Report

of the

1998 Sydney-Hobart Race
Review Committee

Briefing Paper

Introduction

This Briefing Paper has been written on the basis that you may not have had the opportunity to read the Report of the Review Committee, or may not be in a position to determine the accuracy, or otherwise, of many of the technical comments concerning radio communication.

The Briefing Paper is intended to highlight certain points, concerning marine radio communication, mentioned in the Report, and to provide comment, and corrections where technical errors have occurred. It is an attempt to provide information with respect to the findings of the Review Committee, and their recommendations in relation to:

a) the education of those sailing in future Sydney-Hobart, and other yacht races,
b) the planning necessary on the part of those organising such races, and
c) the radio communication infrastructure required to provide safety coverage for the competitors in such events.

In **Section A,** I have listed, in dot point format, some of the technical aspects in the Report, which deal with Radiocommunication matters, that give me cause for concern.

There are a number of technical errors, and inconsistencies, with poor technical terminology, and lack of attention to detail, in relation to:

i) technical aspects of radio equipment,
ii) radio propagation, and
iii) operational procedures concerning marine radiocommunication.

Section B outlines those major issues on which I believe further recommendation should be made, particularly with regard to:

a) education and training of crews, and
b) the radio installation on board yachts, sailing in the Sydney-Hobart Race.

Section C covers the recommendations stemming from the Report that directly affect the radio installation at the RYCT.

Section

- page 6 **"Six lives lost, five boats sunk and a further 66 boats retired from the race." ..."..the biggest maritime rescue operation ever, in Australian waters, with 55 rescued in an operation involving some 25 aircraft, six vessels and approximately 1000 personnel."**

- page 8 "Twelve yachts required SAR intervention -....."

- page 2 " many crews, despite having high levels of ocean racing experience, were poorly informed on aspects of safety equipment use and Search and Rescue techniques."

- page 5 "Consistently around 10% of the fleet retires for a variety of reasons, ...Some typical causes for retirement include.....electrical problems, ..."

Comment: This figure of 10% appears to be an acceptable figure, as far as the CYCA is concerned, given that no effort has been made to investigate the reasons for the "electrical problems" that arise, and no effort made to improve the "safety checks" that could possible eliminate some of the causes. (see later statement on page 65, that it is expected the "average yacht" will have "low battery power" or "poor (battery) connections".)

- page 13 "Section 2.3.5 Safety Equipment
  As a part of the particular safety requirements for the 1998 SHYR, all yachts had to provide the following:
  HF radio certificate.."

- page 54 "Section 5.0 Information and Communications
  Entry Forms are then completed and returned to the Sailing Office.
  Attached to that form should be:
  Radio Check Certificate.."

- Page 69 "Section 5.1.4 Review of Recommendations Stemming from the 1993 SHYR
  - " introduction of a "Radio Certificate" (radio check by qualified person)

Comment: The lack of consistency in referring to what in my opinion should be the "Radio Installation Survey Inspection Report Form", *indicates either:*

i) a lack of knowledge, or little command of the particular subject, or

ii) a lack of real interest in the particular subject.

- page 20 "3.0 Chronology of Events

DATE	TIME	EVENT
27/12/98	1650	Sword of Orion...May Day.....EPIRB activated on deck,...
Comment:	*EPIRBs do not radiate effectively to the satellite or aircraft, unless in the water.*	
	2045	Sword of Orion...hears SAR helicopter...EPIRB placed in water.
28/12/98	0250	Sword of Orion...hears SAR helicopter...EPIRB placed in water.
29/12/98	0305	Veto missed Sked 3 (and Sked 2), asked to activate EPIRB by RRV.

Comment: Sked 2 occurred at 0300 hours on 27th December, and Sked 3 occurred at 1400 hours on 27th. This period of 48 hours appears to me to be too long, given the conditions that prevailed, for the Race Organisation to leave a yacht that had not reported before taking any action with regard to it's safety.

Comment: Emphasis was placed on the "deployment of life rafts from aircraft" during the Compulsory Race Briefing, but instruction on how EPIRBs should be correctly operated was obviously not thought to be important. How many life rafts were actually deployed from aircraft during the 1998 Race?

Education on the correct use and operation of EPIRBs must be provided to all yachting crews. The incidents detailed above clearly indicate that there is a significant lack of understanding of the manner in which the signal propagates from the EPIRB to the satellite, or searching aircraft, and the part that the relationship between the antenna and the sea surface plays in the propagation process.

Comment: With the recommendation that all yachts are to carry 406 MHz EPIRBs, comes a greater need for education on particular aspects of their operation.

- page 31 "4.2 Forecasts and communication to competitors
  Weather information was available to the fleet through a number of avenues:

  e) By HF Radio on board yachts through:
  - VIS, VIM, VIH"

- page 166 "Glossary

  VIH Hobart Radio"

Comment: The Telstra Coast Radio Station, Hobart Radio, (call sign VIH) was decommissioned in 1991

page 59 "In Hobart at the RCC, the SHYR Committee had to deal with a number of separate issues.

- Coordination/communication AMSA ⟶ RRV ⟶ fleet, and fleet ⟶ RRV ⟶ AMSA

...the RCC was inundated with phone calls and the system was unable to cope."

- page 63 "Information from the fleet is, in practice, limited to the twice-daily mandatory position report Skeds at 0300 and 1400 hours. Ad-hoc information is reported to the RRV in case of an incident or retirement."

Comment: In my opinion, two daily mandatory position reports are quite inadequate for such a race. There should be provision for up to four "Safety Radio Skeds" within a 24 hour period for yachts to register their position and condition with Race Control. (See AMSA's AUSREP Scheme for Small Craft Reporting.)

5.1.3 Radio Communications

- page 64 "Both HF and VHF equipment are prescribed under the Cat 1 Safety. (sic) .....HF is still a major radio communications method for maritime and aeronautical use, primarily because of its range. .....4483 kHz is recognised as being a good "working" frequency for the race, offering good local as well as medium distance communication capabilities."

Comment: *HF is not a "radio communication method". The range over which communication can be reliably maintained over a 24-hour period will vary with the time of day. (See IPS propagation predictions for December 1998.)*

- page 64 "The RRV uses a standard marine HF radio, transmitting with a power of 150 watts, *with an antenna system similar to that used by the fleet.* The installation and commissioning of the radio on the RRV is critical and ***results in a high quality signal*** which can be heard by the whole fleet as well as the RCC and the CYCA. ***Only a few yachts exhibited similar signal qualities.***"

- page 65 "The quality and reliability of communication ***between RCC, the RRV and competitors were not as good as it could have been***, with some intermittent and low quality transmission taking place."

Comment: *the expressions "high quality signal" and "low quality transmission" are not technical terms that would be used in describing radio communication signals. Communication engineers deal in signal strength measured in microvolts per metre, measured at a specified distance from the transmitter. The signal quality is more a function of the type of modulation employed.*

- page 65 "It should be acknowledged that the average yacht's HF installation will always be less than optimum. At the very least the antenna systems used by most yachts (backstay antenna or deck mounted whip) are not efficient. The physical length of these antennae is significantly shorter than the required electrical length. The optimum length for a half wave antenna for 4483 kHz is approximately 32m. ***Any other length results in transmitted power being directed through the earth system that is effectively lost. If, in addition to this, the effect of the antenna being inclined (as the boat heels), a poor power system (due to battery power or poor connections) and a poor earth system, are taken into consideration the result is reduced transmitted power – ie reduced signal.***"

Comment: ***I find it difficult to come to terms with this statement. For the Review Committee to accept that the CYCA accepts that yachts going to have poor battery connections and poor earth connections, and further, fails to initiate corrective measures, is to me, quite unacceptable.***

Comment: *The radio operator tunes the antenna to the frequency in use using a manual Antenna Tuning Unit, or the antenna is tuned by the automatic Antenna Tuning Unit which is found with most modern MF/HF transceivers.*

This results in the antenna presenting the correct impedance and radiation resistance to the transmitter, (and the receiver for optimum reception), resulting in the optimum condition for the transmitter to deliver power to the antenna.

- page 66 "Another problem that surfaced in the 1998 SHYR was the inability of the RRV to efficiently utilise an additional channel for distress management. It became apparent very quickly, that the load on the 4483 kHz channel was far too great."

Comment: *What "distress management" procedures did the CYCA Race Committee have in place? The word Distress did not appear in the 1998 Notice of Race or Sailing Instructions.*

However, it should be noted that there is a passing reference to distress in the Draft 1999 Sailing Instructions.

Distress radio procedures and Distress radio communication management are still not given the separate section and emphasis that they demand.

- page 66 "Finally, the RRV did not have the capability to communicate directly with many of the SAR aircraft, particularly fixed wing aircraft. Aircrafts (sic) are not normally fitted with Marine **VHF Channel 16** which operates on **141.3 MHz**, and use aviation frequencies of 121.5 MHz (distress) and 123.1 MHz (search and rescue)."

Comment: ***156.8 MHz is the frequency which is designated as VHF Channel 16! 141.3 MHz is not in the VHF Maritime Mobile frequency allocation.***

- page 66 "Prior to 1996, Telstra operated maritime HF facilities in Sydney, Hobart, Melbourne and Brisbane. These facilities have now been consolidated into facilities in Melbourne and Brisbane."

Comment: *HF receivers and transmitters, with their associated antennas, are still located at Sydney but are operated from Brisbane. Yachts are therefore able to communicate with a Telstra Coast Station physically located at Sydney.*

- page 67 "In adverse weather conditions and for the latter part of the race the RRV is often out of range."

- **page 149** **"9.10 Communications**

  Communication between the RCC_RRV-Fleet were unreliable (or had the potential to be) because:

  - geographical remoteness of RCC (Hobart)" (?)

Comment: *HF radiocommunication, using the appropriate frequency, is capable of providing long range communication over thousands of miles. The lack of direction to the Fleet/RRV/RCC to use appropriate frequencies is again indicative of the lack of understanding of radiofrequency propagation, or of poor race management. (see IPS radio frequency propagation predictions for December 1998 for the optimum HF working frequencies to be used for reliable communication).*

- page 73 "**6.0 Ability of yachts and their equipment to withstand the conditions**

  While this is not recorded each year, experience demonstrates that it is not unreasonable that the following occurs:

  - flat batteries and minor electrical problems,"

Comment: ***I find it difficult again, to come to terms with this statement. I believe that it is unreasonable to accept that yachts will have flat batteries, when the battery is the sole means of powering the radio installation, and further, fail to initiate corrective measures. I find this quite unacceptable.***

- page 75 "Damage to yachts in the 1998 SHYR

Extent of Damage	Total	Yachts Retired	Yachts Finished
Totals	110	70	40
Electrics Unserviceable (Not Flat Batteries)	18	15	3
Electrics Unserviceable (Flat Batteries)	4	1	3
Engine Unserviceable (Flat Batteries)	12	9	3
VHF Unserviceable (Flat Batteries)	11	7	4
Other Radio Damage	11	9	2
GPS Unserviceable (Flat Batteries)	11	6	5
HF Unserviceable (Flat Batteries)	9	6	3

- page 84 "**Serviceability of Engines and Electrical systems**

  Sixteen percent reported Electrical problems not related to batteries, including failures of GPS, HF and VHF radios."

SAR Communication

Comment: *Between pages 112 and 136, a number of references are made to the inability of yachts to communicate with the SAR aircraft, fixed wing or helicopters. This appears to have been due either to the VHF on board the yacht being unserviceable or the crew not being aware that the SAR aircraft could communicate on marine VHF (using VHF channel 16, or the On-Scene Search and Rescue channel, Channel 6). The Report covers this aspect on page 148, in the section, 9.9 SAR.*

The Review Committee's recommendation that yachts must carry a water proof hand held marine VHF transceiver is timely. However the recommendation should have also specified that the hand held be fitted with Channel 6, as well as Channel 16, the two on-scene Search and Rescue channels.

Section C The radio installation at the RYCT.

- page 160 "B7. COMMUNICATIONS
Compulsory

  - RCC-Fleet
    RCC suffers from basic HF/VHF connectivity problems with the fleet. It needs to have an installation at its disposal, that offers very high quality transmit and receive capability.

    The installation needs to be accessible to the primary RCC centre (currently located in Hobart) and, most importantly accessible to the Race Director. The antenna farm needs to be located in an interference free area (outside a metropolitan or built up area). The transceivers need to be high power (400-1000Watt) with RF gain amplifiers capable of detecting weak signals."

- page 161 "**Recommended**

  - RRV-Fleet

    The RRV installation needs to be above normal power to ensure that the entire fleet, *regardless of the quality of their own installations*, is capable of hearing the RRV in all weather conditions.

    The CYCA should install a linear amplifier for its VHF transceiver, capable of increasing the transmitted output power to 100 PEP."

Comment: *Increasing the power output of the HF and VHF transmitters on board the RRV or at the RYCT will not result in signals being heard by yachts who have: -*

> *" inefficient antenna systems, poor battery connections and poor earth connections" .*

Only by improving the standard of the radio installation on board the yachts, by conducting a proper inspection of the radio installation carried, and setting compulsory standards to be achieved, will such communication problems be overcome.

Comment: *PEP stands for peak envelope power, which is the method by which SSB transmitter power is measured. The system of modulation used in marine VHF transmitters is FM. FM produces constant power output and is not measured in terms of "peak envelope" power.*

Section B — Issues on which further comment or recommendation should be made, particularly with regard to:

a) education and training of crews,
b) the radio installation at the RYCT, and on board the RRV, and
c) the radio installation on board yachts, sailing in the Sydney Hobart Race.

Education:

i) The COSPAS/SARSAT system,
ii) the propagation characteristics of EPIRBs.
iii) the correct operation and deployment of EPIRBs,
iv) the radiotelephony Alarm Signal,
v) Distress radio communication procedures,
vi) Distress frequencies, and propagation on the HF bands,
vii) SAR radio communication procedures, and
viii) the correct use of the 'on-scene' VHF channel Ch 6.

Radio Installation:

i) the implementation of a formal Radio Installation Survey Inspection and Reporting process.

Section C — The radio installation at the RYCT.

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- page 161 "**Recommended**

  - RRV-Fleet

    The RRV installation needs to be above normal power to ensure that the entire fleet, regardless of the quality of their own installations, is capable of hearing the RRV in all weather conditions.

    The CYCA should install a linear amplifier for its VHF transceiver, capable of increasing the transmitted output power to 100 PEP."

Comment: *The terms and conditions of the radio licence, issued by the Australian Communications Authority, prevents limited coast stations from using transmitting powers in excess of 400 watts. Therefore the RYCT cannot legally install MF/HF transmitting equipment having a power output above 400 watts. In the case of VHF transmitters, the maximum legal power permitted, for limited coast stations is 50 watts. In the case of the RRV however, the maximum power that may be used is 25 watts!*

RF gain amplifiers do not increase the capability of detecting weak signals because they also increase the level of the received noise as well. The demodulator stage in a receiver detects signals. The sensitivity of a receiver (the ability of a receiver to detect signals) is determined by its design and is measured in terms of micro volts of signal at the antenna terminal. The receive antenna should be located in a "quiet" area but the location of the transmitting antenna is not critical as far as "interference" from noise is concerned.

The Board of the RYCT, through the Communications Committee, is currently conducting a total review of the radio installation at the Royal Yacht Club (referred to as the RCC in the Report), with the intention of installing new radio equipment (a 400 watt MF/HF transceiver). At the same time, the antenna performance will also be improved.

However this will not be the answer to the problem of communication with the yachts in the race. This can only be overcome by:

a) improving the standard of radio installation on board the yachts, the RRV, and at the RCC,

b) education of the yacht crews in the use of:

i) radio communication equipment,
ii) the appropriate radio frequency, for the range over which communication is required,
iii) EPIRBs, and
iv) *SAR radio communication.*