased until the available water is over 4 litres. Use of shade or the saving of a few degrees of temperature is as effective and as important in increasing survival time as water.

In jungle areas, the water needs of the body are about one-half to one-third that required in the desert at equal temperatures.

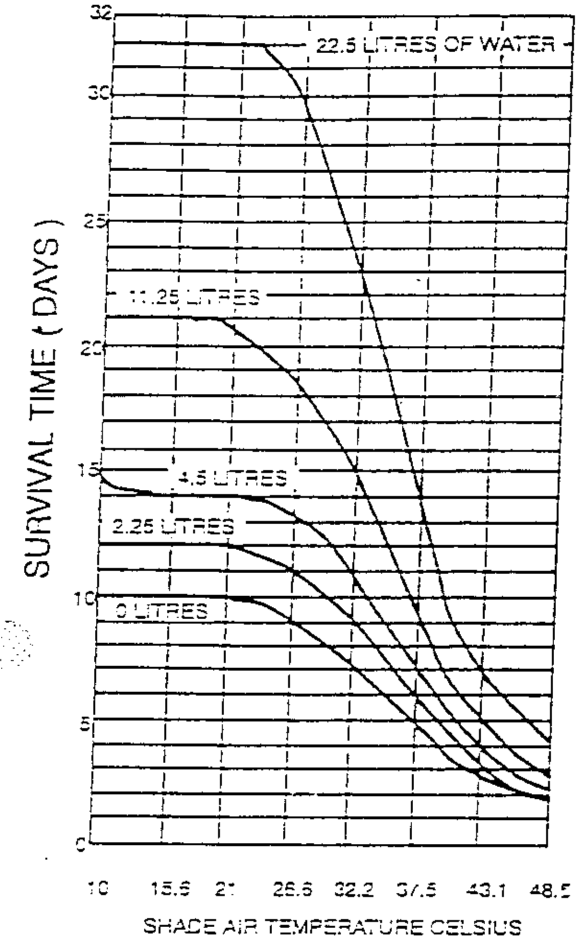


Figure 3.4 - Expected Desert Survival (Survivor Stationary)

315 Survivor Stress Factors

Two basic assumptions are always made concerning survivors of a distress incident:

(i) there are always survivors who require emergency medical care; and

(ii) they are under a condition of great stress and experiencing shock.

To assess the probability of casualties in an airline accident, surveys of world accidents on or in the vicinity of airports have shown that:

(i) in 82 percent of accidents no occupant will be seriously injured; and

(ii) in 95 percent of accidents not more than 25 percent of occupants will be injured.

Other records show that 60 percent of all survivors of any type of accident are injured to some extent.

However these figure are averages and it must be assumed that in all accidents injuries will exist. It may also be assumed that not even able-bodied, logical-thinking survivors will be able to help themselves.

Records include numerous accounts where supposedly able-bodied, logical-thinking survivors failed to accomplish extremely simple tasks in a logical order, and thus hindered, delayed or even prevented their own rescue. This is due to shock, which, following an accident, is often so great that even those of strong mind think and act illogically. All survivors will be in some degree of shock. Some may be calm and somewhat rational, some may be hysterical and in panic, while the remainder will be temporarily stunned and bewildered. This last group will generally have passive attitude and can be easily led during the first 24 hours after the incident. As the shock wears off, most of them will develop active attitudes. Those that do not develop active attitudes will die unless rescued quickly.

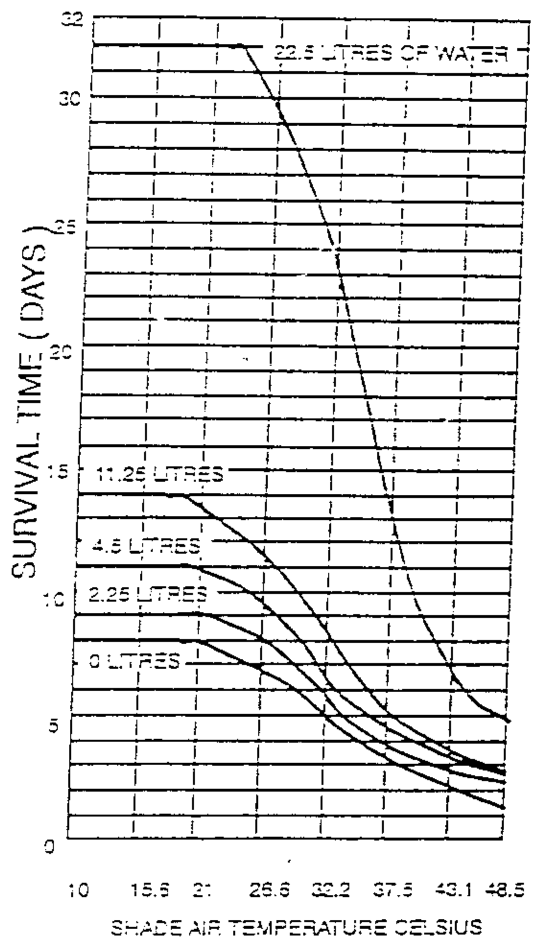


Figure 3.5 Expected Desert Survival (Survivor Night Walking)

Even an individual observing an emergency situation and reporting it to the SAR system should be considered as being under stress. Many times it will be necessary for SAR personnel to specifically request essential information from an individual reporting an emergency. This situation should be expected and SAR personnel should be prepared to cope.

IMMERSION SUIT USAGE WITHIN THE RAAF

1. INTRODUCTION

1.0.1. The RAAF Institute of Aviation Medicine (AVMED) was tasked by the Principal Medical Officer at RAAF Headquarters - Training Command (PMO HQTC) to review and investigate immersion suit usage within the RAAF[1] This tasking resulted from a visit by PMO to RAAF Base East Sale (ESL) where concerns about the usage and maintenance of various immersion suits arose.

1.0.2. A related request for AVMED advice concerning immersion suit usage within the RAAF has also been made by Air Headquarters (AHQ)[2].

2. AIM

2.0.1. The aim of this paper is to discuss aviation medical aspects of immersion protective clothing relevant to it's usage by the RAAF and to provide recommendations regarding such immersion suit usage.

3. METHOD

3.0.1. Available documents were reviewed[3]. Feedback was sought from all RAAF flying units[4] as to what, if any, immersion protective clothing they used and the conditions in which it was used. Policy guidance feedback was sought from AHQ and HQTC with respect to the expected survival times or time to rescue of RAAF aircrew forced to ditch into water[5].

3.0.2 Review of the available information and policy guidance has allowed AVMED to provide recommendations to assist in future policy development.

4. RESULTS & DISCUSSION.

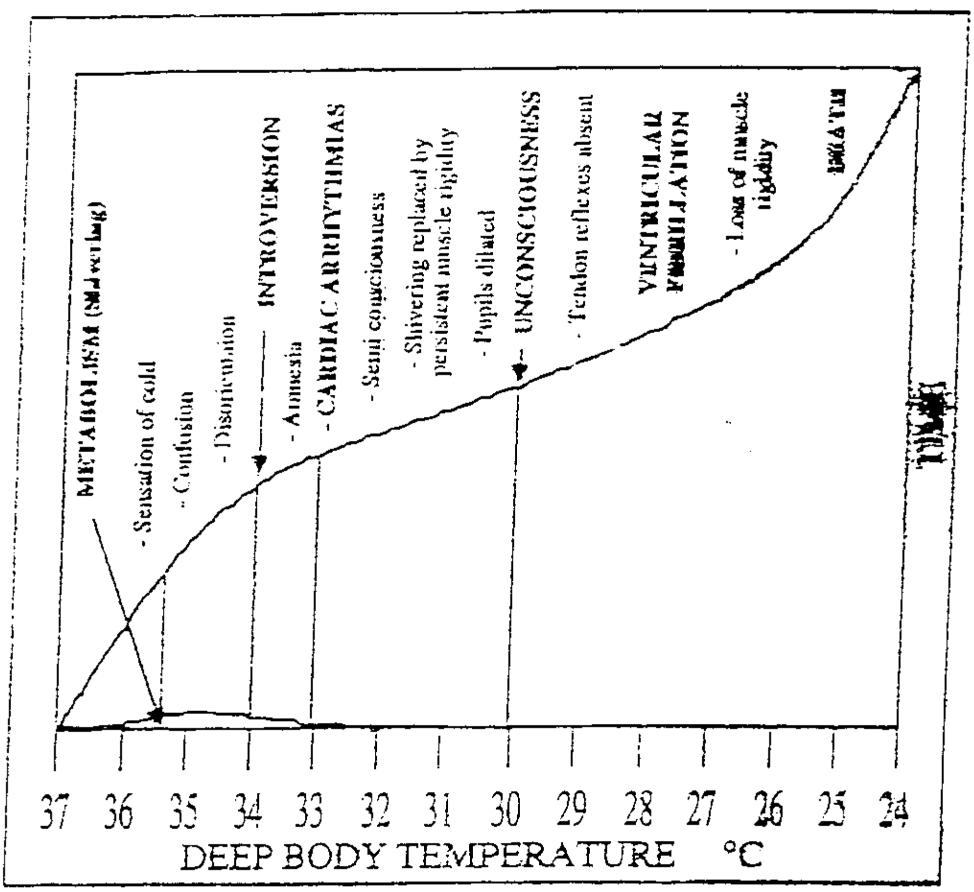
4.0.1. This section begins with a general, non-technical, overview discussion on the subject of cold water immersion hypothermia, it's dangers, and methods of reducing the risk of hypothermia. This is followed by an outline of the role of immersion suits in military flying operations. Next is an outline of current immersion suit usage within the RAAF, discussion on aspects of policy relevant to immersion suit usage, and finally AVMED's recommendations.

4.1. COLD WATER IMMERSION HYPOTHERMIA.

4.1.1. When immersed in water colder than the body's core temperature (which is usually maintained at around 37°C) a man will lose heat to the surrounding water. If the water temperature is lower than 32°C the body's physiological protective mechanisms will probably be unable to adequately control the heat loss and a progressive reduction in the core temperature will result. Reduction of body core temperature, if allowed to continue, can result in functional impairment and eventually death (Figure 1).

4.1.2. Death due to immersion hypothermia occurs because certain chemical reactions within the cells of the body are dramatically slowed due to the cold. This altered cellular chemistry causes the central nervous system and heart to become more 'irritable' than usual. This irritability, in turn, can result in altered conscious state, impaired breathing, convulsions, and irregularities of the heart's rhythm. Death can be due to a progression of any combination of these body malfunctions.

Figure 1[5]
The effects of cold on the human body.



The effects of cold on the human body.
The relationship between deep body (core) temperature and human body function. As the deep body temperature falls function is impaired eventually resulting in death if the fall in body temperature continues. Figure adapted from work carried out at the Royal Navy's Institute of Naval Medicine.

4.1.3. The occurrence of immersion hypothermia depends on a number of factors including:

a. The temperature of the water;

b. The duration of immersion;

c. The clothing of the subject;

d. The activity and posture of the subject:

e. The sea state:

f. The percentage body fat carried by the subject:

g. Individual susceptibility of the subject.

4.1.4. An immersed individual must be able to maintain flotation and avoid death by drowning before cold water immersion considerations become important. It is assumed that adequate flotation equipment is available in all of these discussions.

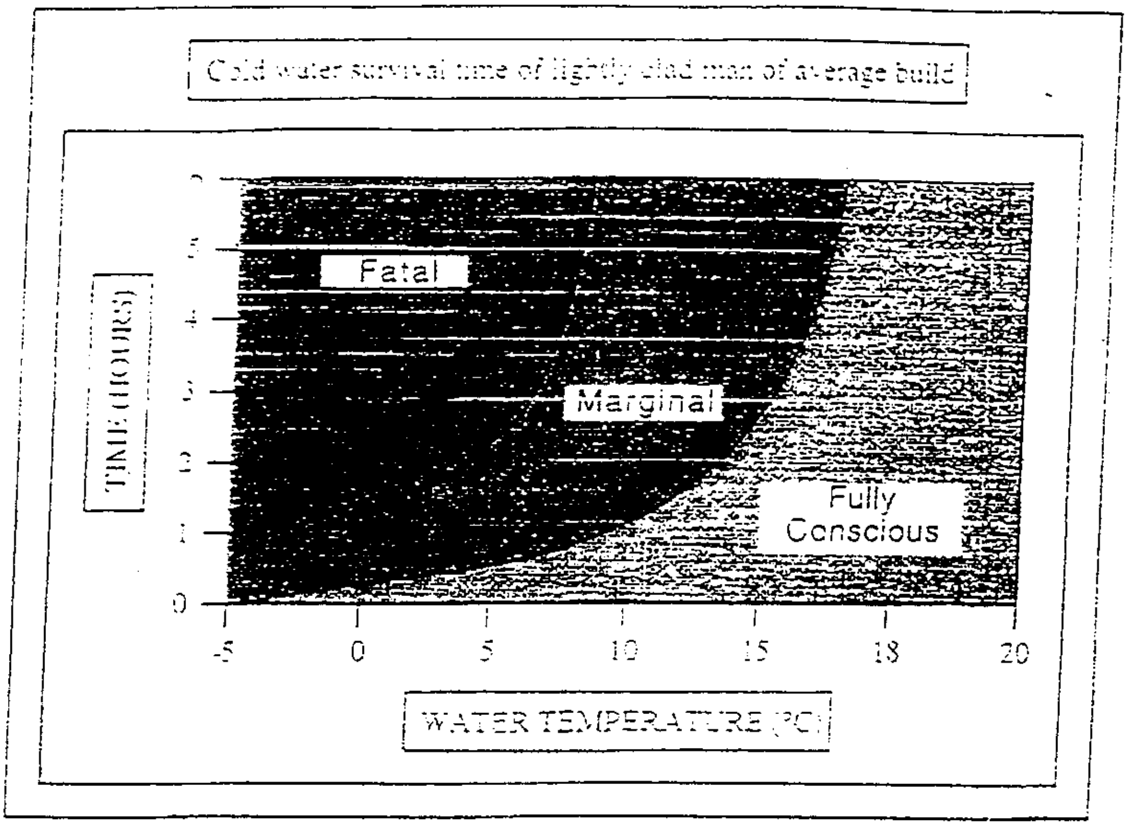
4.1.5. Water temperature.

4.1.5.1. Water temperature is one of the most critical parameters influencing the incidence of cold water immersion hypothermia. The colder the water the shorter the period of immersion before hypothermia becomes a problem. Figure 2 illustrates the relationship between the survival time of a lightly clad, average build, man and the temperature of the water in which he is immersed. It can be seen from Figure 2 that the unprotected person's likely survival time in water of 5°C is approximately 2 hours compared with in excess of 6 hours in 10°C water.

4.1.6. The duration of immersion.

4.1.6.1. Figure 2 also illustrates the relationship between duration of immersion and survival outcome. Hypothermic death upon immersion in 12°C water is unlikely within 1 hour but likely after 5 hours.

Figure 2 .
Cold water survival of lightly clad man of average build.

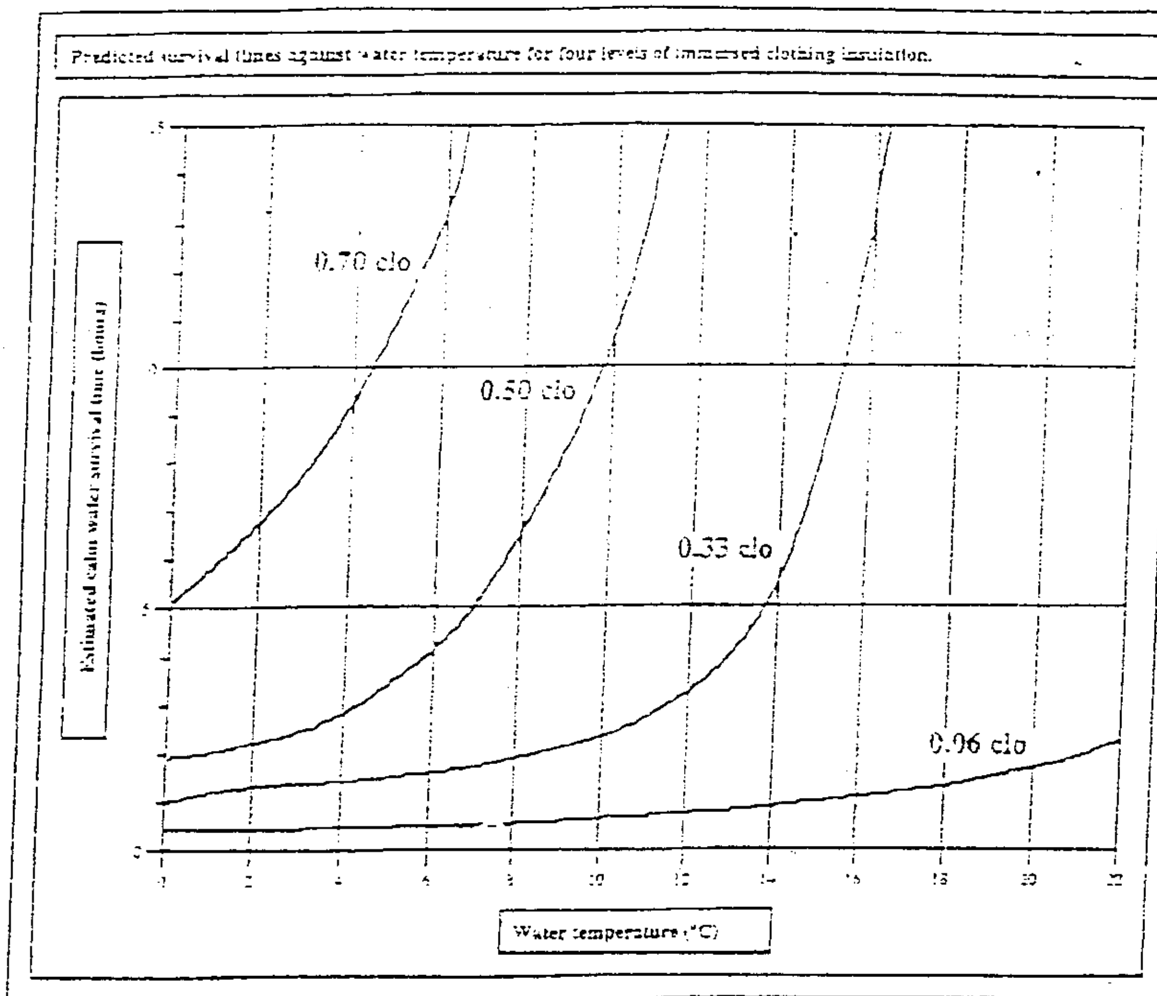


Hypothermia due to immersion in cold water.
Survival of men of average body build wearing light weight clothing upon immersion in water of various temperatures. The curve dividing the 'marginal' from the 'fatal' areas indicates the relationship between water temperature and the likely duration of survival of 50% of subjects. Adapted from British work published in an American Safety and Flying Equipment journal.

4.1.7. The clothing of the subject.

4.1.7.1. The waterproofing and insulative characteristics of the clothing worn during cold water immersion are of paramount importance in the prevention of hypothermic death. Figure 3 illustrates the changes in immersed survival time afforded by clothing with differing degrees of immersed insulation performance.

Figure 3[3].
Predicted calm water survival times for personnel wearing clothing with differing immersed insulative performance.

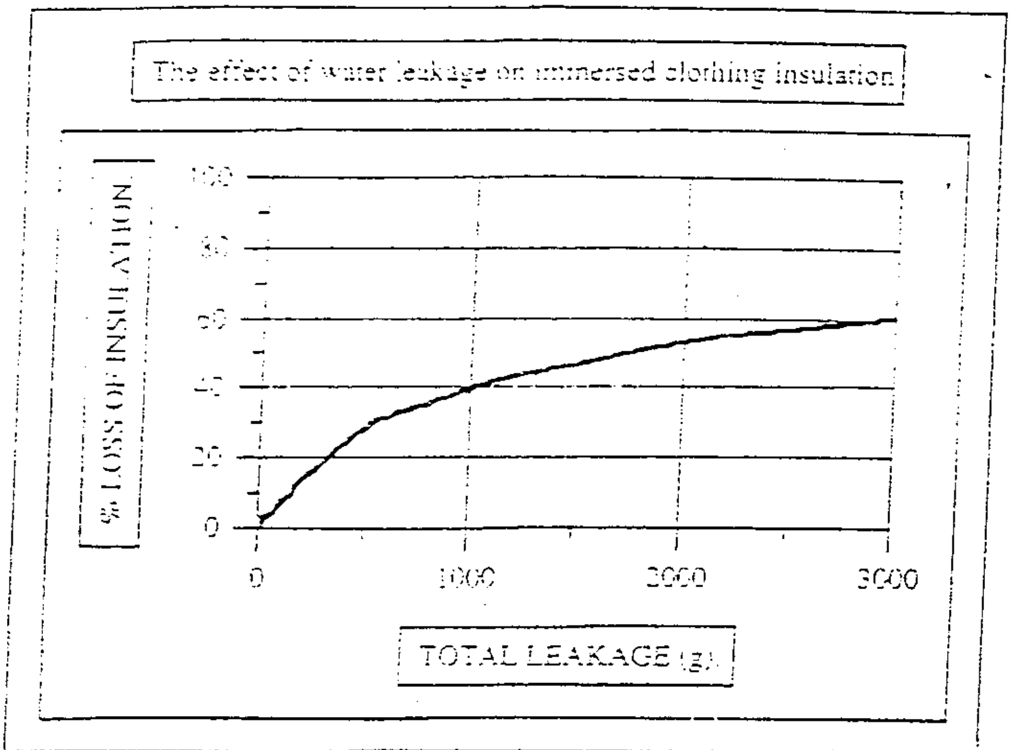


Survival times for garments with differing immersed insulation.
Estimated calm water survival times plotted against water temperature for thin individuals (approximately 10th percentile mean skinfold thickness) wearing various levels of immersed clothing insulation. The unit clo denotes the rate of heat loss : 1 clo = 0.155 $^{\circ}C.m^{2}.W^{-1}$. Note that the times from this graph do not correlate exactly with those of Figure 1 as the two graphs were derived using different methods. Adapted from widely published British work included in Air Standards Coordinating Committee publications.

4.1.7.2. Figure 4 demonstrates the degradation of insulative performance of immersion protective clothing with the leakage ingress of water. Note that the passing of urine into a waterproof protective garment will also degrade it's insulative characteristics.

4.1.7.3. The standard RAAF nomex flying suit, worn with long cotton underwear and issue boots and gloves provides around 0.06 clo (See text attached to Figure 3) immersed insulation while the various 'immersion suits' commercially available usually provide between 0.3 - 0.9 clo immersed insulation.

Figure 4[9].
Immersed insulation loss with water leakage.



Immersed insulation loss with water leakage.
Shows the percentage loss of insulation plotted against the water leakage into the insulation worn beneath an immersion suit. Graph adapted from British work published in American Aviation Space and Environmental Medicine journal.

4.1.8. The activity and posture of the subject.

4.1.8.1. The more active a person is when immersed in cold water the more heat is lost to the environment. Activity generally produces more metabolic heat within the body but this is rapidly lost as more cold water contacts the body's surface. Provided that buoyancy is maintained an absolute minimum of movement is advisable in an immersion survival situation.

4.1.8.2. Posture also plays an important role in cold water immersion survival. A large proportion of body heat can be lost from the head, armpits, groins, and trunk of an immersed person. Most survival manuals[10] recommend adoption of a Heat Escape Lessening Posture (HELP) which involves holding the arms firmly against the side of the chest and raise the thighs to protect the groins. Adoption of the HELP may increase cold water immersion survival time by up to 50%.

4.1.8.3. Group immersion survival prospects are enhanced by the formation of a 'huddle' pressing the sides of each other's chests together

4.1.9. The sea state.

4.1.9.1. Wave motion has two effects that can reduce cold water survival times. Firstly wave motion may cause the immersed person to need to make an effort to maintain stability and freeboard resulting in increased movement and loss of heat. Secondly wave motion acts to continuously flush cold water against the exposed body further potentiating heat loss.

Extract from ABR 5150
Naval Aviation Instructio

AIR TEMPERATURE (°C)

WIND SPEED (kts)	18	15	12	9	6	3	0	-3	-6	-9
6	16	13	9	6	3	-1	-4	-7	-11	-14
12	13	9	5	1	-2	-6	-10	-14	-18	-22
18	12	7	3	-1	-6	-10	-14	-18	-23	-27
24	11	6	1	-3	-8	-12	-17	-21	-26	-30
30	10	5	0	-4	-9	-14	-18	-23	-27	-32
36	9	5	0	-5	-10	-14	-19	-24	-29	-33
42	9	4	-1	-5	-10	-15	-20	-25	-29	-34
48	9	4	-1	-6	-10	-15	-20	-25	30	-35

Table 1—Effect of Wind on Temperature

Cruising Yacht Club of Australia

A.C.N. 000 116 423
New Beach Road, Darling Point, N.S.W. 2027
Telephone: (02) 9363 9731 • Fax: (02) 9363 9745
ADDRESS ALL CORRESPONDENCE TO THE GENERAL MANAGER

28 July 1999

Captain C.F. George AM
Commander Australian Aviation Force
COMAUSNAVAIR
Naval Air Station
NOWRA NSW 2540

Dear Captain George,

I note receipt of your letter dated 12 July 1999 regarding the 1998 Sydney Hobart Race Review Committee May 1999 Report.

I welcome your comments and thank you for the time and effort you have taken to review our document and for your constructive criticism.

The CYCA would welcome the opportunity to meet with you or your designated representative(s) in order to more fully explore your proposals and suggestions as well as to give us the opportunity to put some of our recommendations into context.

As the Sydney Hobart Review Committee has now been disbanded, the appropriate group within our club community to meet with you is our Sailing Committee, chaired by our Vice Commodore Mr Hans Sommer. The Sailing Committee is responsible for the organisation of the Sydney Hobart Race as well as implementation of the Review Committee's recommendations and any future amendments or changes thereto.

I have forwarded a copy of your letter and attachments to the Sailing Committee and have asked Mr Sommer to make contact with you to confirm that you are prepared to meet with us and to arrange a suitable time and venue.

Yours sincerely,

HUGO VAN KRETSCHMAR
COMMODORE CYCA

Doc 3

Commander Australian Naval Aviation Force, HMAS ALBATROSS, NOWRA NSW 2540

CANA 1/25/2
CANA 511/99

The Commodore
Cruising Yacht Club
New Beach Road
DARLING POINT NSW 2027

Dear Mr van Kretschmar

I note that a condition of our 1999 Sydney to Hobart Race is that thirty percent of a crew must have attended a CYC Safety Seminar or AYF Yacht Safety and Survival course. Naval Aviation has been represented at a number of the CYC seminars during which a brief on RAN SAR techniques was provided. Please note that the techniques briefed by RAN personnel covered RAN procedures. These may not accord with standard practice within civil industry or those endorsed by AUSSAR. I have advised AUSSAR of this issue and also spoken with a Mr Dan Tyler who is President of the Helicopter Association of Australia (HAA). Dan may be contacted at NRMA Careflight, telephone (02) 8916144. There may be potential for a brief on SAR procedures to be provided to your members by an appropriate representative of the rescue authority and the civil rescue helicopter industry.

Yours sincerely

C. F. GEORGE, AM
Captain, RAN
Commander Australian Naval Aviation Force

Telephone: (02) 4421 1349
Facsimile: (02) 4421 1353

20 August 1999

Doc 4

Cruising Yacht Club of Australia

A.C.N. 000 116 423

New Beach Road, Darling Point, N.S.W. 2027

Telephone: (02) 9363 9731 • Fax: (02) 9363 9745

Internet: www.cyca.com.au Email: cyca@bigpond.com

ADDRESS ALL CORRESPONDENCE TO THE CHIEF EXECUTIVE OFFICER

RECEIVED

1/25/2

C. F. George, AM
Captain RAN
Commander Australian Naval Aviation

Dear Chris

The Cruising Yacht Club of Australia is instigating a Sydney-Hobart Yacht Race Crisis Management Plan in order to be fully prepared for any incidents that may occur.

On October 20th the CYCA will be holding a Planning Meeting for Rescue Authorities and would very much appreciate representatives from your organisation attending.

The Meeting is scheduled for 2pm. Please advise Andrea Holt at the CYCA Sailing Office on 9363 4445 of your ability to attend.

Yours faithfully,

A. Holt

Phil Thompson
Sailing Manager.

Sydney-Hobart Yacht Race

Cruising Yacht Club of Australia

Crisis Management Plan

Version 01
Status: Draft

Copy Number _____

Document Date: 23/9/1999

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BUSINESS
RISK
SERVICES

Issuing Authority

This document is produced under the authority of the Chief Executive - Cruising Yacht Club of Australia.

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Change Control Record

Version number	Version date	Change record details
01	23/9/1999	Initial draft

Review Record

This document has been reviewed by:

________________________ *(Author)*
Date: ___/___/___

________________________ *(Reviewer)*
Date: ___/___/___

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1 Contact Information

Contact information for persons and organisations with a defined role in the execution of the Crisis Management Plan. These would include:

- The Crisis Management Team
- Key Line Management
- Support Teams from the Police, Search and Rescue and the Navy.
- Race Media Centre
- Race Committee
- Race Sponsors

Alternates should be identified for each team member.

1.1 Crisis Management Team

Title	*Name*	*Business Hours Phone Number*	*Mobile or Pager Phone Number*	*After Hours Phone Number*	*Home Address*
Chief Executive Officer	Andrew Thomson	02) 9363 9731	0408 266 922	02 9363 5542	3 / 4 New Beach Road Darling Point 2027
CMT Co-ordinator	Steve York	9232 6333	0416 010 858	9585 2066	47 McRaes Avenue, Penshurst NSW 2222
CYCA Director	Geoff Lavis	02 4229 8861	0414 298 861	02 4284 0481	34 Peace Crescent Balgownie 2519
CYCA Director	Don Telford	02 8923 2301	0418 220 050	02 9959 4533	26 Whaling North Sydney 2060
	John Brooks			02 9960 2607	1/25 The Crescent Mosman 2088
	Maryrose Heffernan	(02) 9363 4445	0414 695 546	9369 5545	76 St James Road Bondi Junction 2022

1.2 RYCT Teams

Title	*Name*	*Business Hours Phone Number*	*Mobile or Pager Phone Number*	*After Hours Phone Number*	*Home Address*
Immediate Past Commodore	Robert Badenach	0362 359 311	0417 331 4410	0362 251 484	34 Red Chapel Avenue Sandy Bay 7005
Commodore	John Sharman	0362 234 599	0412 326 173	0362 251 997	2 / 5 Rose Court Sandy Bay 7005
General Manager	Michael Wearne	0362 234 599	0417 052 086	0362 348 674	143 Melville Street Hobart 7000
Inspector of Police	Hank Timmerman	0362 032 184	0419 509 618	0362 651 765	19 Brady Street Midway Point 7171

1.3 Support Teams

POLICE

Title	*Name*	*Business Hours Phone Number*	*Mobile or Pager Phone Number*	*After Hours Phone Number*	*Home Address*
Police	Grahame Welsh	02 9692 5411			

NAVY

Title	*Name*	*Business Hours Phone Number*	*Mobile or Pager Phone Number*	*After Hours Phone Number*	*Home Address*
Navy					

AMSA

Title	*Name*	*Business Hours Phone Number*	*Mobile or Pager Phone Number*	*After Hours Phone Number*	*Home Address*
AMSA					

RACE COMMITTEE

Title	*Name*	*Business Hours Phone Number*	*Mobile or Pager Phone Number*	*After Hours Phone Number*	*Home Address*
Race Director	Phil Thompson	02 9363 4445	0419 288 323	02 9909 2643	43 Bennelong Road Cremorne 2090
Race Chairman	Hans Sommer	02 9428 2900	0418 221 710	02 9953 6369	9/12 Kareela Road Cremorne Point 2090
Race Committee	Mark Robinson	02 9363 4445	0418 966 776	02 9712 0471	6 / 26 Kings Road Five Dock 2046
	Mark Pryke	02 9907 1066	0419 22 33 44	02 9905 1000	5 Libya Crescent Allambie Heights 2100
	Howard Elliott	02 9342 6309	0411 508 810	02 9877 0222	11 Hillside Crescent Epping 2121
	Robert Badenach	0362 359 311	0417 331 441	0362 251 484	34 Red Chapel Avenue Sandy Bay 7005
	John Sharman	0362 234 599	0412 326 173	0362 251 997	2 / 5 Rose Court Sandy Bay 7005
Race Committee Hobart	Ken Batt	02 9296 1622		02 9918 0749	27 George Street Avalon 2107
Race Committee Hobart	Sam Hughes	0262 306 818		0262 816 558	49 Jennings Street Curtin ACT 2605

Media Centre

Title	*Name*	*Business Hours Phone Number*	*Mobile or Pager Phone Number*	*After Hours Phone Number*	*Home Address*
Media Centre	Peter Campbell	9869 8197	0419 385 028	9869 8489	64 Boronia Avenue Cheltenham 2119
	Lisa Smith	9363 9731	0418 428 511	9521 7130	3 Moona Road Kirrawee 2232

Title	*Name*	*Business Hours Phone Number*	*Mobile or Pager Phone Number*	*After Hours Phone Number*	*Home Address*
Weather Bureau	Ken Batt	02 9296 1622		02 9818 0749	27 George Street Avalon 2107
J – Track Personnel					

Forward Race Liaison

Title	*Name*	*Business Hours Phone Number*	*Mobile or Pager Phone Number*	*After Hours Phone Number*	*Home Address*
Forward Race Liaison	Andrew Thomson	02 9363 9731		02 9363 5542	3 / 4 New Beach Road Darling Point 2027
	Andrea Holt	02 9363 9731		02 9817 5558	80A Park Road Hunters Hill
CMT / Media	Di Pearson	02 9363 9731		02 9388 7182	4/4 Marine Parade Watsons Bay 2030

Radio Relay Vessel

Title	*Name*	*Business Hours Phone Number*	*Mobile or Pager Phone Number*	*After Hours Phone Number*	*Home Address*
Radio Relay Vessel	Lew Carter	02 9966 7631	0413 046 656	02 9371 0024	3/13 Dumaresq Road Rose Bay 2029
	Michael Brown		0408 446 794	07 5444 6794	10 Mawarra Ave Buddina Qld 4575
	Audrey Brown		0408 446 794	07 5444 6794	10 Mawarra Ave Buddina Qld 4575

2 Authority

Recognizing the risks to participants in this challenging offshore race the purpose of this CYCA Crisis Management Plan is to manage any emergency issues for the Club and participating sailors.

It also very clearly defines the Crisis Managament Team Members and their roles in managing the emergency.

The Race Fleet is at sea from the 26th December to 1st January, but Race times are subject to differing weather conditions. The Crisis Management Team will be on call throughout the time the fleet is sailing the 630 nautical miles from Sydney to Hobart.

The CYCA Crisis Management Tam will be based out of the C.Y.C.A. offices in Sydney and from there they will communicate with the Mobile Crisis Control Tem who will be in Eden or Hobart, the CYCA Media Centre in Hobart, and the RYCT Crisis Management Team in Hobart but the Control Centre will be in Sydney at the C.Y.C.A.

The CYCA would like to thank Steve York and Business Risk Services (ph. 02 9232 6333) for their assistance in preparing this plan.

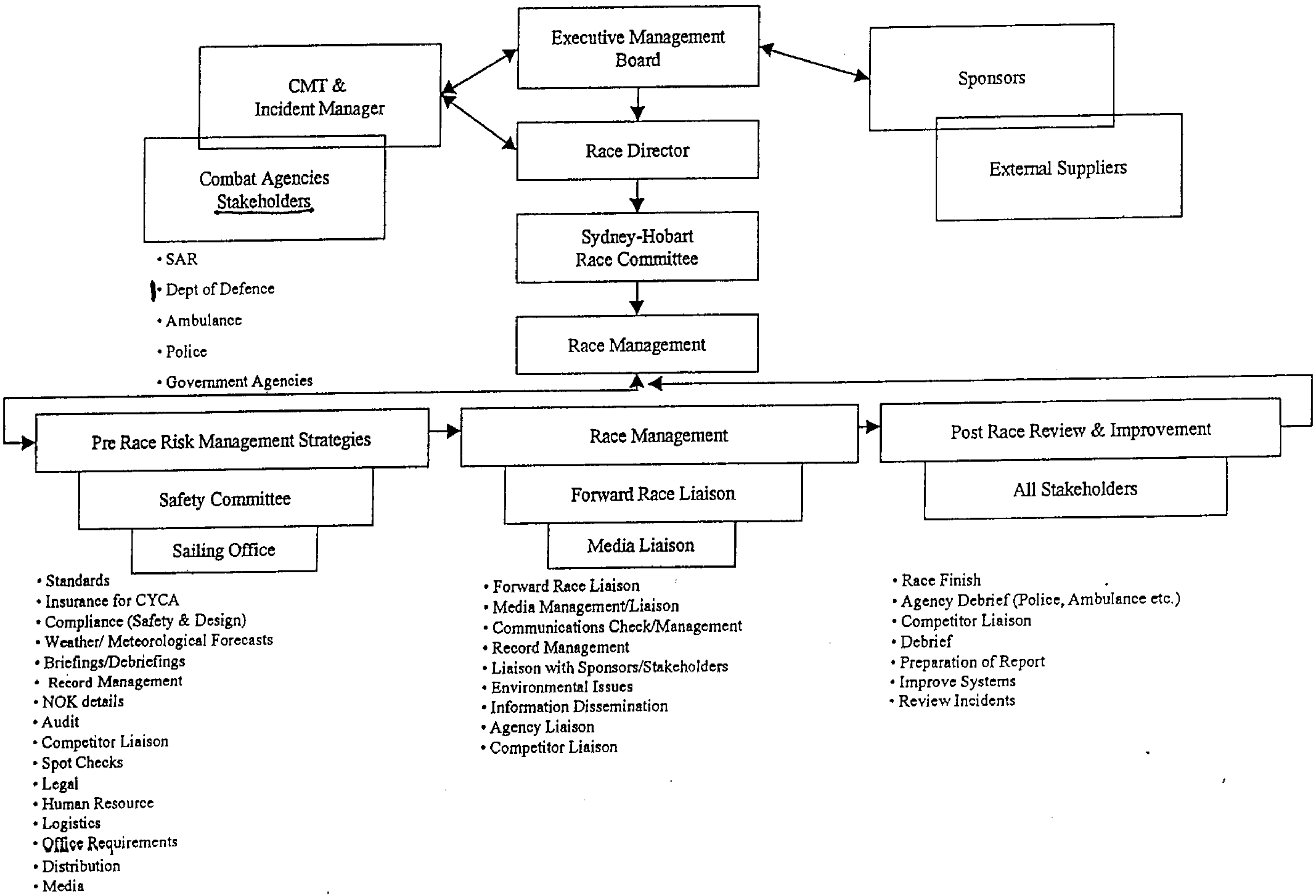
3 Emergency Management Organisation

3.1 Organisation Chart

The Crisis Management Organisation is a specialised organisation structure (which may or may not be the same as the existing corporate organisation). It is formed when a disaster is declared.

As the chart to the side shows, the Crisis Management Organisation consists of a number of teams with specific roles and objectives.ion technology teams with specific roles and objectives. Each team has a Team Leader and team members.

Crisis Management Structure



3.2 Emergency Management Team Charters

The table below provides an explanation of the key objectives as summarised in their Team Charter:

Team	*Team Charter*
Sydney	The objective of the (Company) Management Team is to: • Receive notification and co-ordinate the assessment of an incident • Coordinate the recovery teams • Notify the Duty Manager (a representative of the Crisis Management Team). • Establish and maintain C.Y.C.A. Crisis Management Strategy
Hobart	
Mobile	

4 Emergency Management Plan Structure

4.1 Definitions of Emergencies

Level 1 –Severe Incident

Assessment	Response	Who
Major severity/impact (see Risk Management Guide) Potential loss of life Emergency services response MOB for more than ten minutes	• Immediate • Report to emergency agencies • Decision to activate CMT • Supporting teams mobilised	Race Director/Alternate Emergency services

Level 2 – Major Incident

Assessment	Response	Who
Moderate severity/impact (see Risk Management Guide) Major damage Potential weather conditions Potential severe incident MOB AMSA Activation EPIRB Activation Injury	• Formal declaration • CMT notified • Emergency services notified	Race Director/Alternate Emergency services

Level 3 – Minor/Incident

Assessment	Response	Who
Minor severity/impact (see Risk Management Guide) Injury	• Local decision by race management • Report to Race Director and Race management centre • No formal declaration	

5 Risk Management Matrix

Through out this document the following matrix, based on the Australian Risk Management Standard AS4360, is used to assess risk and the above criteria.

The CYCA has reduced the assessment of incidents covered by this plan into the above categories due to the nature of ocean racing and assessment by the Crisis Management Team

5.1 Risk Assessment Matrix

Impact / Consequences

Likelihood	insignificant	minor	moderate	major	severe	unknown
unknown	S	S	[redacted]	[redacted]	[redacted]	[redacted]
almost certain	S	S	[redacted]	[redacted]	[redacted]	[redacted]
lilkey	M	S	S	[redacted]	[redacted]	[redacted]
moderate	L	M	S	[redacted]	[redacted]	[redacted]
unlikely	L	L	M	[redacted]	[redacted]	[redacted]
rare	L	L	M	S	[redacted]	[redacted]

Legend

[redacted]

Significant

Moderate

Low

6 Using the Emergency Management Plan

6.1 Emergency Identification – By any competitor, member of the CYCA Crisis Management Team, or other Team.

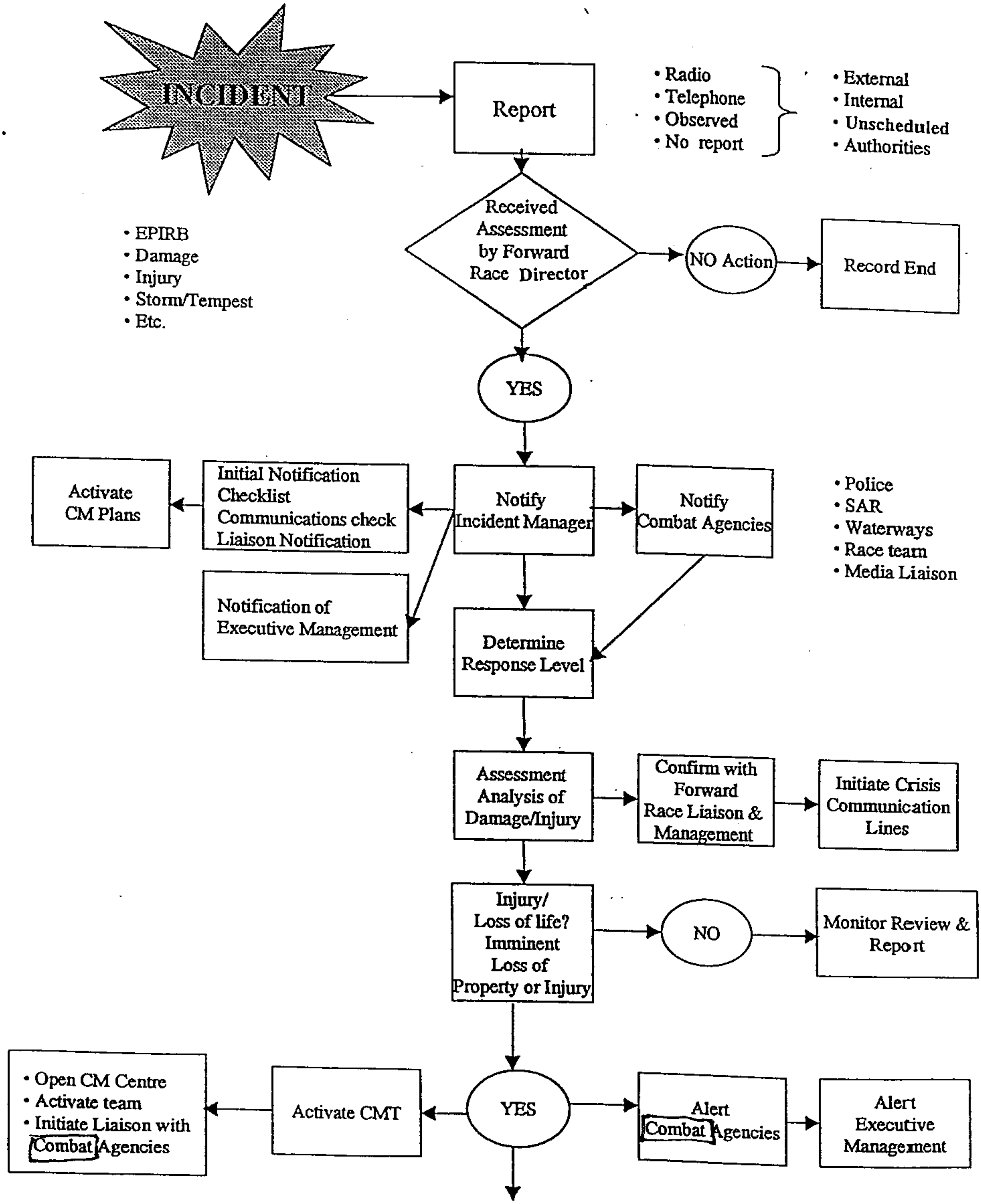
6.2 Assessment – By Race Director

6.3 Escalation – By Race Committee

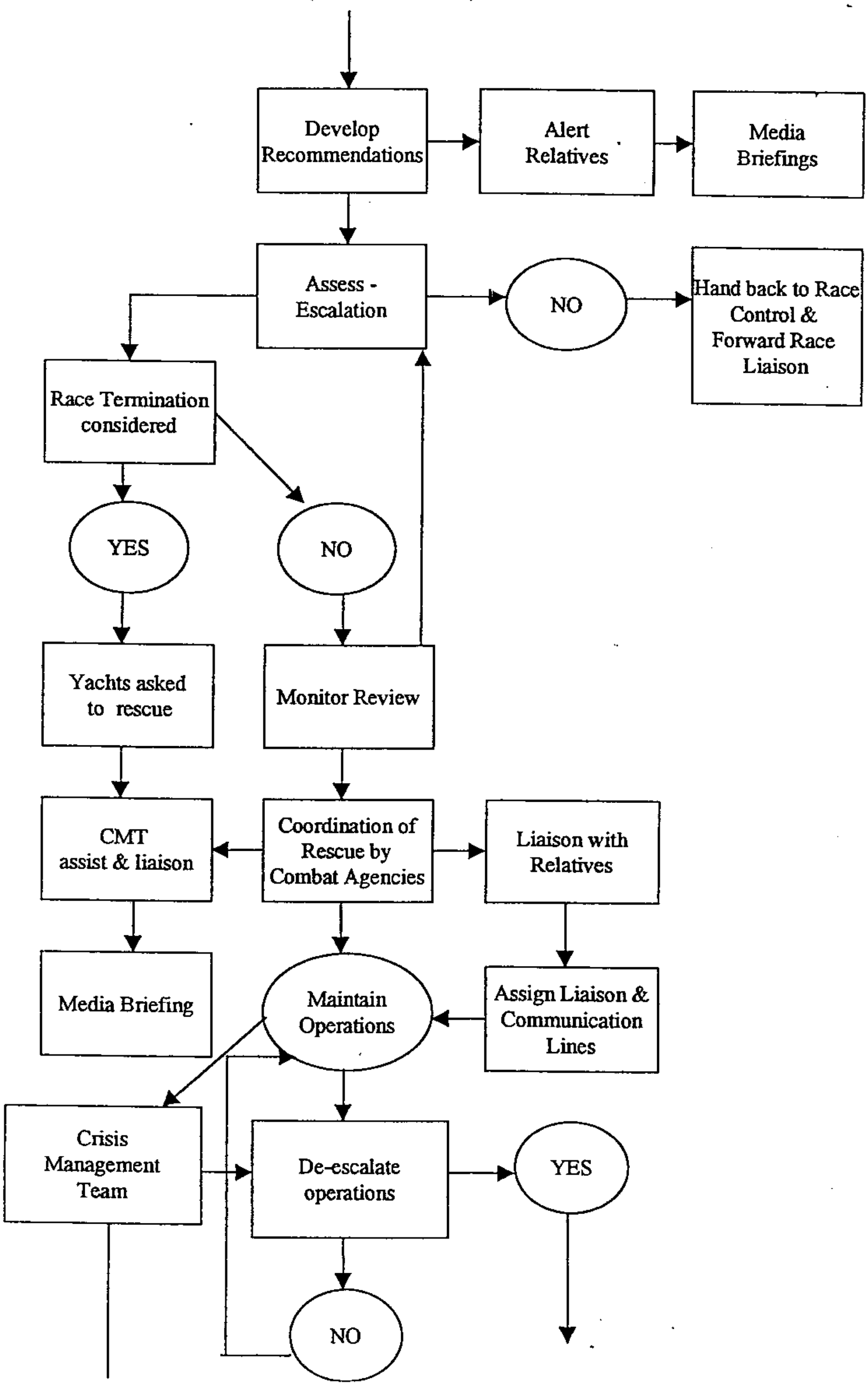
6.4 Callout procedures authorized by Race Director

6.5 Emergency Management – C.Y.C.A. will have control of the issues pertaining to the C.Y.C.A., Police or other agencies of control of any rescue operation,

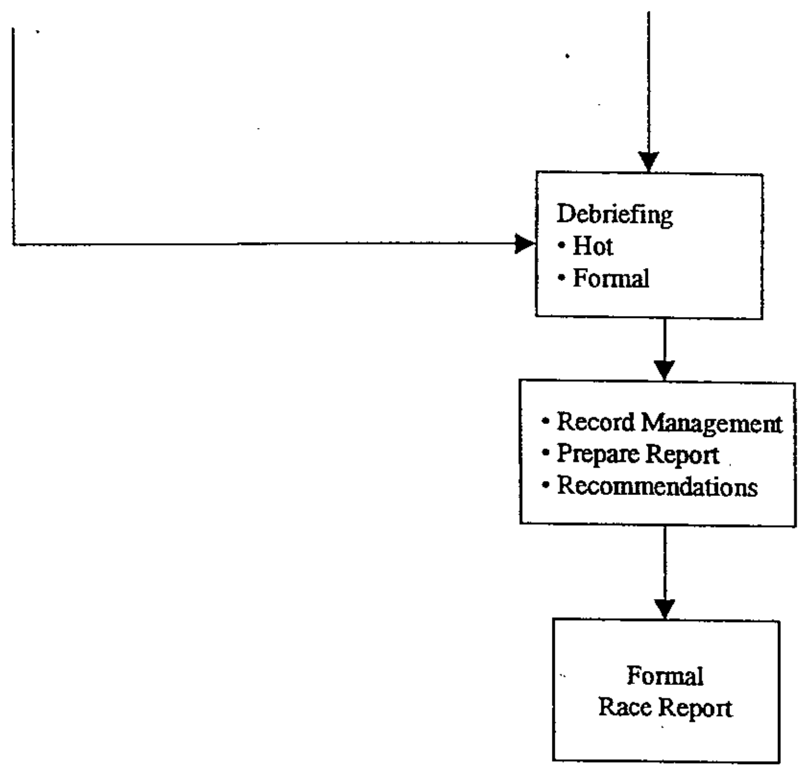
Crisis Management Incident Flow Chart



Crisis Management Incident Flow Chart
(continued)



Crisis Management Incident Flow Chart
(continued)



7 Crisis Control Centre (CCC)

7.1 Establishing the Crisis Control Centre

7.2 Emergency Control Centre Locations

7.2.1 Primary Emergency Control Centre - Sydney

7.2.2 Mobile Emergency Control Centre - Eden / Hobart

7.2.3 Bega Secondary Control Centre

7.3 Crisis Control Centre Resources

(I.E. pens, papers, tables chairs, log, radio, telephones etc.).

7.4 Operating the Emergency Control Centre

Standard Operating Procedures

8 Emergency Management Procedures

Emergencies may include:

- Weather
- Man Overboard
- Sinking Vessel

Individual detailed plans may exist for these emergencies and should be referenced by the applicable Emergency Procedure.

8.1 Incident Management Procedures

Detailed Emergency response procedures for identified emergencies. For each identified emergency the procedure would detail the following:

8.1.1 Threat A - Weather

- Procedure Custodian – Ken Batt and Race Director
- Definitions – Monitor the threat pre and during race to reduce risk.
- Response Procedure
  - Assessment and report to Race Director
  - Activation by Race Director
  - Management by Crisis Management Team.

Preventative Strategies

Training Seminars
Representative at Briefing on 24/12/99
Full Weather Briefing on 26/12/99
Weather Consultant with Race Committee

8.1.2 Threat B – Man Overboard

- Procedure Custodian – Sam Hughes (AMSA) and Race Director.
- Definitions
- Response Procedure
  - Assessment and report
  - Activation
  - Management

Training Seminars
Increased Personal Safety Equipment
Dedicated Personnel for Next of Kin Liaison of each incident

8.1.3 *Threat C – Sinking Yacht*

- Procedure Custodian – Sam Hughes (AMSA) and Race Director
- Definitions
- Response Procedure
  - Assessment and report
  - Activation
  - Management

Training Seminars
Liaison between Insurance Companies
Vetting Committee
Increased & Improved Safety Equipment
Dedicated Personnel for Next of Kin Liaison of each incident
Tracking Devices

8.2 *Time Line*

Risk Management Strategies

14/10/99	South Coast Planning Forum
19/10/99	Stakeholders Meeting to nominate Agency Delegates
1/11/99	Close of Application for Entries
26/11/99	Close of Entries
24/12/99	Race Briefing
26/12/99	Weather Briefing
26/12/99	Race Starts
27/12/99	Race Committee moves to Hobart
28/12/99	Crisis Management Team moves to Eden

9 Appendices

List all things we'll attach:-

SYDNEY-HOBART CHART LIST -	Aus.197	For Start
	Aus.808	To Jervis Bay
	Aus.807	To Montague Island
	Aus.806	To Gabo Island
	Aus.358	Across Bass Strait
	Aus.356	Flinders Island to St Helen's Point
	Aus.423	If Course is East of 807, 806, 358 and 356
	Aus.355	Into Storm Bay and to Finish
	Aus.422	Gabo Island to South of Tasmania
	Aus.171	Iron Pot. up Derwent River to Finish & Dunalley Canal
	Aus.795	Storm Bay
	Aus.172	Port of Hobart. For Finish
DETAILS OF PORTS AND ISLANDS EN ROUTE -	Aus.200	Port Jackson
	Aus.195	Port Kembla and Wollongong with Approaches
	Aus.193	Jervis Bay
	Aus.191	Bateman's Bay, Twofold Bay, Ulladulla Harbour, Kiama
	Aus.179	Plans in Banks Strait
	Aus.170	Cape Sonnerat to Maria Island, Spring Bay
	Aus.174	Port Arthur & others

Radio Frequencies

All other necessary info.

Resource Inventory and Supplementary Documentation

This Section contains a list of items required for this plan to operate efficiently. The resources listed are stored at the locations listed below.

Item	*Description*	*Qty*	*Location*	*Review Date*
1.	Mobile Phone, battery and charger			
2.	Taxi Vouchers			
3.	Torch (and fresh batteries)			
4.	Log on passwords			
5.	Signature plate for cheque signer			
6.	Certificate Forms for printing			
7.				

10 Facility Guides

10.1 (Primary Site) Evacuation Meeting Point

(Primary Site) Evacuation Meeting Point

Meet near the front of the (Primary Site)

(Primary Site Diagram)

10.2 Location Map

Maps / Charts
- CYCA
- Hobart
- Eden

Check / Usual Route / Latitude & Longitude
Helicopter Bases
Hospitals

10.3 Floor Plan of Emergency Control Room

(Site Plan Diagram)

10.4 Maintaining and Rehearsing the Plan

10.4.1 Scheduled Plan Reviews and Maintenance

This plan will be reviewed in accordance with the schedule detailed below. The xxxxx will be responsible for coordinating the reviews and receiving updates to the plan documentation.

Plan Section	Who Reviews and Updates	When Reviewed and Updated

10.4.2 Scheduled Rehearsal Program

This plan will be rehearsed in accordance with the schedule detailed below. The xxxxx will be responsible for coordinating the rehearsals and receiving updates to the plan documentation.

Loss Scenario	Rehearsal Objectives (Measurable)	Rehearsal Scenario	Rehearsal Resource Requirements	Rehearsal Plan	Review and Feedback Process	Date of Test
Liferaft Theory					The process for reviewing the rehearsal, reporting results and implementing any changes to the plan as a result of the rehearsal.	
Helicopter Procedure						
Flare Day						
Liferaft Righting						

11 Glossary of Terms

Disaster
A disaster is defined as an unplanned event requiring the immediate redeployment of limited resources. Disasters can be human, natural or technological in nature. Natural event (eg. earthquake, fire, flood, storm) Human behaviour (ie. bomb threat, arson, hostage event, robbery) Technology breakdowns (ie. power outage, computer system failure)

Recovery Phase
The period of time immediately following the disaster declaration when the (Company) is establishing alternate resources to ensure that critical business processing can be performed.

Interim Processing Phase
The phase after a disaster has occurred when the (Company) is conducting business using the alternate facilities at the (Recovery Site).

Alternate Procedures
Alternate processing procedures are procedures which can be used to substitute for normal processes eg manual processing techniques. Alternate procedures can be adopted during the recovery phase.

Restoration Phase
Moving to either the original site, a new site or an intermediate site.

ABS	American Bureau of Shipping
AMSA	Australian Maritime Safety Authority
AYF	Australian Yachting Federation
BOM	Bureau of Meteorology
Boxing Day	26 December
BPN	Business Post Naiad
Cat 1	Category 1 (a class of safety requirement for yachts racing offshore)
CHS	Channel Handicap System
ColRegs	International Rules for the Prevention of Collisions at Sea
CYCA	Cruising Yacht Club of Australia
EPIRB	Emergency Positioning Indicator Radio Beacon
ETA	Estimated Time of Arrival
GPS	Global Positioning System (a navigation system using satellites)
GRP	Glass Reinforced Plastic (a material used in the construction of many modern yachts)
HF	High Frequency (radio)
IMS	International Measurement System
IOR	International Offshore Rule
ISAF	International Sailing Federation
ITC	International Technical Committee
IYRU	International Yacht Racing Union
kHz	Kiloherz
Knots	= nautical miles per hour (a measure of speed)
LOA	Length Overall
LPS	Limit of Positive Stability (a measurement of the righting ability of a vessel)
May Day	internationally recognised distress call

Mb	Millibar (a measure of pressure)
MHz	Megaherz
MOB	Man Over Board
MSL	Mean Sea Level
NOK	Next of Kin
NOR	Notice of Race
ORC	Ocean Racing Club
PAN PAN	internationally recognised urgency call
PFD	Personal Flotation Device (life jackets which fall into various classes depending on their rated buoyancy and operational characteristics)
PFD 1	Personal Flotation Device Type 1 as specified by the Australian Standards
PHS	Performance Handicap System
POB	People on board
RCC	Race Control Centre
RF	Radio Frequency
RORC	Royal Ocean Racing Club
RRS	"ISAF Racing Rules of Sailing for 1997-2000" published by AYF.
RRV	Radio Relay Vessel
RVCP	Royal Volunteer Coastal Patrol
RYCT	Royal Yacht Club of Tasmania
SAR	Search and Rescue
SGC	Solo Globe Challenger
SHYR	Sydney Hobart Yacht Race
SHRRC	Sydney Hobart Race Review Committee
SI	Sailing Instructions
Sked	Schedule (a set program of radio communications)
SOO	Sword of Orion
Spectra	a type of braid used on yachts for halyards
Telstra Control	name of the Radio Relay Vessel in the 1998 SHYR
VCOS	VC Offshore Stand Aside
VHF	Very High Frequency (radio)
VIB	Brisbane Radio
VIH	Hobart Radio
VIS	Sydney Radio
VIM	Melbourne Radio
WC	Winston Churchill
Yachtcom	Telstra Yacht Communication System
YRA	Yacht Racing Association

DOC 5

COMAUSNAVAIR
Naval Air Station
NOWRA NSW 2540
Ph (02) 44211349

CANA 1/25/2
CANA 600/99

The Sailing Manager
Cruising Yacht Club of Australia
New Beach Road
DARLING POINT NSW 2027

Dear Mr Thompson

Thank you for the invitation to attend your Crisis Planning Meeting on 20OCT99. I am concerned that you should be aware that Search and Rescue (SAR) operations arising from or associated with the Sydney to Hobart Yacht Race is not primarily a matter for Navy, which does not have aircraft routinely available for SAR operations. The issue is AUSSAR's within the Australian Maritime Safety Authority (AMSA) and possibly within the direct concern of CYC in consultation with Sydney to Hobart participants and civil rescue helicopter companies. During the 1998 race Navy helicopters were alerted through the Australian Defence Force Headquarters by AUSSAR.

Unfortunately I am unable to attend the meeting but I will send a representative. LCDR Terry Garside will attend in an informal capacity. From the material available to me, my analysis of the CYC's investigation of the 1998 race and it's subsequent actions has concluded, that the training and equipment required to be carried by entrants in the 1999 race does not minimise the risk to the safety of the crews (in my view) to the reasonably practicable extent. I have dealt with this matter in earlier correspondence.

I recommend that your Crisis Planning activity should commence with a Risk Assessment of the forthcoming Sydney to Hobart Race. This would provide a guide for the optimum briefing/preparation of entrants and the management of crises when they occur. I know that there are companies who are available that can introduce you to the subject of how to complete and use a Risk Assessment should you wish.

Yours faithfully

C.F.GEORGE AM
Captain
Commander Australian Aviation Force

Tel: (02) 4421 1349

15 October 1999

Commander Australian Naval Aviation Force. HMAS ALBATROSS. NOWRA NSW 2540

CANA 1/25/1
CANA 672 /99

The Commodore
Cruising Yacht Club of Australia
New Beach Road
DARLING POINT NSW 2027

Dear Sir

SYDNEY TO HOBART YACHT RACE (SHYR) CRISIS PLANNING

Thank you for the opportunity to participate in your Crisis Planning Meeting on 20 Oct 99. We have studied the draft Crisis Plan and note that the risk assessment process followed appears to be different from that prescribed by the AS/NZ Standard on Risk Management (AS/NZS 4360:1999). It is not possible to determine the risks presented by the various hazards of the race nor the measures that might therefore be applied to mitigate the risk they present. The Crisis Plan clearly is predominantly about the management of an event after it has occurred. I note that Navy is listed as a stakeholder in the CMP. As I have previously advised, the Naval Aviation Force is not a stakeholder and will become involved in associated activity only after being tasked through Defence Headquarters by AMSA/AUSSAR.

May I ask about a number of other safety related issues, which in my view should be included in CYC's safety training plans?

a. **The SHYR risk environment.** Has CYC as the regulator of the SHRY provided for entrants an assessment of the environment that is likely and possibly to be encountered during the race? Here I mean:

- Sea state/weather against probability of occurrence;
- Sea/air temperature with an estimation of survival times following immersion and exposure in various clothing states;
- The probability of damage/loss of yachts based on race history (the CYC's report of the 1998 SHYR is very useful in this regard);
- The probability of injury/fatality based on race history;
- The CYC's policy regarding the activation of helicopter or other rescue services; and
- The estimated time helicopter or other rescue services will need to arrive on scene day/night and at various positions along the route of the race.

I propose that the promulgation of this data would empower skippers and crews to better manage their safety and exposure to personal risk. As such this would be a most appropriate risk control measure.

b. **Safety Training**. The Notice of Race for the 1999 race requires only "30 percent" of competing yachts' crews to have completed safety training. The reason behind this policy is a matter for CYC. but I recommend that CYC should formally remind skippers and boat owners of. what I understand is. their duty of care and legal responsibility according to OH&S legislation. This requires them to ensure that every member of their crew is appropriately trained. (The draft Standard for Onboard Safety Training by National Marine Safety Committee refers.)

c. Specific Safety Issues.

- **EPIRB's and strobes**. These with flotation equipment. harness and thermal protection should be attached to each crew member. if not at all times. certainly at night and in bad weather. (The experience with Green Hornet during the Melbourne to Osaka 1999 is relevant.)

- **Drogues**. The CYC's report of the 1998 SHYR found (at paragraph 9.4) that:

  "their use would have been a sound option in the conditions of the 1998 race." RORC in their memorandum on safety, recommends yachts 'consider carrying a drogue or drogue system.' Their deployment in some conditions would steady a boat during the SAR helicopter rescue evolution. However, a recommendation on the carriage of drogues appears not to have been given for the 1999 SHRY. Is there a reason for this?

- **Equipment Safety Standards**. The AYF's Racing Rules of Sailing (Special Regulations) are in places. significantly different to the RORC's Special Regulations. Specifically RORC at Appendix B of the organisation's Special Regulations lists International Standards applying to yachts and, in particular, safety equipment (including liferafts). Are these being used by AYF as a definition of 'best practice'? A specific anomaly appears to be Appendix II, Addendum A.1 of AYF's special regulations at subparagraph 1j where the capacity is decided by dividing the volume of main buoyancy tubes in litres by 96. Conversely RORC determines capacity by dividing volume in cubic centimetres by 96.

- **Hypothermia**. Although the probability does not appear to have been discussed, it seems likely that hypothermia contributed to the outcomes of the 1998 SHYR. Is the condition, the likelihood of its occurrence and protection against it, covered in CYC's safety seminars? I propose that the subject should be briefed in detail. Some participants in the 1998 race appeared not to have a safe knowledge about the risk presented by exposure.

- **Risk to helicopters**. It is perhaps understandable that yachts' crews have in some cases a misplaced confidence that a SAR helicopter will be able to bring them to safety in even extreme conditions. This is not always the case and, as a rough guide, the risks to the helicopter are usually about the same as those being experienced by the yacht with which the SAR evolution is being conducted. Again I propose that yachts could be empowered by this information.

In conclusion, many of the recommendations above may have already been put in place by CYC or there may be reasons not known to me why CYC/AYF have established the existing regulation/safety framework. In either case I would be most interested to know the outcome of considerations so that I may further my education and better understand the hazards and risks presented to race participants and Navy aircrew should they again become involved. I would be pleased to discuss any of the issues raised in this and previous letters and would welcome an opportunity to visit CYC. A very important objective for me is to assist with making the SHYR as safe and successful as this great Australian event can reasonably be.

Yours sincerely

Cris George.

C. F. GEORGE, AM RAN
Captain
Commander Australian Naval Aviation Force

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15 November 1999

Doc 7

Cruising Yacht Club of Australia

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ADDRESS ALL CORRESPONDENCE TO THE CHIEF EXECUTIVE OFFICER

09 December 1999

C.F. George AM RAN
Captain
Commander Australian Naval Aviation Force
HMAS Albatross
Nowra NSW 2540

RECEIVED
1 4 DEC 1999
FILE No.: 1/25/2
COMAUSNAVAIR

Dear Commander George,

Thank you for your detailed response following the Crisis Planning meeting in October.

Although we have not fully responded to your questions here, often because we don't necessarily have the answer, or we are still framing policy, we have passed your letter to our Sailing Committee and also to the Ocean Racing Club (ORC) the international body, ultimately responsible for formulating ocean racing safety policy.

(a) **Sydney Hobart Yacht Race risk environment** - your suggestions here are extremely valid and we intend to include them in our planning and briefing.

Note that the CYCA has no power, nor does it want any to activate helicopter or other SAR intervention. AMSA has this authority, and we access AMSA via a Liaison Officer permanently attached to the Race Management Team from 24 December.

(b) **Safety Training** - the 30% policy is a minimum.

The response to the programme has been excellent. The 'normal' crew population for a Sydney Hobart Yacht Race would be about 1,100 (based on 100 yachts). To date, over 2,000 have participated in the scheme.

(c) **Specific Safety Issues**

- **EPIRBS and Strobes** - noted and we will look at incorporating the appropriate protocols in safety procedures.
- **Drogues** - equipment carried on racing yachts can easily be substituted for drogues, eg. spinnakers, sails, anchors and warps and were successfully used during the 1998 Sydney Hobart Race. The use of drogues and substitutes are covered in the Heavy Weather Seminar.
- **Equipment Safety Standards** - the AYF as the governing body chose to adopt Australian Standards for equipment. This by and large explains the differences between the AYF and RORC.
- **Hypothermia** - you are right. This was not considered in the 1999 Race Review.

- Interestingly, crews - even those that were in extreme peril having been rolled, reported water temperatures being quite warm. The satellite image of the current supports this. Notwithstanding, had the storm hit the fleet another 100 miles south, the impact of water temperature could have been vastly different. Our seminar on heavy weather, includes a lengthy session on what is appropriate clothing, and preparation to meet difficult weather conditions. We also supply all seminar attendees and all competing yachts with a copy of AMSA's book 'Survival at Sea'. There is a section on hypothermia. As a result of your letter this section will be specifically referred to at the race briefing on 24 December.

- **Risks to Helicopters** - you may know that the auto-hover failed on one chopper in the midst of a rescue in 1998. As a general statement, I believe that the yachting community, certainly those that participated last year, are well aware of the risks to helicopters and have a healthy respect and admiration for the pilots and crews. This is discussed at the helicopter rescue seminar.

I hope this answers some of your questions. Thanks again for the constructive input.

For and on behalf of the
Cruising Yacht Club of Australia

PETER BUSH

PNL

Doc 8

75 Princes Highway
Falls Creek
Nowra NSW 2540
9 APR 00

Mrs Pam Lazzarini
Crown Solicitor's Office
GPO Box 25
Sydney 2001

Dear Pam,

Sydney to Hobart Yacht Race 1998: CRN 403208

Further to the material I sent you on 20MAR00, I thought that you might find the Joint Media Release from the Minister for Defence and Minister for Transport of 6MAY97, relevant **(Enclosure 1: JOINT MEDIA RELEASE MIN 70/97 Tuesday,6 May, 1997)**. The release appears to address issues that might also have influenced the outcomes of the 1998 Sydney to Hobart Yacht Race and more recent maritime SAR operations.

I learnt last week from an article in one of our Naval Aviation Flight Safety publications, TOUCHDOWN 1/97, **(Enclosure 2: The Vendee Globe MARSAR)** that Mr Theiry Dubois had experienced difficulties with his life raft which were possibly similar to those encountered by the crew of Winston Churchill. In particular, I was interested to hear that Dubois had reportedly encountered structural and stability problems with the raft dropped to him prior to his rescue by the helicopter from HMAS Adelaide. I do not know what follow up actions/lessons learnt were subsequently passed to yachting federations by AMSA/AUSSAR.

Yours faithfully,

CGeorge
C.F. George
CAPT RAN

Enclosures.

Encl 1 to cf of 9 Apr

AUSTRALIA

JOINT MEDIA RELEASE
from

The Minister for Defence The Minister for Transport
Mr Ian McLachlan Mr John Sharp

MIN 70/97 Tuesday, 6 May, 1997

SOUTHERN OCEAN LESSONS NOT FORGOTTEN

Australia's maritime rescue services have learnt valuable lessons from reviewing all aspects of the Southern Ocean yacht rescues earlier this year. These would be conveyed to yachting federations and race organisers to ensure all would benefit from Australia's experience in these rescues.

In a joint announcement today, the Minister for Defence, Mr Ian McLachlan, and the Minister for Transport and Regional Development, Mr John Sharp, said future rescues would benefit both from the reviews and the on-going improvements to Australia's search and rescue capability.

The Ministers said although it was not Australia's job to issue instructions to international race organisers, the Southern Ocean rescues demonstrated several deficiencies in precautionary and safety measures which should be addressed for future races. These included:
- Ensuring the Maritime Rescue Coordination Centre had access to all race information prior to yachts arriving in the Australian Search and Rescue Region;
- Emphasising Search and Rescue (SAR) arrangements for different regions at pre-race briefings;
- Improving survival training for yacht crews with emphasis on a better understanding of the COSPAS-SARSAT satellite system;
- Instituting more northerly waypoints for yacht routes and ensuring the course was within the operational radius of long range maritime patrol aircraft;
- Ensuring all competitors were equipped with suitable radios;
- Making it mandatory for yacht hulls to be marked with high visibility dayglo orange.

The Ministers said Australia's maritime rescue services would also review their procedures, including:
- Examining the design, contents and identification of Air Sea Rescue Kits;
- Reviewing methods of accurately delivering survival equipment in the worst conditions;
- Marking survival equipment with pictograms and multilingual directions;
- Improving the briefing arrangements between both the Transport and Defence Departments, and
- Better coordination of Search and Rescue assets during rescues.

Quoting examples, Mr McLachlan said the 10-man life raft dropped during the Southern Ocean rescues was too large for one person to manage in extreme seas and tended to roll in high wind conditions. "As a result, the Royal Australian Air Force will investigate an alternative smaller air dropped raft more suited to rough conditions," he said.

"The RAAF will also review the design of its Survival Stores Containers after noting survivors had difficulty opening the containers in cold and windy conditions."

"The new search and rescue amalgamation which comes into force on 1 July 1997 will further enhance Australia's rescue activities," Mr Sharp said.

The Ministers said Defence personnel and members of the Australian Maritime Safety Authority (AMSA) and its Maritime Rescue Coordination Centre (MRCC) played an invaluable role in ocean rescues.

Debriefing sessions after the January rescues involved all key players, including Defence, AMSA, Airservices Australia, and competitors and organisers from the Vendee Globe Yacht Race. The Ministers said the debriefs had identified problems and possible solutions from both the sailors and agencies involved in their rescue.

"AMSA is now involved in more direct liaison with race directors of all round-the-world yacht races and has developed a closer working relationship with the Australian Defence Force," the Ministers said.

"Obviously some issues can be implemented immediately whereas others have to be investigated and perfected with the combined input of the AMSA, Navy and Air Force.

"It was expected that once the final evaluation was completed, the Minister for Sport, Territories and Local Government, Mr Warwick Smith, would write to appropriate yachting federations and race organisers recommending a number of measures which could be made mandatory to improve race safety."

Meanwhile, two Australian Defence Force officers who were heavily involved in the Southern Ocean rescues have discussed race safety recommendations with race organisers. The officers, Captain Rowan Moffitt (Navy) and Wing Commander Ian Pearson (RAAF) attended post-race activities in France last weekend.

Defence, Jim Bonner Ph 06-2777800 or 0419 438490
Transport, Adam Connolly Ph (06) 2777680

Defence Home Page

ENC 2 to CF9 of 9APR00

THE VENDEE GLOBE MARSAR

THE following article is an account of the amazing rescue of Messrs Thierry (Terry) DUBOIS and Tony BULLIMORE from the freezing nothingness of the Southern Ocean. The rescue took place some 2 500 km from the Australian mainland, closer to Antarctica than civilisation. Whilst the rescue involved the untiring efforts by staff at the Maritime Rescue Cordination Centre in Canberra, and superb flying by 92WG, RAAF, to locate the yachtsmen and provide immediate lifesaving measures for Terry Dubois, the article concentrates on the ship/ship's flight aspects; ie, to share the event from a birdies' viewpoint. It is anticipated that a composite RAAF/RAN article will be published in RAAF *Spotlight* 2/97.

The recall

The call to return to my ship came at 0600K Monday 6 January 97 whilst I was comfortably tucked into my bed at home in Nowra. The flight was on Christmas leave; however, we were aware that we had become the Operational Rescue Vessel (ORV) on that morning. My CO, CAPT Raydon Gates, had, after discussion with me, allowed the flight to remain on leave even on the east coast despite being on call. The main reason for this was our ability to fly the helo from the airfield on HMAS STIRLING where Seahawk 874 was parked, and still embark on HMAS ADELAIDE anything up to 16 hrs after the ship had received sailing orders. This call was to prove correct.

The initial call from the OOD onboard ADELAIDE was to standby for a return as more details came to hand. After 28 years of military service, a standby usually turns into a happening thing and so I rang QANTAS and booked a flight for that morning. I contacted my SENSO, LEUT Hank Scott, and advised him to do the same. He nearly had the pleasure of flying first class as by the time he had contacted the airline, economy class was fully booked. A couple of cancellations allowed him and LCDR Geoff Konemann to make the flight. Although the flight was qualified and current, higher command elected to send a QHI (Geoff) as added insurance on the task. Whilst I didn't necessarily agree with the decision, the reason it was made for was accepted. As it turned out we were one aircrew member short and a crew of five would be needed to perform the rescue. To Geoff's credit, he took a back seat approach and allowed the flight/ship interface to run its normal flow and plan the operation its way. Two maintainers from HMAS DARWIN also supplemented our numbers.

Embarkation (and enter Mr Murphy)

The three east coast aircrew made the civil flight on time – thanks to 816 SQN providing a Seahawk to fly myself and Geoff to Sydney to connect with the Perth flight. We arrived at the Helicopter Support Facility at HMAS STIRLING at 1545H, just before ADELAIDE sailed. LEUTs John May and Terry Gadenne were in the west at the time of the call-out and so sailed with the ship, leaving us three to embark 874 at a planned time of 1700H. As mentioned, CAPT Gates was happy for us to remain on the east coast as after our leave the aircrew were scheduled to complete re-currency checks at NAS Nowra before rejoining our ship. If called out, the long legs of the Seahawk meant that we could still catch the ship some eight hours after sailing – and eight hours it was!

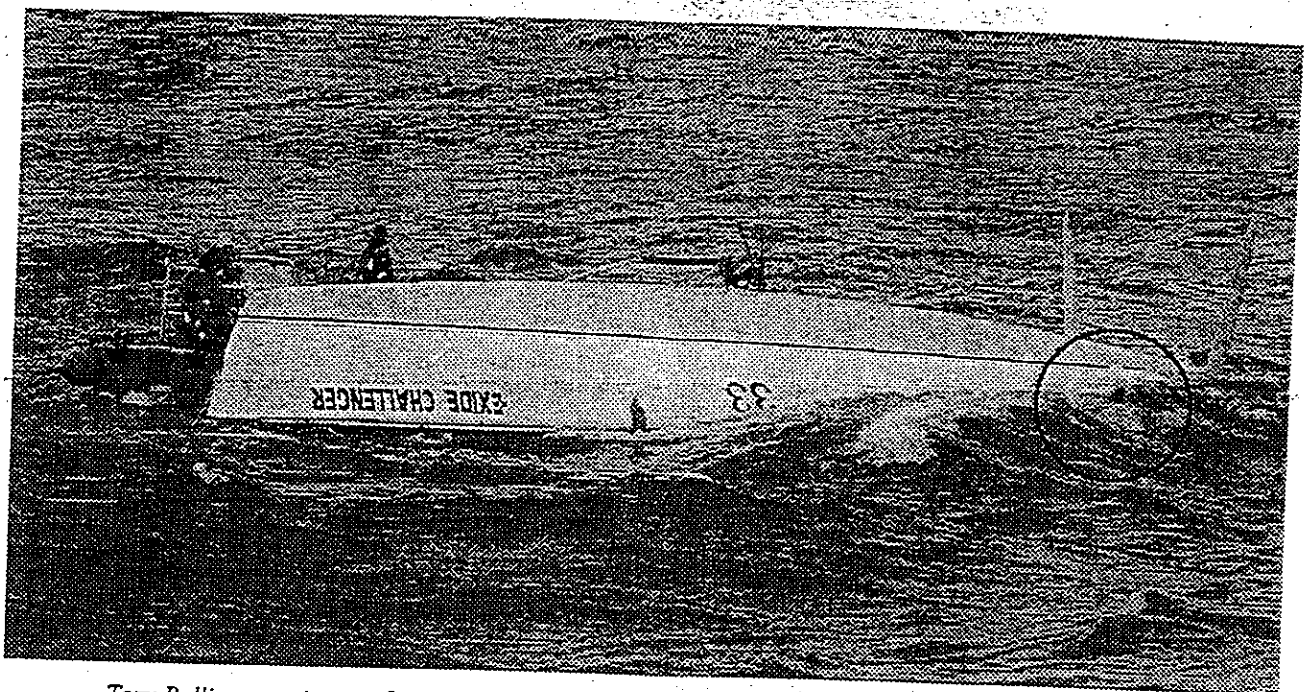
During the pre-flight inspection, the No 1 and the back-up hydraulic pump oil reservoirs were found to be empty. A top-up of oil followed by a ground run confirmed our fears that we had a major leak. A quick call to the ship using the ever-reliable mobile telephone and my flight senior maintenance sailor, CPOATWL Steve Searle, and two maintainers were landed back on the island courtesy of HMAS STIRLING'S boat. With commendable speed, 'robbery action' of the back-up hydraulic pump from DARWIN'S Seahawk was initiated. NALO, in Sydney, were equally fast in authorising the removal, as time was running out with regards to crew rest.

At about this time, I elected to instigate a back-up plan and jacked up a refuelling tanker with a police escort to drive to the furthermost point south and wait for our arrival. If crew rest was exceeded, we would not arrive until Tuesday morning. The tanker would allow us to still catch the ship as she sailed towards the rescue site. However, at 2200 the aircraft was declared serviceable and, with only a 40 minutes transit time to ADELAIDE, we elected to embark that night. After cancelling the tanker and police escort, we effected a successful recovery to the ship at 2355.

The transit

While all this was taking place, a P-3C Orion had located Terry Dubois and deployed an Air Sea Rescue Kit (ASRK) to him. Tony Bullimore's capsized yacht, the EXIDE CHALLENGER, had also been located but there were no signs of life.

ADELAIDE conducted her initial passage at 20 kts due to weather. This eventually improved to allow a



Tony Bullimore swims out from under the hull of the EXIDE CHALLENGER. (Photo Kerry Berrington)

speed increase to 26 kts when it was known that HMAS WESTRALIA would be able to sail to provide fuel. Weather conditions remained favourable and a good speed of advance was maintained.

A utility sortie was flown on 7 January to ensure all crew were happy with 'high-line' procedure. I decided to use LEUT Hank Scott as the wireman and for me to do the winching for the primary reason of fitness. Hank, being considerably younger and fitter, would have a better chance of completing the rescue if both he and Dubois were to end up in the ocean.

The rescue

It was initially calculated that we would be able to launch late afternoon on the 8 January and extract Terry Dubois at last light, returning the 180 miles to land back on board at night. However, the weather had caused Dubois' life raft to drift further south than had been expected thereby increasing the distance required to transit. This meant that we would have to conduct the winch at night with very little fuel to play with. This, coupled with the outside air temperature being reported by the P-3C crew at -2°C at 300 ft in heavy rain, forced us to postpone the rescue until the following morning. The P-3C crew had also reported icing conditions and, as our Seahawk was not equipped with de-icing systems, it made for a simple decision.

We launched at 0430 on 9 January (28 years to the day that I had enlisted in the military) in much improved weather conditions. The outside air at sea level was +3°C with only patches of low cloud that we could visually navigate around. The water temperature was still a chilly +2°C and the wind had dropped to 25 kts.

The 53 miles we had to transit allowed time for the P-3C, that had arrived on the scene, to relocate Terry Dubois. The visibility was starting to reduce as we approached the yacht; however, a smoke marker from the Orion assisted us in spotting him. A copy-book high-line winch was conducted and Terry was safely inside the helo within minutes. It will be hard to ever forget that big smile under his bushy beard: an expression of *'it's all over'*. We recovered back to ADELAIDE at 0537.

A miracle of survival

We re-launched at 0630 for reconnaissance of the EXIDE CHALLENGER, arriving on scene after a short transit of 15 minutes. A 10 minute low hover was conducted with the hope of eliciting some response from Tony Bullimore (if he was still alive). With no sign of life, the aircraft recovered at 0730. Two media personnel were onboard for the recce and were able to get detailed video and still photography of the yacht. This was immediately developed and analysed for the possible entry that would release Tony Bullimore if he was trapped inside the yacht's hull.

Due to the reduced visibility of less than 1 000 yds, ADELAIDE was vectored to the EXIDE CHALLENGER by the on-task Orion. At 0900 the ship was within 200 yds of the hull and commenced a slow circle sounding the ship's siren. At 0908 the sea boat was launched to examine the yacht's hull for the expected cutting operations. Remarkably, and as all the world now knows, after tapping on the hull and yelling, Tony Bullimore replied. Moments later he popped up on the surface. The ship's diver entered the water and assisted him into the boat which was then recovered at 0930.

Some lessons learnt

It would have indeed been surprising if, following such a unique and complex rescue operation, some points had not arisen for future consideration. Some aviation lessons learnt include:

1. Five aircrew are needed for safe S-70B-2 Seahawk operations in this type of SAR and area of operations. Assisted recoveries were necessary due to environmental conditions and the fifth member is required to act as Landing Safety Officer (LSO). ADELAIDE'S flight is normally only four personnel. With the second TACCO being unavailable, a pilot was drawn from 816 SQN and from HMAS DARWIN.

2. The de-icing system for the Seahawk should be fitted for safe all-weather operation in such areas. The flight manual limits aircraft operations by the requirement for the OAT to be above +5°C if in cloud. During this operation, temperatures were as low as -2°C at the water surface, and cloud down to 50 ft.

3. An allowance of six 'Mustang' immersion suits of various sizes should be allocated to FFGs for the carriage of key non-aircrew personnel.

4. Long-range fuel tanks should be trialled and placed into service at sea.

5. The Seahawk HF radio performance was poor, necessitating relay by the P-3C.

6. A more effective hook assembly, already identified, that will ensure winching safety, needs to be expedited into service. The Hook Safety Plate (HSP) was unwieldy to use in the extreme cold, as the wireman was wearing Clearance Diver's thick gloves as well as his normal flying gloves. To compound the problem, there was no room for the plate when using the double-lift harness and two strops.

[Note: The HSP is an interim risk-management measure designed to prevent dynamic roll-out (DRO) and 'D' ring reversal (DRR). A new hook has been successfully trialled and will be introduced into naval service in mid-1997. – SONAS]

Survivors' comments

As well as being a very grateful man, Terry Dubois, having spent several days in a liferaft, offered the following constructive comments about the rescue:

- the liferaft from the first ASRK he managed to get into (the third dropped to him), was of much poorer quality than subsequent ASRKs dropped to him. The rubber was deteriorating and that liferaft sank from under him very quickly;
- it was difficult to open the cardboard survival packs. They are hard to manage, particularly when suffering from cold injury and consumed a lot of energy. It would be simpler to have the rations contained within a plastic container with a screw-top lid;
- of all the rations in the survival packs, only the biscuits, muesli bars, chocolate and water were consumed. The remainder was thrown overboard because of the difficulty with the packaging and the nature of the rations;
- the large liferaft did not have particularly good stability with a single person in it, and once it was capsized it was difficult to right;
- the sea anchors made a significant difference to stability, but nevertheless two sea anchors were lost when they parted at the attachment to the liferaft.
- the radio drop was excellent (within one metre) and it was tremendously comforting to be able to talk to someone; and
- the winching operation was simple and professionally done.

Tony Bullimore, a no less grateful yachtsman (as witnessed by that BIG kiss planted on one of his rescuers on ADELAIDE's Zodiac, also offered the following comments:

- he heard the Orion aircraft but was not sure how far away it was and was not prepared to leave the yacht's hull to find out;
- he did not hear any charges or sonobuoys dropped by the Orion;
- he heard the Seahawk when it hovered low over the hull;
- he did not hear the ship's siren when it was sounded from 200 yds away; and
- he heard clearly the tapping on the hull and voices from the Zodiac.

A warm feeling

The month of January 1997 will long be remembered by me (and no doubt others) for the successful rescue of two lone yachtsmen participating in the Vendee Globe around-the-world race. It was an event in which the Ship's Flight played a major role; however, as mentioned at the outset the rescue of the Terry Dubois and Tony Bullimore was achieved by a multitude of agencies working in close cooperation. Among them though, my personal thanks and congratulations go to 816 SQN and HMAS DARWIN in providing personnel and advice to enable ADELAIDE's flight to form an integral part of this operation. ☺

Terry Dubois, CAPT Gates (HMAS ADELAIDE CO) and Tony Bullimore (Photo Bill Hatto)