

# **NAV RALLY INSTRUCTIONS**

## **HANDBOOK for NAV RALLY TRIALS**

November 2013

# NAV RALLY INSTRUCTIONS

## PREFACE

The following rules and recommendations for the conduct of Nav Rallies consist of revisions and additions to rules established initially by the Port Phillip Power Boat Association, and later superseded by the Powerboat Association of Victoria/Victoria Yachting Council rules. The latest revision was initiated by RVMYC to incorporate the use of electronic logging software, specifically Tack Tracker.

Sections covering Code of Practice, Preparation of Nav Rally Courses, Check Points and Running the Course are included in an endeavour to standardise the approach by event organisers, and increase the competence of crews handling events.

It is recommended that those competing in or organising events, study the enclosed data, so that greater enjoyment of the sport can be attained.

Delegates from the following clubs and organisations have worked to produce these rules and recommendations.

Australian Volunteer Coast Guard  
Beaumaris Motor Yacht Squadron  
Mordialloc Motor Yacht Club  
Patterson River Motor Boat Club  
Powerboat Association of Victoria  
Royal Victorian Motor Yacht Club  
Sandringham Yacht Club  
Victorian Yachting Council, Power Boat Division

REVISION TABLE			
Revision #	Date	Details	Authorised By:
0	Sept 2012	Changes to permit Tack-Tracker Use	
1	Nov 2013	Final changes to cater for Tack Tracker	RVMYC

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# NAV RALLY INSTRUCTIONS

## 1. SCOPE

This handbook sets out the guidelines for running Nav Rallies.

- (a) Nav Rally competitions are for Motor Yachts of any type, power or size, provided they are seaworthy for the waters where the competition is held.
- (b) The following procedures give an equal chance to all competitors, irrespective of size, power or speed of the vessel
- (c) In keeping with the spirit of the activity, skippers are requested not to deliberately pre-run the course and/or investigate check boats on the day of the event.
- (d.) The Code of Practice gives guiding principles for Nav Rallies.

## 2 CODE OF PRACTICE

### 2.1 GENERAL

- (a) The contents of this CODE OF PRACTICE should be adopted as guiding principles for all Nav Rallies conducted under these Rules.

### 2.2 PLANNING

- (a) When planning the course, the latest edition of a chart should be used. Briefing Notes, used in planning the course, must specify clearly the applicable chart, and should be the current fully corrected chart.
- (b) Briefing Notes must meet the minimum standards recommended in this Handbook.
- (c) Briefing Notes and course details should be available with event Entry Forms, one (1) calendar month prior to the date the event is scheduled to be held.
- (d) All controls, conditions, local rules, warnings etc, should be listed in the Briefing Notes and should not conflict with the Rules and this Code.
- (e) Start times are to be available, and advised, to entrants at least five (5) days prior to the event.
- (f) Each check crew (if required) should be given written directions which clearly indicate:
  - (i) their anticipated position
  - (ii) what they are to check
  - (iii) a print of the relevant section of the chart indicating location transits and sight lines.

### 2.3 RECOGNITION

Both Skippers and Navigators should be recognised equally in awards for individual events and the Aggregate series.

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## 2.4 INFORMATION

Entry Forms should require the nomination of both the Skipper and the Navigator. The entry forms should also require the names and contact details of both the Skipper and the Navigator.

## 2.5 VERIFICATION

- (a) All documentation described in Preparation of Nav Rally Courses should be verified by an experienced log trialer prior to distribution.
- (b) The experienced log trialer should be named on the Briefing Notes.

## 2.6 CONTROL

- (a) Each event in the series should be planned with a minimum of seven (7) checks, which may comprise both time and/or course checks at the discretion of the organiser.
- (b) When planning the course, the organiser should ensure that a minimum of two (2) water based or boat checks are used. This clause is optional for events where the Tack-Tracker system is used for timing purposes.
- (c) The event organiser should ensure that at least one (1) member of each check crew (if required) is familiar with the check procedure described in Check Points
- (d) Each check crew (where required) shall be provided with a Record Sheet . The Record Sheet must contain the names of boats entered in the event, listed in the order they are expected to arrive at the check point, and include the speed at which each boat entered the event together with the theoretical arrival time at that check point.
- (e) When/if the Tack-Tracker system is used, each vessel is to be provided with a fully charged and operational GPS logging recorder. Skippers and Navigators are to be briefed on their operation and the Skippers responsibilities regarding location, etc. The GPS logging recorders are to be numbered and recorded against the respective entered vessel.
- (f) Where the Tack-Tracker timing system is used, the course, timing, and turn points are to be described to the contestants after the event has been run.

## 2.7 ENTRANTS

Vessels may be entered by Members of recognised Boating Clubs and Associations, or by special dispensation of the event committee.

## 2.8 IDENTIFICATION OF VESSELS

- (a) Each vessel shall display the Club identification numbers in block letters, which will be matt black, against a white background and placed on the vessel to be clearly visible from 45 degrees ahead of abeam to abeam from Port and Starboard.
- (b) Identification numbers shall not be illuminated, and shall be located above the gunwale line of the competing vessel.

## NAV RALLY INSTRUCTIONS

- (c) The minimum dimension of Prefix Letters and Numerals are to be a minimum of 460mm high, 230mm wide and 50mm in breadth.
- (d) Spacing of Letters or Numerals should be a minimum of 75mm.
- (e) Prefix block letters allocated to each club shall be:
  - C - Australian Volunteer Coast Guard
  - B - Beaumaris Motor Yacht Squadron
  - M - Mordialloc Motor Yacht Club
  - P - Patterson River Motor Boat Club
  - R - Royal Victorian Motor Yacht Club
  - S - Sandringham Yacht Club
  - H – Hidden Harbour
  - G – Royal Geelong Yacht Cluband as allocated from time to time by agreement between the competing clubs.

### 2.8 NAVIGATION EQUIPMENT

G.P.S, satellite navigation, automatic pilot, R.D.F., radar, range finders, any over the ground speed measuring device, onboard computers (laptop or otherwise) or any combination of these and whether interfaced or not, may be used.

All other navigational equipment may be used unless prohibited by the event briefing sheet.

### 2.9 INDEMNITY

All those taking part in Nav Rallies conducted under these rules do so at their own risk and responsibility.

The conducting Club or Authority, the Sponsor or any of their respective officials shall not be responsible for the seaworthiness of any vessel, or for the adequacy of its equipment, or for any damage to any vessel, or for injury suffered to any participant whether skipper or crew during the conduct of the event.

It shall be the sole responsibility of each skipper to decide whether to start or continue in the event of adverse weather conditions.

The conducting Club or Authority reserves the right to refuse any entry.

## 3 PREPARATION OF NAV RALLY COURSES

### 3.1 COURSE LAYOUT PROCEDURES

- (a) Copies of the current nominated corrected charts shall be used.
- (b) Unless the Tack Tracker system is being used, the course checked should be determined first then the course laid in reference to the checks.
- (c) The course of the event is to be accurately plotted on a scaled chart using whole numbers of degrees as leg bearings.

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- (d) Unless Tack Tracker is used the course is to be plotted to pass no closer than 0.5 cables from the check point positions determined in (b) above but with land based checkpoints and night checkpoints excepted.
- (e) Where a course is plotted to pass within 0.5 cables of a charted navigational aid, the course instructions to competitors are to nominate on which side competitors shall pass the navigational aid.
- (f) Time checks cannot be set within 1.0 cable of a turnpoint.
- (g) The minimum distance between time check points shall be three cables.
- (h) Where possible, courses should be plotted so that all legs are clear of channels.  
Any leg of a course crossing a channel should be as close to a right angle as possible.
- (h) Courses shall then be accurately measured one leg at a time from the given datum, using the scale on the chart if available.  
The measurements shall be taken to three decimal places.
- (i) Wherever possible, the course should be checked trigonometrically to ensure that the Northings cancel Southings and Eastings cancel Westings to within 0.01 cables.  
Refer to Appendix C
- (j) On completion of the course layout and measurements, and prior to issue to competitors, the event briefing, check point positions and check point times shall be plotted and checked by an experienced Nav Rallier not competing in that particular event.
- (k) For inter club events, the course check shall be carried out by an experienced Nav Rally official from other than the host Club.

### 3.2 START AND FINISH LINES

- (a) Starting and Finishing Lines shall be not less than 75 degrees to the course line of the starting and finishing legs.
- (b) Where a start or finish line uses a charted marker as one of its extremities, datum points shall be nominated in course briefings a minimum of 0.5 cables on a given bearing from that marker.

#### 3.2.1 START AND FINISH SIGHTS shall be

- (a) An imaginary line from the start or finish tower or vessel to a buoy laid off shore on the line of the start or finish and at a point beyond the datum.  
Sighting is made across one or more fixed pointers to the buoy.
- (b) Alternatively, a sight across two fixed points set to a given datum point.  
In this instance a buoy shall be laid to seaward denoting the course boundary from the shore but not necessarily the start point.
- (c) On an offshore start or finish, an imaginary line sighted across two plotted fixed objects on land or sea and conducted from a vessel or suitable structure.
- (d) The Start and/or Finish Vessel in night events shall be identified by a quick flashing light as detailed in race briefing, and so placed on the Start and/or Finish vessel as to be visible 360 degrees.
- (e) When the Tack-Tracker logging recorder system is being used, the start and finish lines (or gates) shall be identical to the start and finish lines set by following the procedures described in clauses (a), (b), (c), and (d) above.

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## 3.2.2 LIMIT BUOYS if used

- (a) Must be accurately laid by means of transits, and shall be at least 0.5 cables from the actual course line.
- (b) Buoys shall be substantial, easily identifiable by a mast of 1 metre minimum in height, flying the Club Burgee of the day, and moored securely on the shortest possible line.
- (c) Check vessels must remain clear of the limit buoy and not impede any competitor's view.
- (d) Limit buoys on a straight line course must be at least 0.5 cables either side of actual course line and check vessels are to stand well clear and not impede any competitors.

## 3.2.3 STARTING AND FINISHING LINE AND TIMES

- (a) Official time shall be Telstra (1194) time or an easily accessible time source set to within 200ms of GPS time.
- (b) Unless otherwise nominated by the organising Club, all vessels shall cross the start and finish lines as near as practicable to right angles, and on course at their nominated speed for a distance not less than 0.5 cables before the start line.
- (c) After Official Course Start Time all vessels must keep clear of the Start line by 0.5 cables unless actually starting.
- (d) Vessels crossing the start line in either direction after Official Course Start Time shall be deemed to have started in the event.
- (e) Times taken at Start, Check Points and Finish, shall be when the bow of the competing vessel crosses the sight line or when the GPS tracker passes through the gate when using Tack Tracker.

## 3.2.3 NIGHT EVENTS

- (a) The Start and Finish Vessel in night events shall be identified by a quick flashing light as detailed in the briefing, and placed on the Start and Finish vessel so as to be visible 360 degrees for the duration of the event or as otherwise noted in the briefing.
- (b) Vessels shall be started at not less than 60 second intervals.
- (c) Unless actually starting, vessels shall keep at least 1 cable clear of the start datum after the official race start time.

## 3.2.4 ADVERSE WEATHER CONDITIONS

- (a) If adverse weather conditions exist, or have been forecast for the area in which the course has been laid, the organising committee of the day may postpone, cancel, or shorten the event.
- (b) A final decision as to whether the event is to be postponed, cancelled or shortened shall be determined not less than one hour before Official Course Start Time for an internal Club event, or two hours before Official Course Start Time of an Open event.
- (c) This information must be available to competitors by phone and nominated radio frequency.

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## 3.2.5 TIMING

- (a) Check point timing devices, where required, shall be of the digital readout type.
- (b) All timing devices must be accurately set to Telstra time signal (1194) or an easily accessible time source set to within 200ms of GPS time.
- (c) Check point timing devices, where required, shall be checked by the Event Officials of the day prior to and at finish of the event.

## 3.2.6 OTHER EVENTS

- (a) Officials must endeavour to ascertain if any high speed "off shore" races, or Yacht Club sail events will be held on the day and time of their event in the area proposed for the course.
- (b) If so, the respective Officials should endeavour to reach mutual agreement on such course or time variations to ensure the safety of all concerned.
- (c) Particular attention should be paid to areas used by small "off the beach" yachts.

## 4. ENTRY FORMS AND BRIEFINGS

### 4.1 General

- (a) Entry forms for inter club events shall be in the hands of the competing clubs at least one calendar month prior to the scheduled date of the event.
- (b) Late entries may be accepted.
- (c) If any Series event is not able to be run on either its scheduled date or its pre-notified backup date, any subsequent running of the event shall be excluded from the calculations of the Aggregate Series for that season.

### 4.2 ENTRY FORMS

All entry forms must provide for the following data:

- (a) Name of vessel
- (b) Club identification number
- (c) Hull length and colour
- (d) Engine data
- (e) Nominated speed for the event
- (f) Skipper's name and phone number
- (g) Navigator's name and phone number
- (h) Number of crew anticipated for the event
- (i) Address for correspondence
- (j) Closing date for entries
- (k) Indemnity clause to be signed by the Skipper

### 4.3 BRIEFING SHEETS

All event briefing sheets must clearly specify:

- (a) Course to be sailed for the event.



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- (b) Chart or charts on which the course is to be plotted, showing the last amendment numbers to that chart or those charts.
- (c) Bearings, nominated in degrees True.
- (d) Distances nominated in Nautical Miles correct to three decimal places.
- (e) Official Course Start Time.
- (f) Official time to be used for the event. This shall be Telstra II94 or an easily accessible time source set to within 200ms of GPS time.
- (g) Course datum points including chart change datum points, if more than one chart is being used for the event.
- (h) Start and Finish lines accurately defined.
- (i) Radio frequency, call sign and times of radio operation for the event.
- (j) Warnings to competitors covering any hazard that may exist in proximity to the course, and any speed restriction applicable to the course area.
- (k) Speeds available for the event.
- (l) Additional conditions of entry, if any.
- (m) The names and phone numbers of the host Club and the event officials.
- (n) Penalties, if applicable, for late entries.
- (o) If the Tack Tracker system is being used.

## 5. CHECK POINTS

### 5.1 GENERAL

- (a) Check Points, where required, are to be manned by responsible persons and it is their duty to record any infringement of the Rules.
- (b) If a check point vessel gets into difficulties after the event has started it shall report directly to the Event Officials the nature of the trouble and what assistance is required.
- (c) When Tack Tacker is used a course marshal boat should be used as an official presence on the course to check for correct behaviour by competitors.

### 5.2. CHECK POINT CREW

A check point crew, where required, should consist of a minimum of three persons, preferably four, at least one of whom is experienced in checkpoint duties.

The duties of each of the crew are:

- (a) SPOTTER who identifies the approaching vessel and clearly calls its identification number.  
If this is not visible, then the name or description of the vessel should be recorded to enable identification after the event.
- (b) CALLER watches the vessel approach the sight line of the check point and calls "IT" as the bow of the vessel passes the sight line.
- (c) TIMER is requested to start the tape recorder by the Spotter and then loudly and clearly calls the hour, minute, and second followed by a count off in seconds giving the change of minutes as they appear.

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- (d) PENCILLER shall pencil in the vessel's number on the rough sheet when given, listen to the time count, and record the minute and seconds when the word 'IT' is spoken.
- (e) When only three persons are available for the crew the SPOTTER and CALLER functions are combined.

At the completion of the event the tape is to be replayed and times checked against the rough sheet, and checked again after transposing from rough sheet to event result sheet.

The spoken second is the one recorded as actual time.

### 5.3 RECOMMENDED CHECK POINT EQUIPMENT

- (a) WATCHES or clocks which are accurate and shock proof, with digital readout. They are to be checked against Telstra Time Signal and double checked against the Master Clock prior to and after the event.
- (b) TAPE RECORDER with sufficient tape to cover the check point time range.
- (c) COPY OF COURSE of event with directions of travel shown, also Check Boat position to be marked in using two sets of fixed objects in transit for positioning, wherever possible.
- (d) PENCILS, paper for rough sheets, binoculars, hand bearing compass.
- (e) EVENT result sheets or details showing the event starters, their numbers in order of arrival, and approximate time of arrival of the first and last vessel.
- (f) RADIO, tuned to nominated event frequency of the day.
- (g) CHECK BOATS shall have anchors of sufficient size and ground tackle to suit, so that the vessel may be securely positioned. A stem anchor should be used to prevent swing.
- (e) All official vessels should be able to check their timing devices during the event.

### 5.4 CHECK POINTS

- (a) Except at start and finish points, no time check will be within one (1) cable of a turn point, and no course check will be within 1/2 a cable of a turn.
- (b) Except where Tack Tracker is used, objects used for checking shall be properly plotted navigational aids or charted land marks.
- (c) Wherever possible, check boats shall be positioned using two sets of charted transit markers where the transit lines are at least 70 degrees apart.
- (d) Where practicable, the positions of checkboats should be checked by other event officials to ensure they are on station.
- (e) The angle of the check point line shall not be less than 75 degrees to the course line.
- (f) Check point officials shall keep an accurate check of all competing vessels and inform the Control Centre of any competitor failing to pass a check point, or who has retired.
- (g) Check boats are to remain on station until cleared to leave by the Officials of the day.
- (h) If a reciprocal course is used with vessels sailing in opposite directions in the same event, check points must be located in positions that are fair for competitors steaming in either direction.

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- (i) Check Boats shall be positioned in the correct location, and then allow time for the vessel to settle at anchor. The Skipper and at least one crew shall then check vessel location to ensure that accurate timing of competitors can be achieved.
- (j) When the Tack-Tracker system is being used, the width of the gates not more than 0.5 cables on either side of the course line.

### 5.5 SAFETY

- (a) It is essential that the start point checker notify checkpoint vessels as to the number of vessels started and when the checkpoint vessel has recorded the same number it will report to the start that "x" number of vessels have been recorded and ask permission to return to port.
- (b) If the number of vessels starting does not total the same at the check point then the start point checker shall be notified and any previous checkpoint queried.
- (c) If no report has been received re: breakdown or withdrawal by a competing vessel then checkpoint vessels shall immediately check the leg on which the vessel went missing.

### 5.6 CHECK POINT DATA TO BE LOGGED

- (a) Check point time for each competitor.
- (b) Any of the penalties listed in Appendix A against the respective competitor.

## 6. RUNNING COURSE

- (a) The Committee of the organising Club reserves the right to refuse to allow any vessel to start.
- (b) A competing vessel may be ordered off the course by the Officials at the time without a reason being given. The vessel must comply immediately with the order.
- (c) A Club Burgee shall be flown by competitors, and if applicable, a Sponsor's pennant may be flown below the Club Burgee or in an appropriate position on the boat.
- (d) After Official Course Start time, all competitors shall comply with the Rules.
- (e) A vessel approaching or overtaking one or more vessels from abaft the beam, shall be known as the overtaking vessel. As soon as the vessel is anywhere within range of risk of collision, the overtaking vessel must keep clear of the overtaken vessel until there is no risk of collision.
- (f) Where two or more vessels are approaching a marker buoy and are abeam of each other, the inside vessel(s) must be given sufficient sea room to complete the turn.
- (g) A vessel overtaking two other vessels which are abeam, or nearly abeam of each other shall not force a passage between the two leading vessels in a manner which causes the overtaken vessels to alter their course to allow the overtaking vessel to pass.
- (h) An overtaking vessel shall not set course for a new mark until clear ahead of the overtaken vessel.

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- (i) No vessel shall bear away out of her proper course, or do any other act which is intended to impede an overtaking vessel(s). In such case the overtaking vessel(s) may be considered to be fouled.
- (j) If a vessel considers itself fouled during an event, or has any reason to lodge a protest it must immediately do so by displaying a white flag conspicuously during the remainder of the event.
- (k) A collision with a course marker buoy, however slight, shall be considered a foul.
- (l) All vessels having completed the course-must proceed in a direction which will keep them clear of other competitors.

## 6.1 PROTESTS

- (a) Skippers protesting against another competing vessel or vessels shall fly a white protest flag clearly visible to the Officials when crossing the finishing line.
- (b) All protests must be in writing and accompanied by any fee prescribed by the organising Club, within a period of one hour after completion of the event or thirty minutes after posting of results.
- (c) Protests lodged shall be considered and resolved preferably on the day by the Event Officials of the day.
- (d) In the event of a continuing dispute, an appeal, in writing, may be lodged with the nominated fee within 12 hours with the organizing Club's nominated appeal panel.  
The protestor shall immediately notify the event committee of such intention.

## 7. EVENT RESULTS

### 7.1 RESULTS EVALUATION

- (a) The winner shall be the vessel with the least number of points lost.
- (b) Tied results shall be decided in the following sequence:
  - a. If two vessels have equal results with one receiving zero points at the final check and the other is early or late, then the vessel with zero points at the final check shall take precedence.
  - b. If one is early and the other late of the scheduled time at the final check, then the late vessel shall take precedence.
  - c. If both early, or both late, the vessel losing the least number of points at the final check shall take precedence.
  - d. If still equal, reverse through the check points using the same procedure as above until a result is achieved.
- (c) Placings shall be determined in the same manner.
- (d) In the event of 3 or more ties the same procedure is to apply.

### 7.2. POSTING OF RESULTS

- (a) All check point times, penalties and results are to be posted at the same time.
- (b) Results are to remain provisional for a period of at least 30 minutes after the nominal winner has been announced and results posted.

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- (c) Any protests against the posted results are to be made in the 30 minute period prior to the result being declared final.
- (d) All protests must be in writing and accompanied by the fee prescribed by the organizing committee.
- (e) No protest against the posted results will be accepted after final declaration of the winner and placegetters.
- (f) All Waypoints used by Tack Tracker are to be displayed with the results.

### **7.3 OPEN INTER CLUB EVENTS**

A result sheet showing the performance of all competitors shall be forwarded to each competing Club or posted to a common website as soon as possible after the event.

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## APPENDIX A PENALTIES

- (a) For changes from nominated speed in an attempt to better time or position on the course: 50 points
- (b) For changes in course in an attempt to better time or position on the course: 50 points
- (c) For failure to navigate to or pass on the correct side of a check point, properly laid sight line, or course marker buoy: 50 points
- (d) For major breaches of (a), b), or c) above: 100 points
- (e) For collision with a course marker or buoy: 50 points
- (f) For failure to comply with any Start or Finish line procedures excluding 3.2.3.d above: 50 points
- (g) For each second early or late at check points: 1 point. Maximum Penalty 300 points
- (h) For failure to display competition numbers of the specified size and type: 50 points
- (i) Failure to pass between any gate: 50 points
- (j) For failure to display Club Burgee: 10 points
- (k) For failure to comply with prescribed Boating Regulations and/or Rules for the Prevention of Collision at Sea: Disqualification

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## APPENDIX B

### AGGREGATE POINTS FOR INTERCLUB EVENTS

Aggregate points will be allotted to placegetters as follows:

Position	Points	Position	points
1	100	11	9
2	90	12	8
3	80	13	7
4	70	14	6
5	60	15	5
6	50	16	4
7	40	17	3
8	30	18	2
9	20	19	1
10	10	20	nil

- (a) Assessment of the best aggregate score for the Club or Inter-Club series will be a percentage basis of actual points to possible events.
- (b) This will enable skippers who are appointed Event Organiser on the day of their Club's event (maximum of one event within the YV series) to compete on an equitable basis.

**Example:** Vessel A can compete in all aggregate events - say 8 in total.

Therefore possible points =  $100 \times 8 = 800$

Say actual score is 600 points

Therefore percentage is  $600/800 = 75\%$

Vessel B that of an Official in an event can compete in only 7 of the 8 events

Therefore possible points =  $100 \times 7 = 700$

Say actual score is 550 points

Therefore percentage is  $550 / 700 = 78.6\%$

Vessel B would therefore have a higher placing than Vessel A.

Should any vessel competing for a Club aggregate be asked to officiate in the running of any event then the above shall apply.

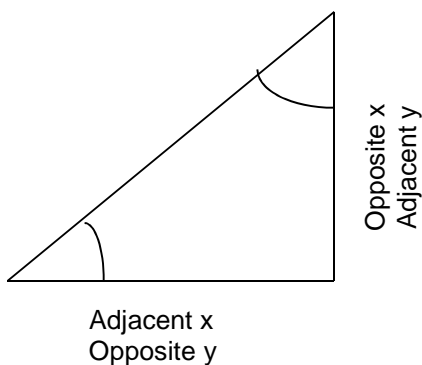
# NAV RALLY INSTRUCTIONS

## APPENDIX C TRIGONOMETRIC CHECK

### ALL THE FOLLOWING TO BE AMENDED

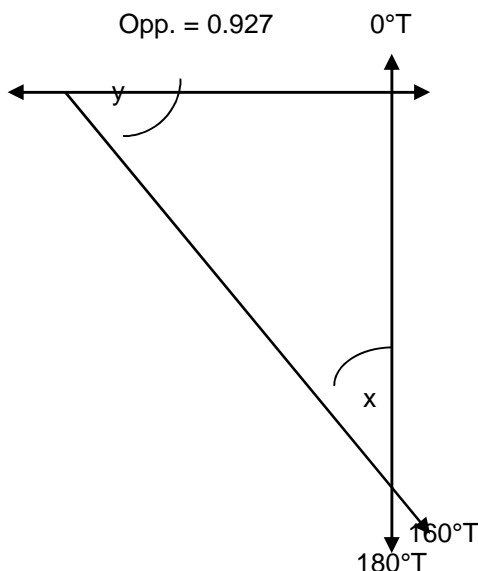
#### BRIEF EXPLANATION OF TRIGONOMETRY INVOLVED

Triangles have 3 sides and 3 angles. When any 3 parts are known, providing one of them is a side, the other parts may be determined. The sum of the angles of any right angle triangle is  $180^\circ$ , and one angle is always  $90^\circ$ . The sides of the triangle are named as per the sketch. The hypotenuse is always opposite the right angle.



Tables of Trigonometrical Functions assist in calculations. (See Page 27) The sine (sin) of an angle  $\beta$  is the length of the Opposite side divided by the length of the hypotenuse, and the cosine (cos) of an angle is the length of the Adjacent side divided by the hypotenuse.

When determining dimensions of the triangle constructed around a course, the hypotenuse is known, being the leg length, and the angles  $x$  and  $y$  can be calculated from course headings.



Using leg 2 of sample course as an example ( $160^\circ\text{T}$  for 2.71 NM), angle  $x = 180^\circ\text{T} - 160^\circ\text{T} = 20^\circ$ , and angle  $y = 160^\circ\text{T} - 090^\circ = 70^\circ$ , or  $180$  (sum of angles)  $- 20 - 90 = 70$ .

Adj. = 2.547

Using one angle as a basis, from Trig. Tables it is found that  $\sin 20 = .3420$  and  $\cos 20 = 0.9397$ .

$$(\sin 20 (.3420) = \text{opp}/\text{hyp} = \text{opp}/2.71 = 0.927$$

$$\cos 20 (.9397) = -\text{adj}/\text{hyp} = \text{adj}/2.71 = 0.927$$

By transposition, length of sides =  
 $\text{opp.} = .3420 \times 2.71 = .927 \text{ NM}$   
 $\text{adj.} = .9397 \times 2.71 = 2.547 \text{ NM}$



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## APPENDIX D

### CLUB LISTING

Australian Volunteer Coast Guard Jetty Road SANDRINGHAM 3191	95987003 VH3 OP All radio frequencies
Beaumaris Motor Yacht Squadron PO Box 45 BLACK ROCK 3193	95895156 VH3 BW 27.910 & V.H.F.
Patterson River Motor Boat Club PO Box 74 CHELSEA 3196	9772 2314 VMP 300 27.910 & V.H.F.
Royal Victorian Motor Yacht Club PO Box 25 WILLIAMSTOWN 3016	93975036  No club radio
Sandringham Yacht Club PO Box 66 SANDRINGHAM 3191	9598 7444  VJ3DS
Royal Geelong Yacht Club 25 Eastern Beach Road GEELONG 3220	5032 2160
Mordialloc Motor Yacht Club PB Box 5009 MORDIALLOC 3195	9580 1203
Hidden Harbour	