1

Introductions

- **Instructors**
  - Rod Smallman
    - rod.smallman@orcv.org.au
  - **Moderators**
  - Neville Rose
  - Paul Roberts

2

House rules & explanation

The sessions will go for approximately 2 hours including presentations, chats and exercises

There will be a 10 min break in the middle

Teams – protocols and tools

- Chat bar – student participation is very much encouraged
- Moderator – might not raise a question to the presenter if they know the topic is coming up
- Raise hand
- Audio and Video selections
- Polls, Quiz's
- Select "View" & "Focus on content" will provide a better experience

3

Acknowledgements

AUSTRALIAN HYDROGRAPHIC SERVICE

PredictWind.com THE WORLD LEADER

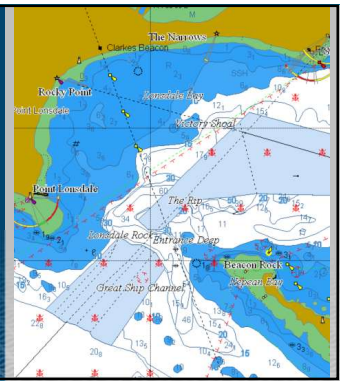
QUANTUM SAILS TO THE NEXT CHALLENGE.

NAVIONICS A Garmin Company

MUSTO 60 YEARS OF INNOVATION

4

Session TWO



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Exercise #02

- You passed Fawkner Beacon at 10am when your GPS stopped working. You keep sailing on a reach when after 2hrs fog sets in. You weren't really keeping track
- The course you have steered, using the magnetic compass was 165 Deg
- The wind is strong, from the West (270 Deg True)
- You expect around 5 degrees leeway
- Your boat has been doing 8 knots

Where are you ?

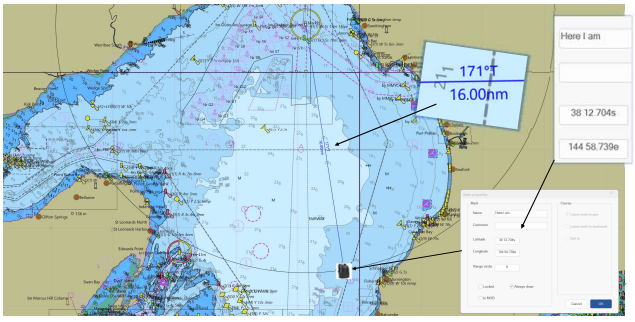
6

Exercise #02 solution

Compass bearing (magnetic)	165 degrees
Adjust for compass variation	+11 degrees east
True direction steered	176 degrees T
West wind – adjust for leeway	-5 degrees to the east
True direction sailed (COG)	171 degrees
2 Hours at 8 Kn = around 16 nm	

7

Exercise #02 solution



8

Electronic Charts –
Quality aspects
by
Mike Prince

Ocean Racing Club of Victoria (ORCV) 2025 Navigation Course

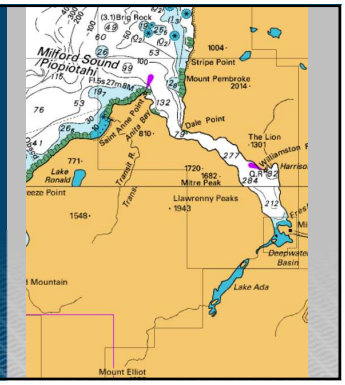
9

Introduction to
Electronic Navigation Charts

Mike Prince
National Charting Program Director
Australian Hydrographic Office

10

Navigating with GPS and Chart plotters



11

Reliability of Information

When you turn on your chart plotter the first thing you get is a message like this…

- This product is an aid to navigation.
- Does not replace Official Charts
- "Only official Government charts and Notices to Mariners contain all the information needed for safe navigation."

B&G are a bit more strident…

"Do not rely on this product as a source of navigation……"

Behind these messages there are some key points:

12

Reliability of Information - key points

- As we discussed last week, the charts used in chart plotters do not contain all of the information available in the Official Charts (ENC or paper charts)
  - "zooming down" to lower levels helps BUT
  - Zone of Confidence information not shown or used
- When you look at an image of your boat imposed on a chart with an apparent accuracy of just a few meters it's very easy to have a false sense of security

13

The GPS System

The GPS system comprises:

- 32 coordinated satellites (though only 24 active at any one time) each orbiting Earth twice a day plus ground control stations and the user's GPS receiver.
- Each satellite transmits a unique microwave signal including orbital parameters and very accurate time.
- The user's GPS receiver calculates its distance from the Satellites and with a minimum of three satellites can determine its position (at sea level!), four satellites for a 3-dimensional fix
- The GPS receiver automatically selects the best satellites
- Accuracy at sea level can often be as good as a few metres
- The GPS system uses the WGS84 map datum

14

15

How good is your GPS?

GPS effectively solves the problem of knowing where you are on the globe…..

- It's not infallible
- Most boats have numerous GPS receivers on board and they may not all agree!

16

GPS – What makes the GPS position shown in your plotter inaccurate ?

Antenna position and inability to see the satellites

- crew sitting on it
- is it under the sail (especially a carbon sail)
- effectiveness of antenna at severe angles of heel

The position and number of available satellites

User equipment failure – antennas do fail and degrade

17

GPS – Precautions

- You NEED to KNOW what your plotter does when/if the signal stops
  - Does an alarm sound ?
  - Can the skipper and crew hear the alarm when on deck
  - Does it continue with current position?
  - Does it use dead reckoning?
- Keep watch, cross check where you can
  - Depths, Light houses, transits
- Utilise HDOP & HPE (Horizontal Dilution of Precision),(Horizontal Position Error)
- Satellite tracker/map in your plotter

18

Setting up the Chart Plotter

https://www.youtube.com/watch?v=ElCeUMI1xvU

Check all the settings – professional assistance in the initial set up may help – e.g.

- Are GPS and Chart plotter set to the same datum ?
- GPS set to degrees, minutes and decimal minutes?
- Helpful to set chart plotter and instruments to display compass True
- Include "confirming data" on Chart plotter displays - depth sounder readings displayed next to your chart are especially useful
- Ensure course over ground is displayed … where you are going is usually more important than where you are pointing!

19

Once you're all set up….

Your instruments do all the hard work for you

- Course over ground (no need to adjust for tides and leeway)
- Bearings, distances and expected sailing time to waypoint
- Speed over ground and Boat Speed
- Velocity made good to your course (VMC)
- Boat speed vs target speeds ("polars")
- Tide levels and some tidal flow information

- ……..And the list goes on

20

GPS – your settings

- How is your GPS set
  - dd mm ss
  - dd mm.mmm
  - dd.dddd

- **Question**
  - 38.29934s 144.54397e
  - 38 29.934s 144 54.397e
  - How far apart are these two positions?

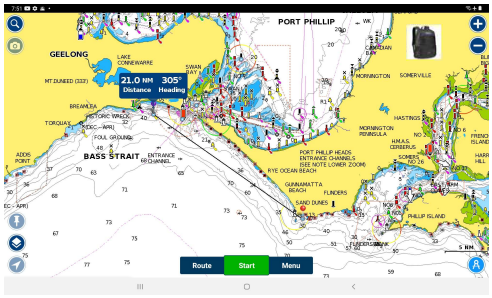
21

Convert decimal degrees to decimal minutes

- To Convert Decimal Degrees 38.29934
- Multiply 0.29934 by 60 = 17.960
- Position in Degrees & Minutes is 38 deg 17.960 minutes
- To convert 144.54397
- Multiply 0.54397 by 60 = 32.638
- Position in Degrees & Minutes is 144 deg 32.638 minutes
- Via the internet https://www.pgc.umn.edu/apps/convert/

22

A 21NM difference!



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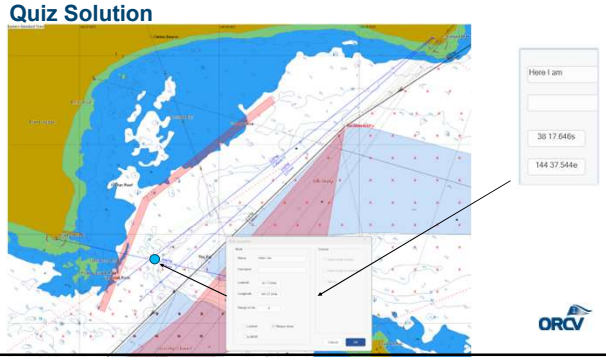
Quick #02

- You're somewhere in the vicinity of Port Phillip Heads in 11m of water
- You take a bearing to the Lonsdale lighthouse of 270° on your hand bearing compass
- You see a white isophasing light just to the left of the Hume Tower

- What is your position in Lat/Long in DD mm?
- What is the light & why?
- What would your bearing be to the light off your hand compass?

24

Quiz Solution



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Compass Variation (Declination)

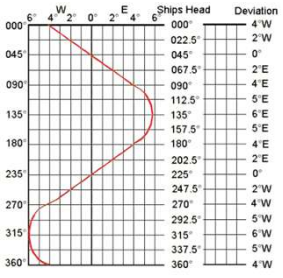
- If your instrument settings are TRUE make sure you a fully aware of the difference between your instruments and your wet compass

26

Compass Deviation

Compass deviation is another magnetic error effecting the steering compass. Variation is a magnetic interference common to all vessels. **Deviation is a magnetic interference unique to the vessel itself**.

The term 'deviation' is used to describe the effect of interference from magnetic fields created by the vessel's own equipment. This can be from things such as batteries, large metal objects like the engine, speakers, VHF radios etc.



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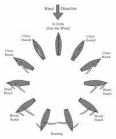
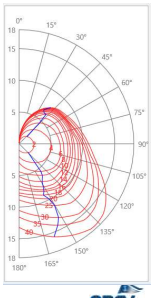
Predicting boat speed

- Every yacht is different, you should know approx. Your boat speed at various wind angles and wind strengths
- This can be represented on polar diagrams or tables
- If you don't have one, start a diary and create your own
- Most current chart plotters include "polar diagrams" for select yachts and will generate target speeds at measured wind strengths and angles.
- This "polar data" is the basis for weather routing.





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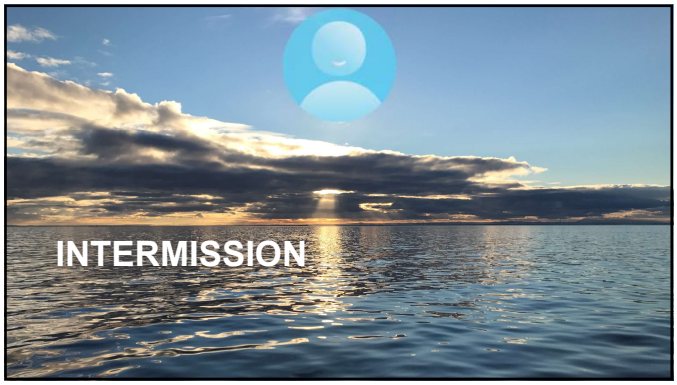

29

Exercise #03 Navionics Exercise

- Plot a course from the exit of the Martha Cove Marina at Safety Beach to the entrance of the Queenscliff Cut (use the automatic course option)

- Any shallow water issues we need to keep an eye on?
- What are the key marks we will encounter on the passage?
- Are there any conventions we will need to obey along the way?
- What is the key danger?

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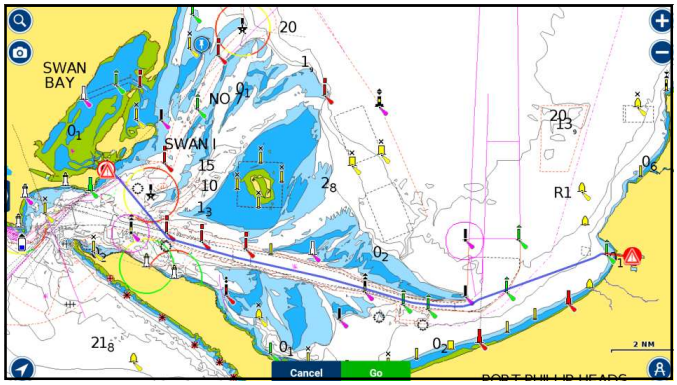

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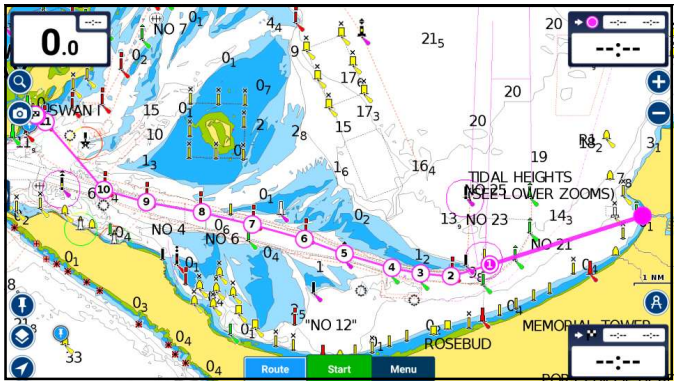

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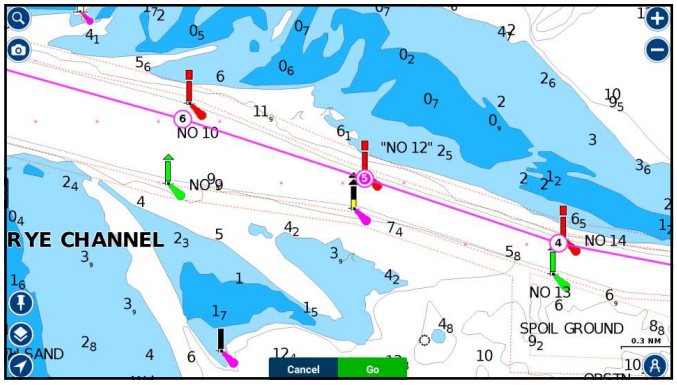
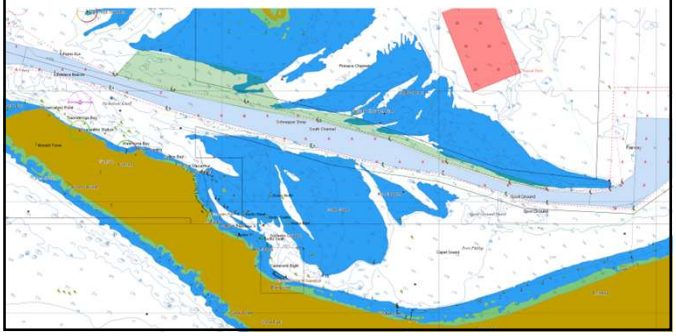


33

Green Zones



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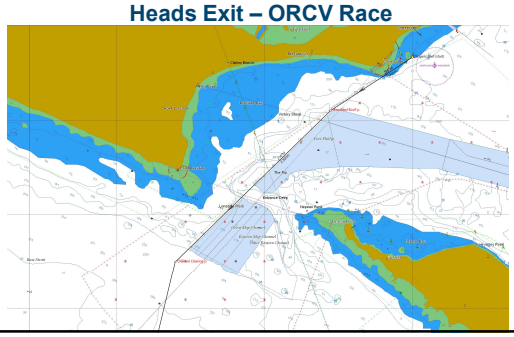
Exiting Port Phillip

The next couple of slides consider how you might prepare for a race start through Port Phillip Heads

35

Heads Exit – ORCV Race



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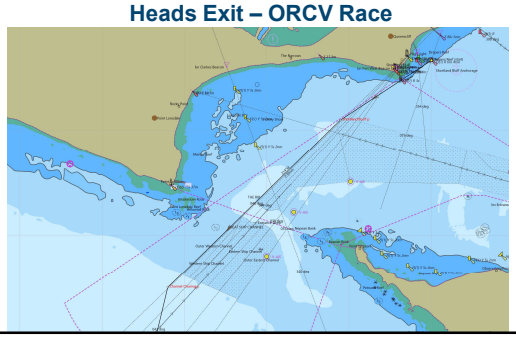
Heads Exit – ORCV Race



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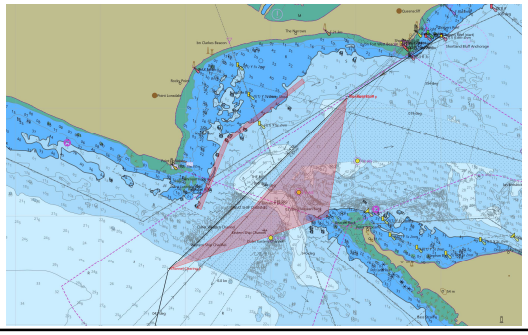
ORCV Bay Exit Limits



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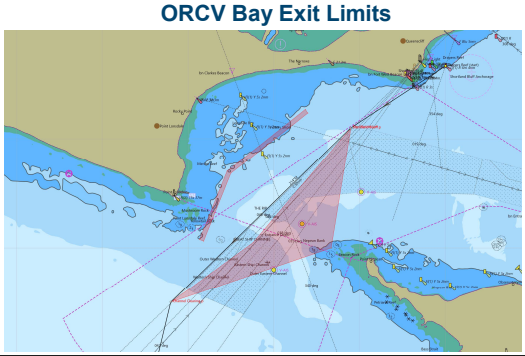
ORCV Bay Exit Limits



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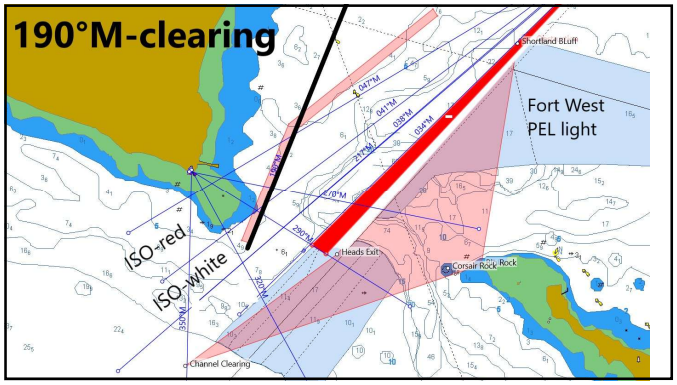

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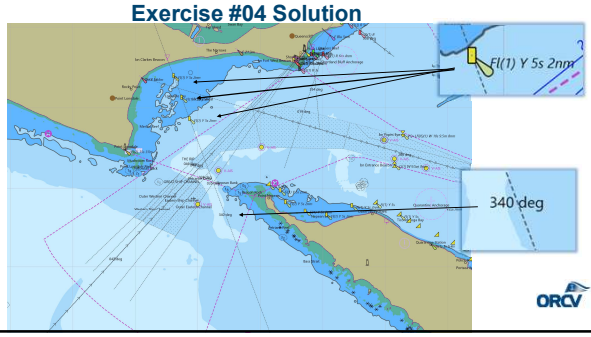
Exercise #04 – Heads Exit

- What is the bearing from sea of the Clark's Beacon and Marcus Hill transit on the chart ? What does it indicate?
- What would be the bearing when viewed from the land?
- What lights are displayed by the three beacons on Victory Shoal?
- What is the distance between the ORCV Heads Exclusion Zone and the 5m line off Lonsdale platform?

41

Exercise #04 Solution



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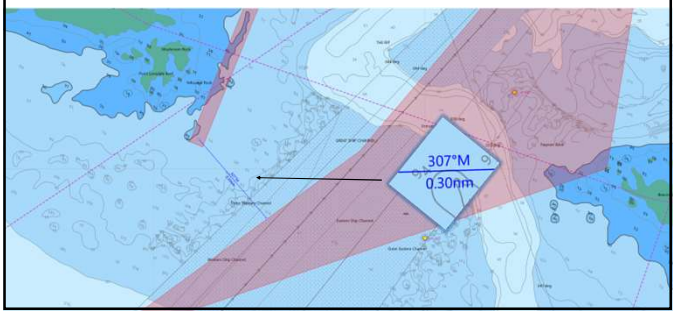
Exercise #04 Solution



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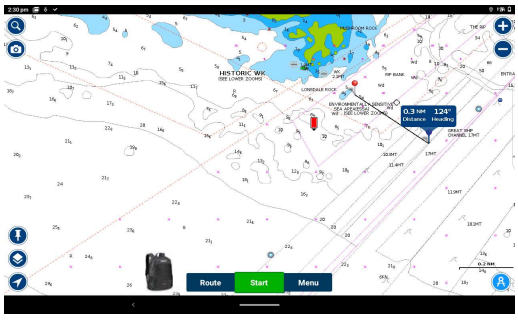
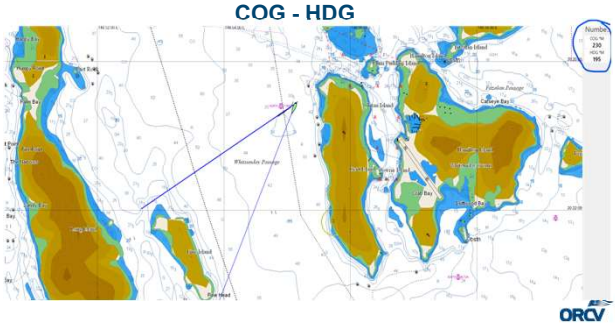
Exercise #04 solution



44

COG - HDG



45

Quiz #03 Time – Distance Exercises

- I am travelling at 6 knots. How far will I go in 36 minutes?
- It is 10.00am and the start line for the race is 5 nm away. What speed do I need to motor/sail at arrive by 10.50am?
- I am located at Mornington Pier. I wish to meet another boat at Fawkner Beacon at noon. What time do I need to leave if I think I can travel at 6.5knots

46

Answers

- Speed is distance /time. Distance is 6*(36/60) = 3.6NM
- 50 minutes is 50/60 hours, Speed=Distance /Time, speed = 5NM/ (50/60) hours = 6 knots
- Distance to Fawkner Beacon from Mornington Pier is 16.6NM. Speed is Distance/Time so Time= Distance/Speed, the time at 6.5knots is 16.6/6.5=2.55 hours= 2 hours 33 minutes, leave at about 9.30am

47

Automatic Identification System (AIS)

What is AIS? (compulsory Cat 1 & 2 races)

Automatic tracking system

Identifies & locates vessels by electronically exchanging data with other nearby ships and AIS Base stations

Class A and B (smaller vessels)

Vessels continually transmit their ID, position, course, speed and other data by VHF.

Receivers only and transceivers

48

AIS - Overview

Unlike radar and other aids to navigation, the AIS systems do not need to have visual line-of-sight to share this information.

- Yachts reliant of VHF coverage – ship to ship or ship to station

Benefits of AIS

- Collision avoidance
- Aid to Navigation
- Identify other vessels
- AIS MOB device

Beware of "old" positions

49

AIS - Features

- Networked AIS displays show vessel positions across the world (marinetraffic.com)

50

Collision Avoidance

Vessel details, position, course & speed shown on chart plotters

Chart plotters can be interrogated to find:-

- Whether boats on collision course
- Passing distance
- When closest passing distance will be reached.

Can be linked to alarms

51

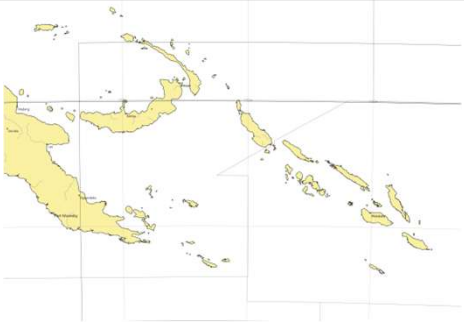
AIS Additional Features

AIS AtoN - transmitting position and status of buoys and lights, which can then show up on an electronic chart, display or radar

Synthetic AIS. Transmitter is located near – but **not on** the object of interest – such as submerged rock

AIS received by satellites to give extended reception of the VHF signal - even when out at sea

52



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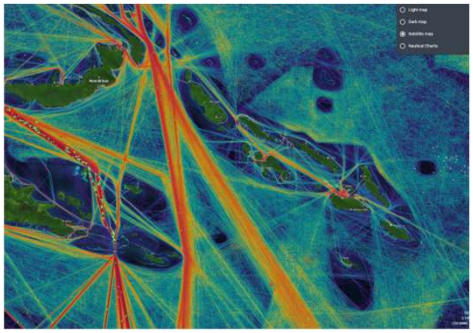

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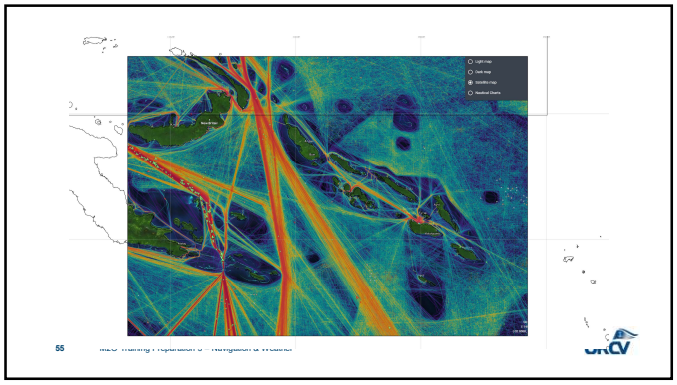

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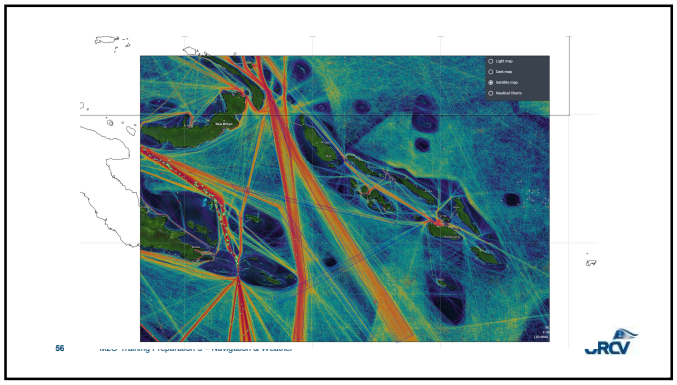

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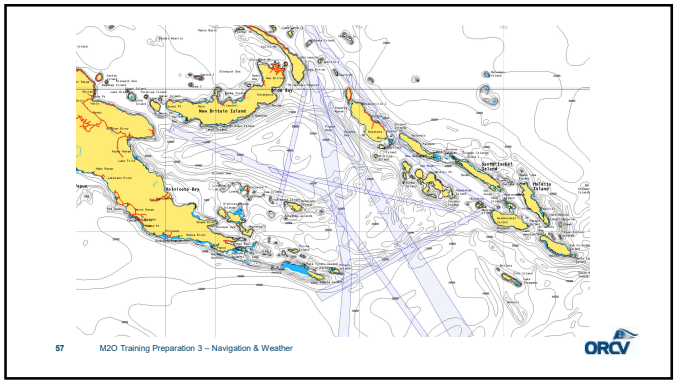
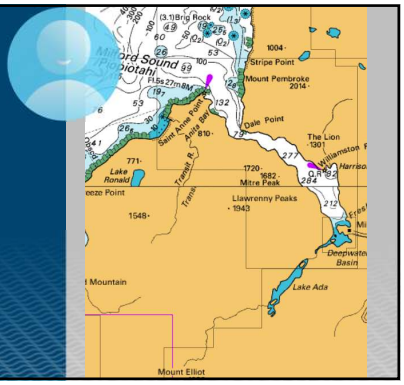


57

ORCV

ORCV

Good Practice for Safe Navigation



58

Key points

- Everyone on a boat should take an interest in navigation
- There should be redundancy – in equipment and people
- There should be a plan, made well before the trip, including plan B catering to "what if"
- Don't blindly rely on technology, use your observations
- Be conservative !!

Proper Preparation Prevents Poor Performance

ORCV

59

Passage / Race Planning

Your passage should be a confirmation of what you have already planned.....

- Estimated times along the route
- Conditions to expect
- Dangers & potential dangers

Include contingencies for unplanned events .....what if

- I need a bolt hole ?
- I break a rudder ?
- I need medical assistance?

ORCV

60

Observations

- Things to note on plan:-
  - Expected sighting of shore line changes (e.g. a headland)
  - Navigation markers
  - Lights and beacons
  - Significant chart features – oil rigs
  - Depth changes
  - Shoaling Water
  - Consider writing them down
    - In your logbook

61

Red Zones

62

What makes a Red Zone Red ?????

- Potential outcomes if you get it wrong
- Likelihood of getting it wrong..
  - Crew fatigue, especially the helm and navigator
  - Weather - visibility, difficult conditions
  - Tides – possibility of rips, breaking waves
  - Inherent difficulty..... navigation lights and shore lights, condition of leads
  - Been there before ??.... do you know what the entrance looks like in the dark ?
  - Reliability of charts
  - Shipping, fishing boats, cray pots

63

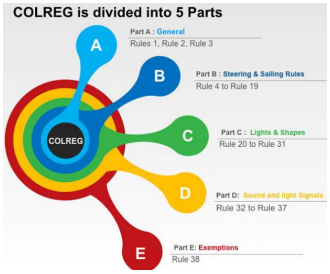
Red Zone Procedures – some general rules

- Identify likely red zones when you do your trip plan....
  - Awareness matters – discuss with crew, watch leaders and both navigators
- One person steering... not steering and navigating
  - Nav Person ….. not down below
  - Lookouts
  - Protect night vision – of skipper and lookouts
- Ensure you have boat under proper control before entering red zone
  - Know the limitations of the boat and crew in the conditions you could expect to experience

64

COLREGS

- Know and follow the rules
- Maintain a proper lookout (windward and leeward)
- Travel at a safe speed
- Allow for the actions of others, both reasonable and unreasonable.
- Know how to recognise lights of ships
- knowledge of the Col Regs



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Available on the App Store

Google play

66

Further Exercises

- Exercise #05 – Port Arlington – Cole Channel Beacon
- Exercise #06 – Blairgowrie Yacht Squadron (BYS) – Queenscliff Cruising Yacht Club (QCYC)
- Exercise #07 – Return trip from Hobart – Melbourne
- Exercise #08 – Fastnet

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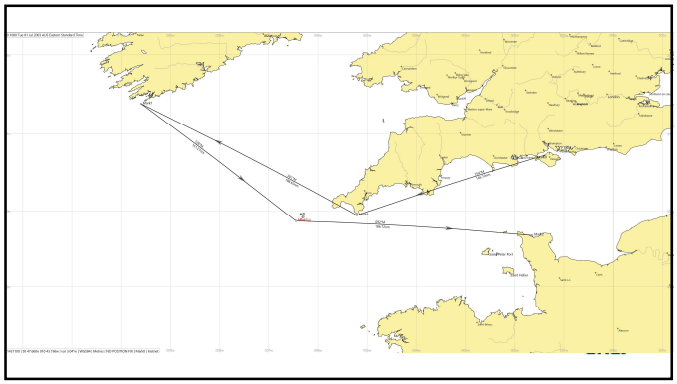

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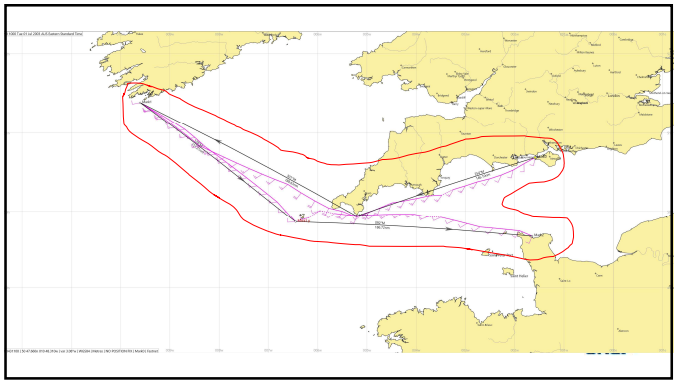

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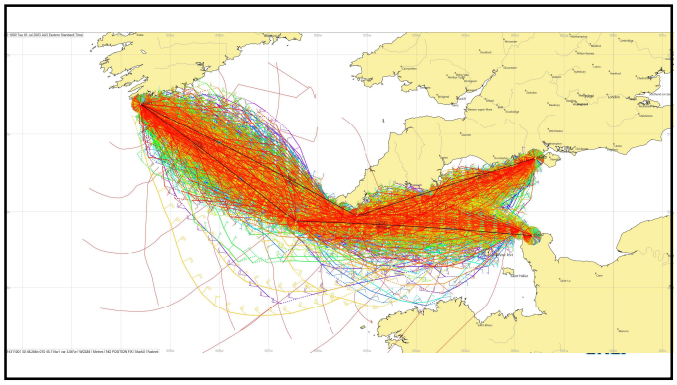

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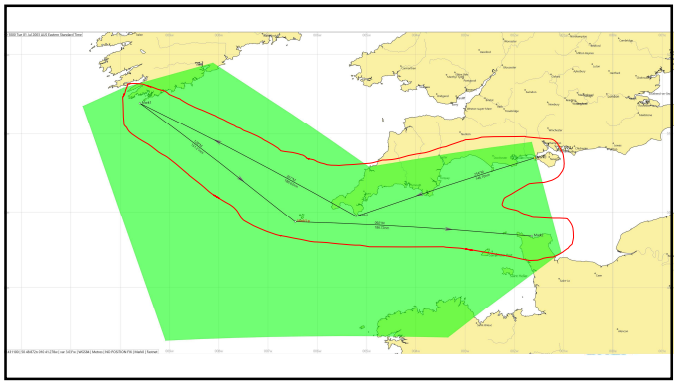

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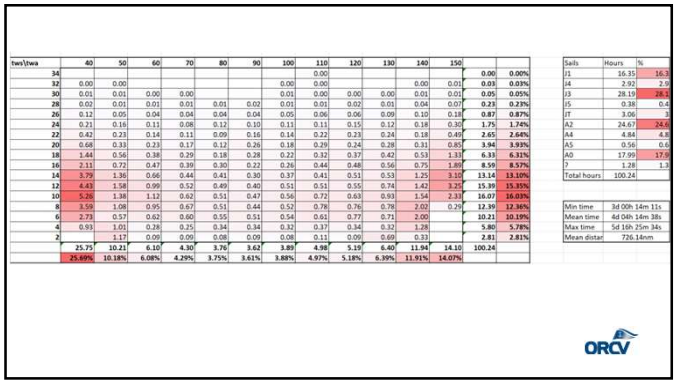

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34								0.00					0.00	0.00%
32	0.00	0.00					0.00	0.00			0.00	0.01	0.03	0.03%
30	0.01	0.01	0.00	0.00			0.01	0.00	0.00	0.00	0.01	0.01	0.05	0.05%
28	0.02	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.04	0.07	0.23	0.23%
26	0.12	0.05	0.04	0.04	0.04	0.04	0.05	0.06	0.06	0.09	0.10	0.18	0.87	0.87%
24	0.21	0.16	0.11	0.08	0.12	0.10	0.11	0.11	0.15	0.12	0.18	0.30	1.75	1.74%
22	0.42	0.23	0.14	0.11	0.09	0.16	0.14	0.22	0.23	0.24	0.18	0.49	2.65	2.64%
20	0.68	0.33	0.23	0.17	0.12	0.26	0.18	0.29	0.24	0.28	0.31	0.85	3.94	3.93%
18	1.44	0.56	0.38	0.29	0.18	0.28	0.22	0.32	0.37	0.42	0.53	1.33	6.33	6.31%
16	2.11	0.72	0.47	0.39	0.30	0.22	0.26	0.44	0.48	0.56	0.75	1.89	8.59	8.57%
14	3.79	1.36	0.66	0.44	0.41	0.30	0.37	0.41	0.51	0.53	1.25	3.10	13.14	13.10%
12	4.43	1.58	0.99	0.52	0.49	0.40	0.51	0.51	0.55	0.74	1.42	3.25	15.39	15.35%
10	5.26	1.38	1.12	0.62	0.51	0.47	0.56	0.72	0.63	0.93	1.54	2.33	16.07	16.03%
8	3.59	1.08	0.95	0.67	0.51	0.44	0.52	0.78	0.76	0.78	2.02	0.29	12.39	12.36%
6	2.73	0.57	0.62	0.60	0.55	0.51	0.54	0.61	0.77	0.71	2.00		10.21	10.19%
4	0.93	1.01	0.28	0.25	0.34	0.34	0.32	0.37	0.34	0.32	1.28		5.80	5.78%
2		1.17	0.09	0.09	0.08	0.09	0.08	0.11	0.09	0.69	0.33		2.81	2.81%
	25.75	10.21	6.10	4.30	3.76	3.62	3.89	4.98	5.19	6.40	11.94	14.10	100.24	
	25.69%	10.18%	6.08%	4.29%	3.75%	3.61%	3.88%	4.97%	5.18%	6.39%	11.91%	14.07%		

Sails	Hours	%
J1	16.35	16.3
J4	2.92	2.9
J3	28.19	28.1
J5	0.38	0.4
JT	3.06	3
A2	24.67	24.6
A4	4.84	4.8
A5	0.56	0.6
A0	17.99	17.9
?	1.28	1.3
Total hours	100.24	

Min time	3d 00h 14m 11s
Mean time	4d 04h 14m 38s
Max time	5d 16h 25m 34s
Mean distar	726.14nm

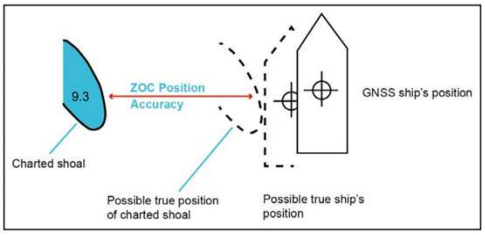
72

Key Take Home Messages

- Paper Charts have given way to electronic charts
- Only ENC's are the official charts
- No charts are perfect! Zones of Confidence always need to be considered
- GPS, plotters and AIS are great aids to navigation but need to be set up correctly and constantly monitored
- Plan routes well in advance to identify potential hazards
- Crew vigilance is critical in addition to instrumentation
- Risk management – What could go wrong and how would we cope?

73

ZOC
Zones of Confidence



74

Ocean Racing Club of Victoria

Fundamentals of Navigation - Student Resources

Join the instructor lead session - click here

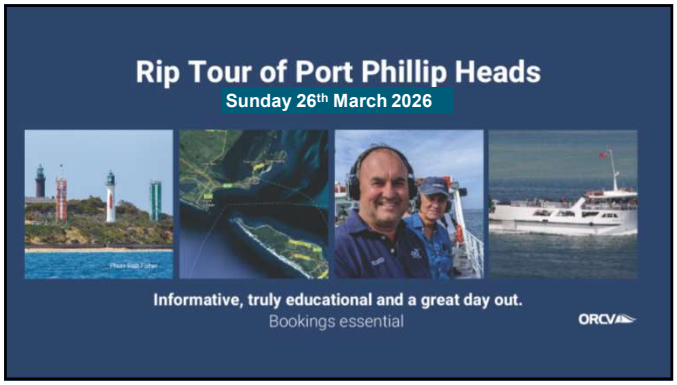
We look forward to you joining us online. To Join, please click on the above Teams Link, which will be open 30 mins ahead of the training session.

Pre Learning

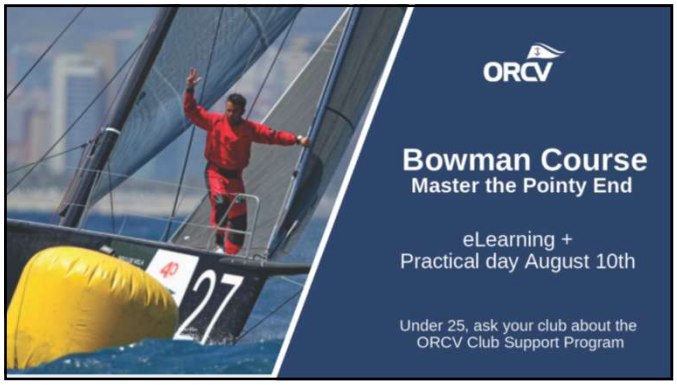
To maximise learning and provide more comprehensive content, we have redesigned the course by providing pre course self-paced eLearning.

The key content item is "Navigation foundations", a short 45min eLearning module designed to bring all participants up to a baseline level of navigation knowledge. Our instructor led online training sessions will assume this knowledge as we move into more intermediate and advanced content. You may already know this content, so feel free to skip through it if you wish. If not, please work through and watch the embedded videos and listen to the content. Come to us with any questions in the first instructor led session. We hope it proves enjoyable and informative. Be on the lookout for an email from notifications@learnupon.com which has your login and will connect you to this content. Email training@orcv.org.au if you can't locate this login.

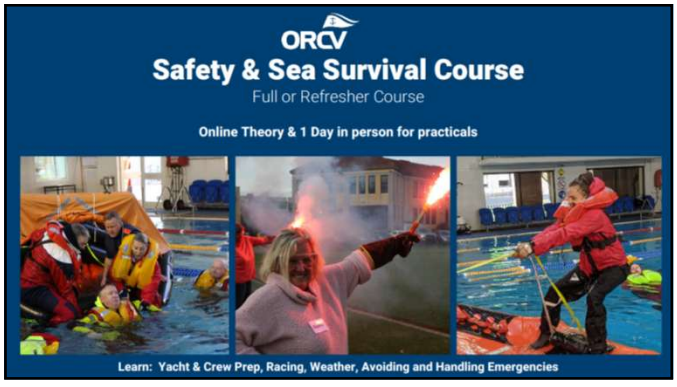
75



76



77



78

Interact with Us

Train

Navigation
On Water Rip Tour
Weather
Foredeck Essentials

Race

Destination Races to:
Devonport, King Island, Hobart
Apollo Bay, Port Fairy,
Coastal Sprints

Volunteer

Support
Many Roles
Race Management, Media,
Training Support, Mentoring

ORCV

79

What we want you to do before the Q&A

ORCV

- Complete the major exercise using your electronic charting software
- Email training @orcv.org.au
- A written Voyage plan
- Screen captures of your electronic route
- A GPX file of your routes

80

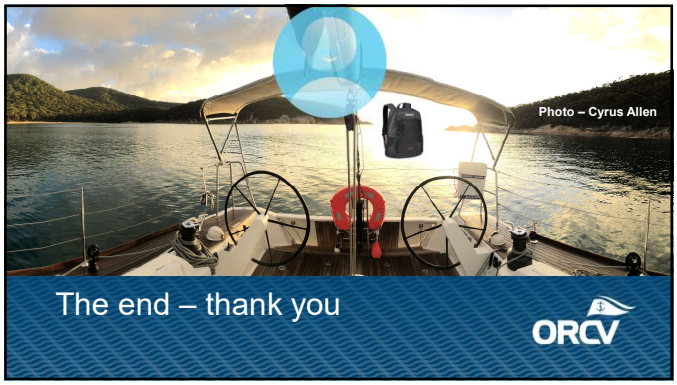
What we want you to do before the Q&A

ORCV

- It would be great to know what you're asking beforehand so that we can prepare better for your questions.
- Any questions sent to training@orcv.org.au beforehand will head the queue.

81

82



83