

# COASTAL NAVIGATION FOR SAILORS

## OUTLINE - 2019

### **Day 1 – Classroom - Saturday 25 May, 9 - 3**

1. **Introduction** (15 minutes: 0900 - 0915)
  - a. Who I am
    - i. Been boating since Scouts in the late 60s
    - ii. Started sailing in the Navy in 1975
    - iii. US Coast Guard Masters License (100 ton) in '95
    - iv. Cruised from SE Alaska, through Panama Canal, up east coast
    - v. Current boat is a Catalina 320, *Fiddler's Green*
  - b. What we'll cover
    - i. Tools of the trade
    - ii. Dead Reckoning (Using speed, time traveled and distance traveled to plan a route)
    - iii. Piloting (Using known landmarks, chart information and currents to determine and track position)
    - iv. Electronic Navigation
    - v. Trip planning and on-the-water navigation
  - c. Pick date for day sail (more to follow at end of day two)
2. **Tools of the Trade (dry land)** (Total 2.5 hr: 0916 - 1200 + 15 min break)
  - a. Chart
    - i. Hand out sample
    - ii. Sources - download from NOAA, local chandleries still have some (\$12.99 at West Marine), order Print On Demand (\$14.95), charting software and apps
    - iii. Show chart catalog - paper and online
    - iv. Chart basics
      1. Mercator projection = lines form easy to use rectangle, bearings accurate
      2. Horizontal lines = latitude (parallels)
      3. Vertical lines = longitude (meridians)
      4. Latitude 0° to 90° N or S
      5. Longitude 0° to 180° E or W

- v. List information found on chart
  1. Name and chart number - show catalog and give online source
  2. Chart scale - give coverage comparison from chart catalog and software (see slide notes)
  3. Unit of depth/soundings (fathoms & feet; feet, meters)
  4. Rose / Magnetic variation (more later)
  5. Names of waterways and shore features
  6. Navigational aids
  7. Vessel Traffic System (VTS)
  8. Chart #1
- vi. Lat/long scales - way to determine exact position  
Current =  $47^{\circ} 16.5' N$  Lat x  $122^{\circ} 28.0' W$  Lon
- vii. True vs Magnetic North
  1. True north points to the north pole
  2. Magnetic north points to the magnetic pole
  3. Magnetic pole lies near Ellesmere Is in northern Canada at  $81.3^{\circ} N$   $110.8^{\circ} W$
  4. Variation on chart 18448 =  $19^{\circ} 30' E$  (1992)  
Annual decrease = 6' so now  $16^{\circ} 48' E$  (USE  $17^{\circ}$  for class)
  5. TVMDC, + W
    - a. Difference btwn True and Magnetic is Variation (declination to land lubber)
    - b. Discuss all corrections made to get from true bearing to compass bearing.
    - c. Discuss deviation and compass bearing to highlight point to not lay magnetic object next to compass.
  6. **Activities:** (Just using math)
    - a.  $17^{\circ} T = ?^{\circ} M$
    - b.  $90^{\circ} T = ?^{\circ} M$
    - c.  $265^{\circ} T = ?^{\circ} M$
    - d.  $355^{\circ} M = ?^{\circ} T$

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**BREAK**

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- b. Dividers
  - i. How and where to measure distance
    1. Scale along bottom
    2. From lines of longitude along sides of chart (all lines of longitude are equally long)
  - ii. Large = \$19.99, small = \$13.49 at West Marine

iii. **Activities:**

1. Brown's Pt to Neill Pt
2. Buoy Y TB to Y TC
3. Width of VTS lanes

c. Rolling Rule

- i. Much more controllable than parallel rules
- ii. Large = \$20.99, small = \$19.99 at West Marine
- iii. Use of the chart rose

iv. **Activities:**

1. Mag bearing fm Brown's Pt to Neill Pt
2. Johnson PT to SW corner Herron Is
3. Reciprocal
4. Position light Fl G 6s at Johnson Pt
5. Mouth of Gig Harbor
6. Boulder at S end McMicken Is

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LUNCH

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3. **Dead Reckoning** (2.25 hr: 1230 - 1500 = 15 min break)

- a. Definition = Using speed, time traveled and distance traveled to plan a route. (Mostly trip planning done in the comfort of home)
  - i. "Since ancient times, dead reckoning has been the foundation of all good navigation."
  - ii. Name probably comes from "deduced", plus you are only using static (dead) factors
- b. How fast is your boat going?
  - i. Boat speed through the water vs over the ground
  - ii. Always expressed in KNOTS = 1 nautical mile/hour
  - iii. 4kts = 15 min/nm, 6kts = 10 min/nm
- c. Drawing a route leg
  - i. Beginning point (Tacoma YC)
  - ii. End point = known distance (Dash Pt = 3.26nm)
  - iii. Direction of travel = bearing (060° M)
- d. Calculating arrival times at turn points
  - i. Every good navigator lives at 60 D Street
    1. Cover what you want to solve
    2. Including 60 gives time in minutes

3. Distance in NM, speed in knots, time in minutes
- e. Laying out a route leg on the chart
  - i. Consider
    1. Wind / Protection
    2. Fetch
    3. Boat traffic
    4. Long crossings (current)
  - ii. **Exercise** - lay out route from Tacoma YC to Dash Pt to Salt Water Park to Des Moines marina
    1. Course above, distance below line & time at waypoints
- f. Make all other notations on chart and summarize info

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**END OF DAY 1**

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### **Day 2 – Classroom - Saturday, 1 June, 9 - 3**

4. **Piloting** (1.5 hours: 0900 - 1030 + 15 min break)
  - g. Definition - Using known landmarks, chart information and currents to determine and track position (Mostly on-the-water navigation)
    - i. While warm and dry, become familiar with features
    - ii. In the boat - tying the chart to real life
    - iii. Tools of the Trade (underway)
      1. Compass - Handheld vs marine compass (take photo & bring samples)
      2. Pros and cons of compass types
      3. Watch
      4. Nav tools at nav station - can't spend much time below = know your route
    - iv. Line of Position (LOP)
      - a. From compass
      - b. From range
    - v. Determining a fix
      1. Three or more LOP at 30° or more angles
      2. Nav aids and known locations
    - vi. Route changes during a sail
      1. Dead reckoning skills on the water
5. **Walk to the Dock** (1.25 hours: 1045 - 1200)

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**LUNCH**

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6. **Recap of Route Planning** (45 minutes: 1300 - 1345 + 15 min break)

- h. Tides
  - i. Look up secondary stations along route
  - ii. Print chart or write down times
- i. Currents
  - i. Look up secondary stations along route
  - ii. Narrow passage with strong currents to plan around?
- j. Wind
  - i. Beaufort scale \*formation of whitecaps = 10 kts

7. **Electronic Navigation** (45 minutes: 1400 - 1445)

- a. Pitfalls
- b. Raster vs Vector chart formats
- c. Tying it all together
  - i. NMEA 2000 (Replaced NMEA 0183)
  - ii. Proprietary networks

**Details for Sail Day** (15 minutes: 1445 - 1500)

- Where and when to meet
- Required gear (how to get gear for new folks?)
- Assignment - Determine weather, tide and current predictions.

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END OF DAY 2

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**On-the-water Exercises**

1. Discuss expected conditions: tide, current, weather
2. Observe actual conditions; wet rocks?, current on buoy?, wind
3. Fix position when we set sail; DR plot to next waypoint
4. Measure distance, observe speed, calculate arrival time
5. Sail course and observe set; calculate current
6. Shoot some bearings and fix position
7. Discuss speed; GPS (SOG) vs Knotmeter; current?
8. Observe range; current?
9. Work with electronics