



OSTS Winter Training



NAV 102

Chart Prep and Navigation



Agenda



Nav 102

- 3/6 Minute Rule
- Set & Drift
- Fix Intervals
- Chart Prep
- Log Book Entries
- Variation



3 Minute Rule / 6 Minute Rule



- **3 Minute Rule**
 - **Speed (kts) * 100 = Distance (yds) traveled in 3 minutes**
 - Example: if traveling 20 knots, the distance you've traveled in 3 minutes is as follows: $20\text{kts} * 100 = 2000\text{yds}$
 - If traveling 15 knots, $15\text{kts} * 100 = 1500\text{yds}$
- **6 Minute Rule**
 - **Speed (kts) / 10 = Distance (NM) traveled in 6 minutes**
 - Example: if traveling 20 knots, the distance you've traveled in 6 minutes is as follows: $20\text{kts} / 10 = 2\text{NM}$
 - If traveling 15 knots: $15\text{kts} / 10 = 1.5\text{NM}$
- **The premise with these rules is that a Nautical Mile (NM) = 2000 yards (yds)**



Set & Drift

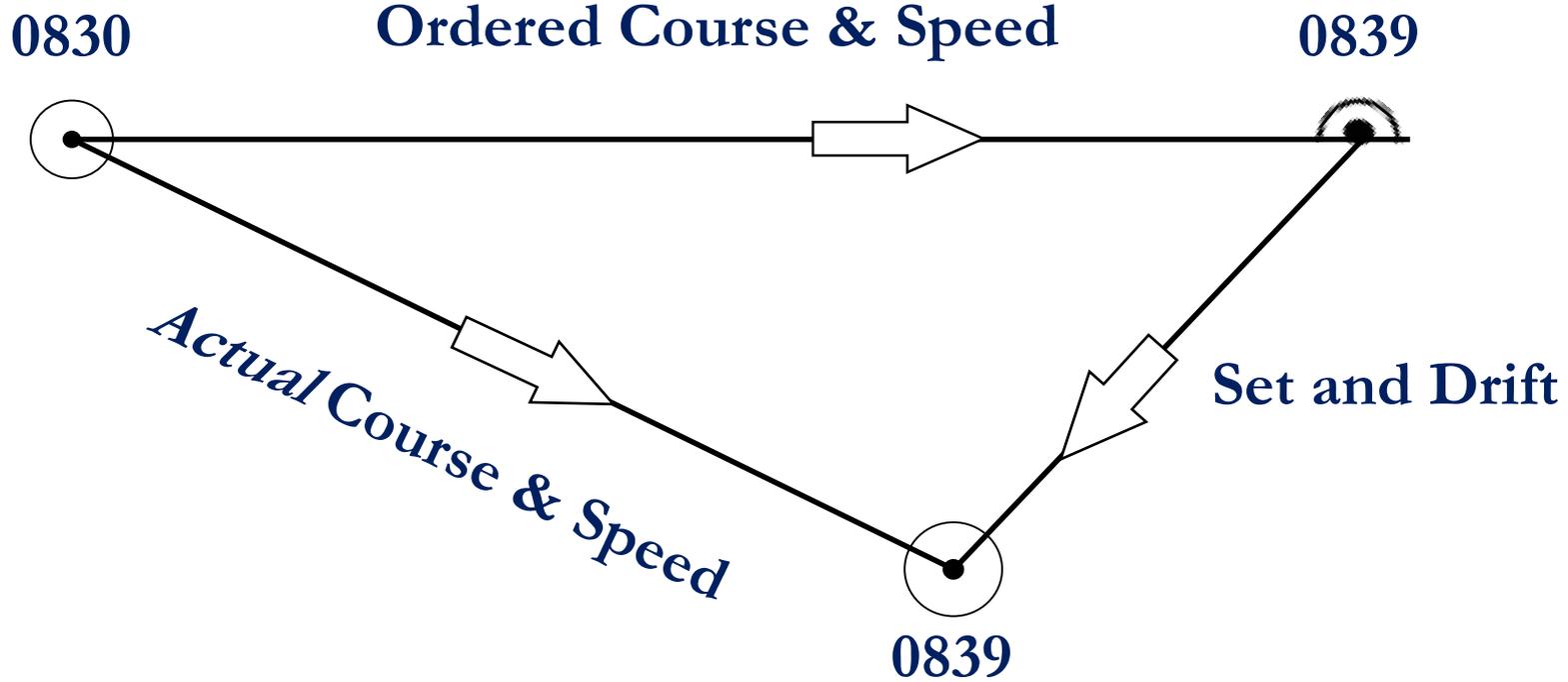


- **Set – Direction boat is being pushed**
- **Drift – Speed boat is being pushed**

- **Causes**
 - **Current**
 - **Wind (leeway)**
 - **Other Variables (e.g. wave action or inexperienced helmsmanship)**



Set & Drift





Set & Drift



- To calculate **Set**:

Draw a line from the DR to the second fix

Place slide ruler on the line and transpose over to the compass rose

Read the direction off the compass rose in the direction of the line

- To calculate **Drift**:

Measure the distance between the DR and the second fix

Divide that distance by time as an application of:

$D = S \times T$ which would convert to $S = D / T$



Exercise: Set & Drift



At 1200 you take 3 bearings

Thomas Pt Shoal: 310

Tolly Pt "1AH": 350

Matapeake Tower: 045

At 1215, you take a GPS fix

38 54' 20" N

076 24' 30" W

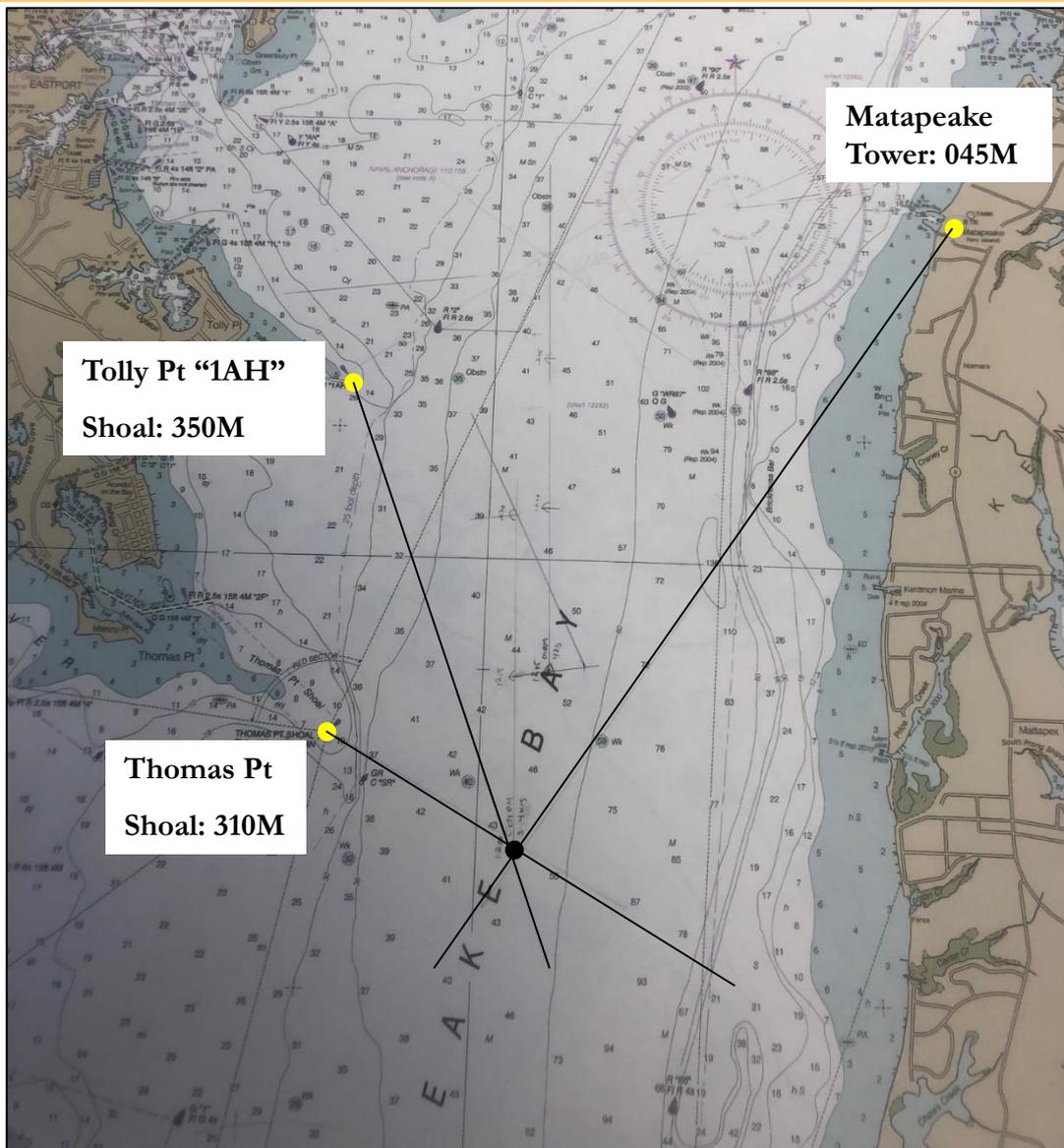
Course: 010M

Speed: 4

Fix Interval: 15 min



Exercise: Set & Drift





Exercise: Set & Drift





Exercise: Set & Drift



Set: Magnetic
Direction from DR
to Fix.

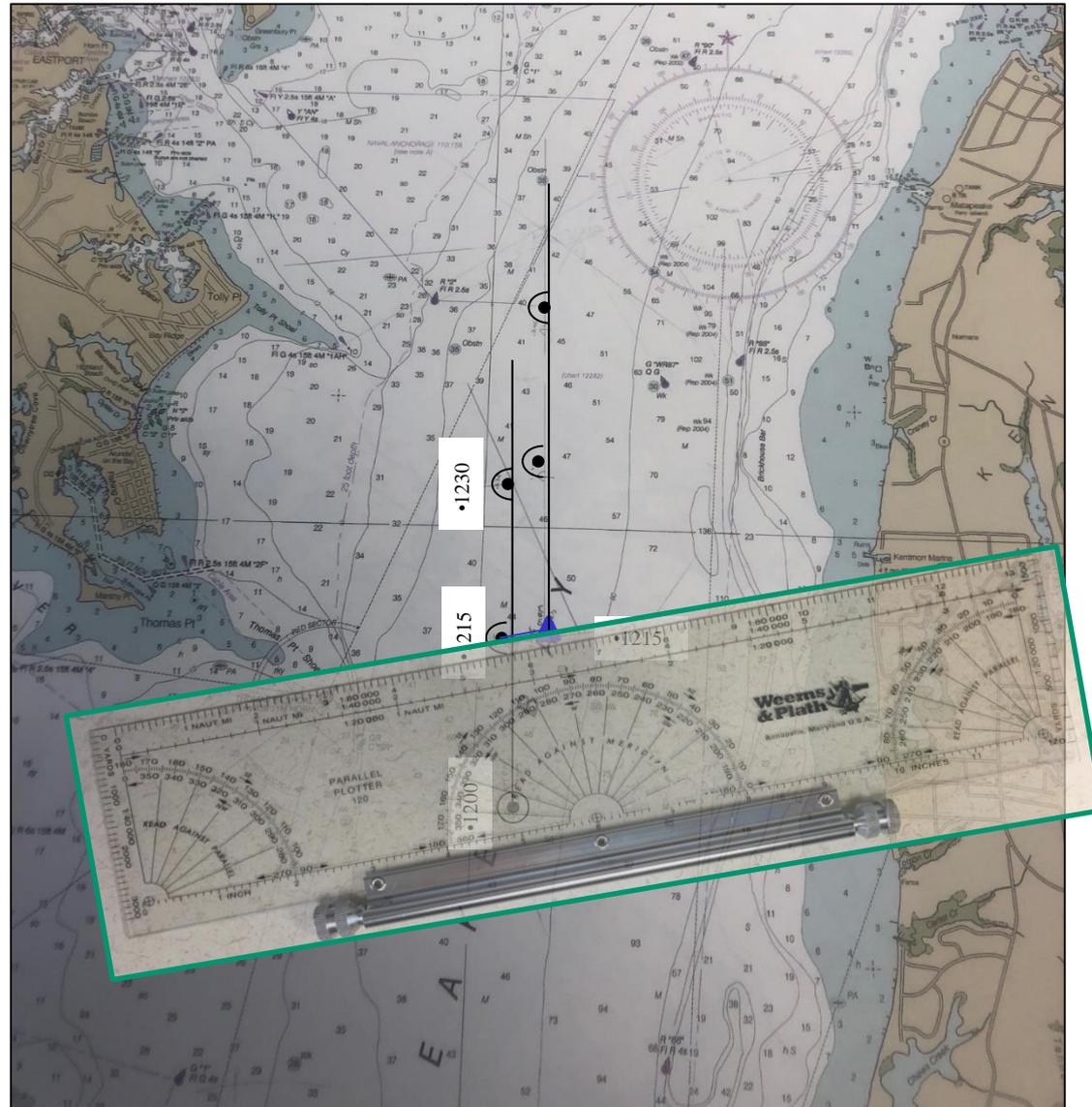
Set= 100 Magnetic

Drift: Measure distance
from DR to Fix.

$$S(\text{kts})=D(\text{NM})/T(\text{hours})$$

$$S=.25\text{NM}/.25 \text{ hours}$$

Drift=1kt





Exercise: Set & Drift



What course do you need to steer to maintain 010M taking set and drift into account? (Compensating Course)

What course do you need to steer to get back to your initial DR line (laid at 1200) by 1230? (Correcting Course)



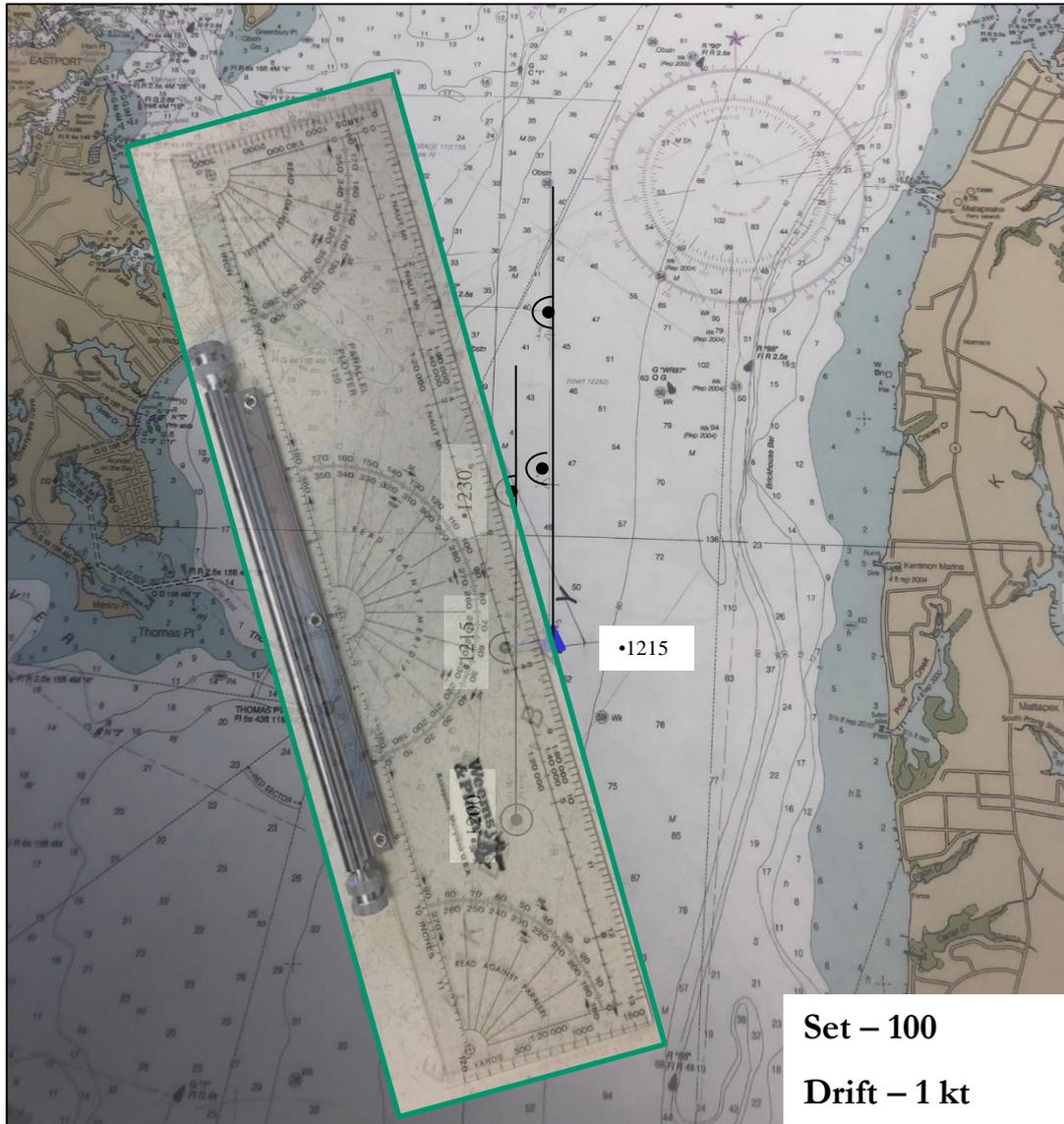
Exercise: Set & Drift



To maintain course 010M (taking set and drift into account) position your slide ruler between your GPS fix (new course line) and your 1230 DR (old course line)

358M

By steering 358M on your new course line, you will make 010M



Set – 100

Drift – 1 kt



Exercise: Set & Drift



Measure the distance between your DR and fix.

Plot that distance past your fix (see second blue line)

Place your slide ruler between the 1230 DR (initial course line) and the end of your drift line (second blue line)



348M

Steering course 348M will get you back on your initial course line by 1230

Set – 100
Drift – 1 kt



Fix Intervals



AREA	DISTANCE FROM LAND/SHOAL WATER	FIX INTERVAL
Restricted Waters	Less than 2 NM	3-15 minutes or as conditions warrant*
Piloting Waters	Between 2-10 NM	6-15 minutes or as conditions warrant*
Coastal Waters	Between 10-20 NM	15-30 minutes or as conditions warrant*
Open Ocean	Greater Than 20 NM	30-60 minutes



DIVPRODEVINST 3530.2F



DIVPRODEVINST 3530.2F

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CHART PREPARATION CHECKLIST

Ensure the chart is the latest edition and reference Notice to Mariners (NM) and Local Notice to Mariners (LNM). For chart corrections refer to: <http://ocsddata.ncd.noaa.gov/nrm/> and <http://www.navcen.uscg.gov/?pageName=lnmMain>

Do not write on or mark over written information on the chart (light characteristics, notes, etc.) while prepping each chart. If circling an aid to navigation with pen, leave a space in the circle (or triangle) for text. Do not use red ink on the chart, it will not show up under red light at night.

Waypoints (N/A for VOST): Plot all in pencil on each chart using the waypoint list provided by the Operations Officer. Waypoints shall be a 1/8" solid round dot (no crosshairs), labeled with the four digit alpha numeric name of the waypoint (CN04) to coincide with the waypoint list. Create the track specified on the waypoint list with a pencil.

Shoal water (18 foot contour): Outline on the chart with a blue Sharpie Permanent Marker, Ultra Fine Point. Outline all shallow areas (18 feet or less) within the deeper water. Outline all fish traps and fish haven areas in 18 feet or less. Outline security areas (such as Cove Point LNG terminal). NOTE: VOST is directed to outline 12ft contour for Navy 44 STC. VOST STC with draft > 8ft are directed to trace 18ft contour.

Corrections: Mark on the chart using the NTM and LNTM. Make ALL corrections to aids to navigation, and other corrections (shoal water, new obstructions, moved buoys, new fish trap areas, etc.) that occur in water 18 feet or deeper. Use Chart No. 1 as a reference to put new information on the chart, and the chart correction template to draw symbols.

Correction tree: create a tree with three columns on the middle left margin of the chart. Highlight top row (NTM/Name/Initials) in orange highlighter. The first column will be the NTM or LNTM number (designated by the week/year it was made, for example 42/11 is week 42 of 2011). The second column is the date the correction was made by the chart preparer (1JUN12) and the third column is for the initials of the chart preparer (RM). If there are no corrections to be made, enter "00" in the NTM, the date and your initials as an indicator that the NTM was consulted. Use one line for each correction. Temporary corrections shall be made in black pencil, permanent corrections in black ink.

NTM	Date	Initials
42/11	1Jun12	RM
13/12	1Jun12	RM

Chart sounding datum: Highlight in yellow fluorescent highlighter.

Geodetic Datum: Highlight in orange highlighter. Note if not in WGS-84 and adjust chart plotter GPS on boat as needed.

Magnetic ring of compass roses: Highlight all on the chart in yellow highlighter. Highlight variation if true only (offshore charts).

Unlit buoys: Identify all unlit beacons (buoys, shoal poles, etc.) by a 5/8" circle using a template; outline in black pen, and color with a green highlighter. Do not make "green" using a yellow and blue highlighter – it cannot be read under a red light at night.

Visual Ranges: Highlight all visual range lines with yellow highlighter.

Red Sectors: Highlight arc of navigation aid red sectors with yellow highlighter.

Bridges: For all bridges on track, highlight bridge controlling height, crossing point and center span location in yellow highlighter.

Radar navigation aids: (navigation aids with a RACON and prominent points of land) Identify using a 5/8" triangle using a template; outline in black pen, and color with a blue highlighter. Radar navigation aids will have a two or three figure identifier, with "R" as the first letter for Radar. RACON buoys will be labeled by their buoy number. Land or land based objects will use one or two letters following "R", i.e. "R P" for a pier or "R TP" for Turkey Point.

Visual navigation aids: (lit and unlit buoys can be used in addition to land based visual aids such as lights on fixed structures, tanks, spires, and prominent points of land) Identify by using a 5/8" circle using a template; outline in black pen, and color with a yellow highlighter. Visual aids are used for shooting a line of position (LOP) and will have an identifier starting with "V" as the first letter. Buoys will be labeled by "V" and their buoy number, i.e. V 87 for buoy 87 on the Chesapeake Bay. Land based aids will use up to three letters or numbers following "V" i.e. V CD for Chapel Dome or V RT1 for Radio Tower 1. Ensure visual aids on overlapping charts have the same identifier for recording in the bearing log. Choose navigation aids that can be used in daylight and/or night, and that you can triangulate for a fix.

Label and fold the chart: Label the number of the next chart near the track at the intersecting margin. Mark a line with green highlighter, and write the next chart number between the line and the chart margin. With the chart face up fold right to left, bottom to top. Lay the chart down so that there is a single fold at the lower right hand corner. Label the chart in this corner. When the chart is placed in the navigation desk you should be able to see only a single fold and the label will be in the right hand corner. Label the chart number and name in legible 1" block letters on the bottom right hand corner of the folded chart. Immediately above the label, write the number of the connecting chart (from the chart list provided by the relevant sailing program Operations Officer); immediately below the label, write the chart number of the following chart. The numbers of the previous and following charts should be 1/3" letter. For example:

Chart: 13224

Chart: 13223 NARRAGANSET BAY INCLUDING NEWPORT HARBOR

Chart: 13218

Track: (N/A for VOST). When approved by the Skipper, mark it with a black Sharpie, Ultra Fine Point. Each straight-line segment of the track will be labeled with the magnetic course (C xxx°M) and distance (D xxx nm) in a track box. This marking will be placed along each segment at least once. The reciprocal course shall be placed along each segment if used as a return track, with the arrow pointing the opposite direction.

Approval: DNAS or the Program Director (OSTS/VOST) is responsible for the final approval of all charts. After review and making any necessary corrections, DNAS or the Program Director will sign Block # _____, (year) _____. Approved by: _____ (DNAS or Program Director signature). (NOTE: This does not alleviate the responsibility of each Skipper and XO to review and sign their own charts prior to departure.)



Chart Ed. and NTM



___Ensure the chart is the latest edition and reference Notice to Mariners (NM) and Local Notice to Mariners (LNM). For chart corrections refer to: <http://ocsddata.ncd.noaa.gov/ntm/> and <http://www.navcen.uscg.gov/?pageName=lnmMain>

CAUTION

This chart has been corrected from the Notice to Mariners (NM) published weekly by the National Geospatial-Intelligence Agency and the Local Notice to Mariners (LNM) issued periodically by each U.S. Coast Guard district to the dates shown in the lower left hand corner. Chart updates corrected from Notice to Mariners published after the dates shown in the lower left hand corner are available at nauticalcharts.noaa.gov.

nauticalcharts.noaa.gov



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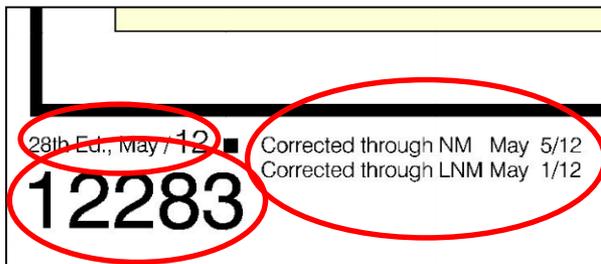


Chart: 12283 Current Edition: 28 Print Date: May. /2012
Annapolis Harbor

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[Paper/RNC Catalog](#)

Action	Item Name	Charting Label	Latitude	Longitude	Published Document	Kapp	RNC Panel	RNC Posted
Add	Sounding in Feet	4	N 39° 00' 26.000"	W 076° 29' 58.500"	LNM 42/12, 5th Dist	642	12283_1	10/15/2012
Add	Sounding in Feet	7	N 38° 59' 55.600"	W 076° 29' 47.000"	LNM 42/12, 5th Dist	642	12283_1	10/15/2012
Add	Sounding in Feet	5	N 39° 00' 27.700"	W 076° 29' 56.900"	LNM 42/12, 5th Dist	642	12283_1	10/15/2012
Substitute	Sounding in Feet	4	N 38° 59' 56.300"	W 076° 29' 44.600"	LNM 42/12, 5th Dist	642	12283_1	10/15/2012
Substitute	Sounding in Feet	5	N 38° 59' 55.000"	W 076° 29' 48.800"	LNM 42/12, 5th Dist	642	12283_1	10/15/2012
Add	Sounding in Feet	5	N 39° 00' 25.400"	W 076° 29' 55.200"	LNM 42/12, 5th Dist	642	12283_1	10/15/2012
Add	Sounding in Feet	19	N 39° 00' 09.170"	W 076° 29' 36.650"	LNM 32/12, 5th Dist	642	12283_1	8/6/2012
Add	16 ft sounding and revised 18 ft depth curve	16 ft sounding and revised 18 ft depth curve	N 39° 00' 10.260"	W 076° 29' 36.030"	LNM 32/12, 5th Dist	642	12283_1	8/6/2012
Add	16 ft sounding and revised 18 ft depth curve.	16 ft sounding and revised 18 ft depth curve.	N 39° 00' 11.370"	W 076° 29' 35.450"	LNM 32/12, 5th Dist	642	12283_1	8/6/2012
Relocate	Weems Creek Junction Daybeacon WC	GR "WC"	N 39° 00' 05.291"	W 076° 29' 56.399"	LNM 22/12, 5th Dist	642	12283_1	6/5/2012

This listing provides all corrections to this chart since 5/11/2012 3:39:00 PM, the Release Date of Edition 28.

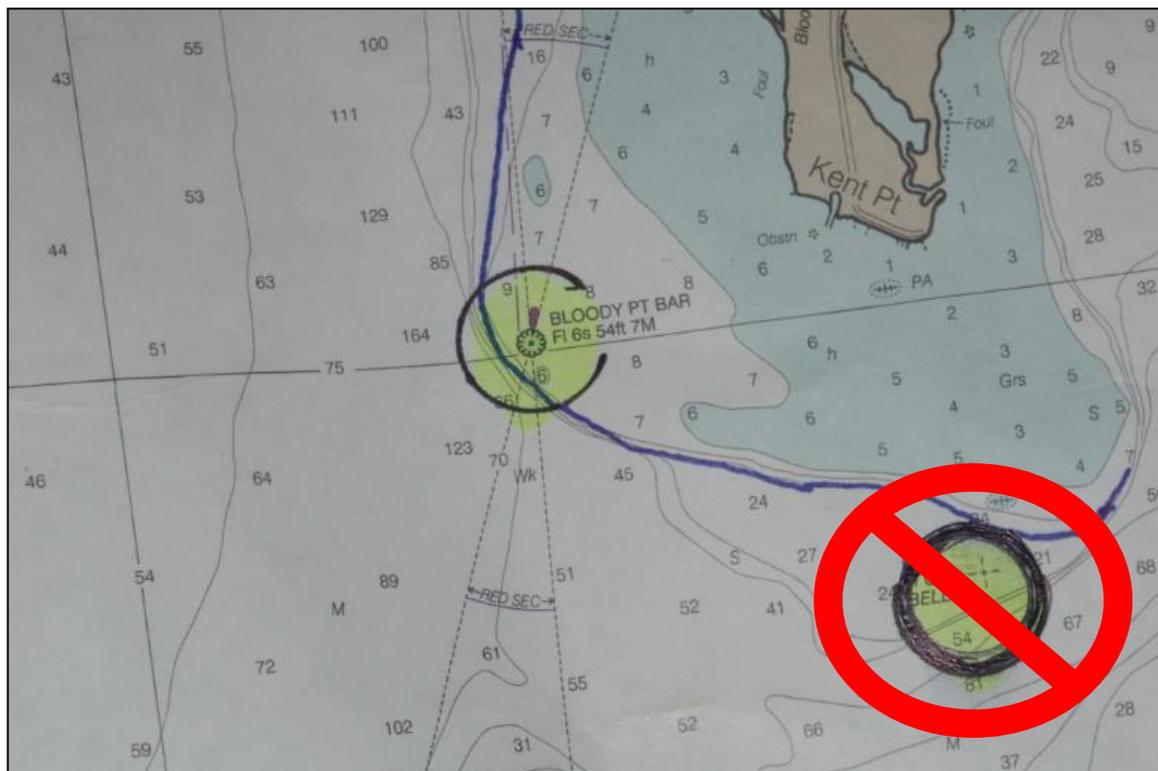
[Edition: 28](#), Print Date: May. /2012
[Edition: 27](#), Print Date: Mar. /2011
[Edition: 26](#), Print Date: Mar. /2006
[Edition: 25](#), Print Date: May. /2004
[Edition: 24](#), Print Date: 1/6/2001
[Edition: 23](#), Print Date: 9/6/1997



Markings on Chart



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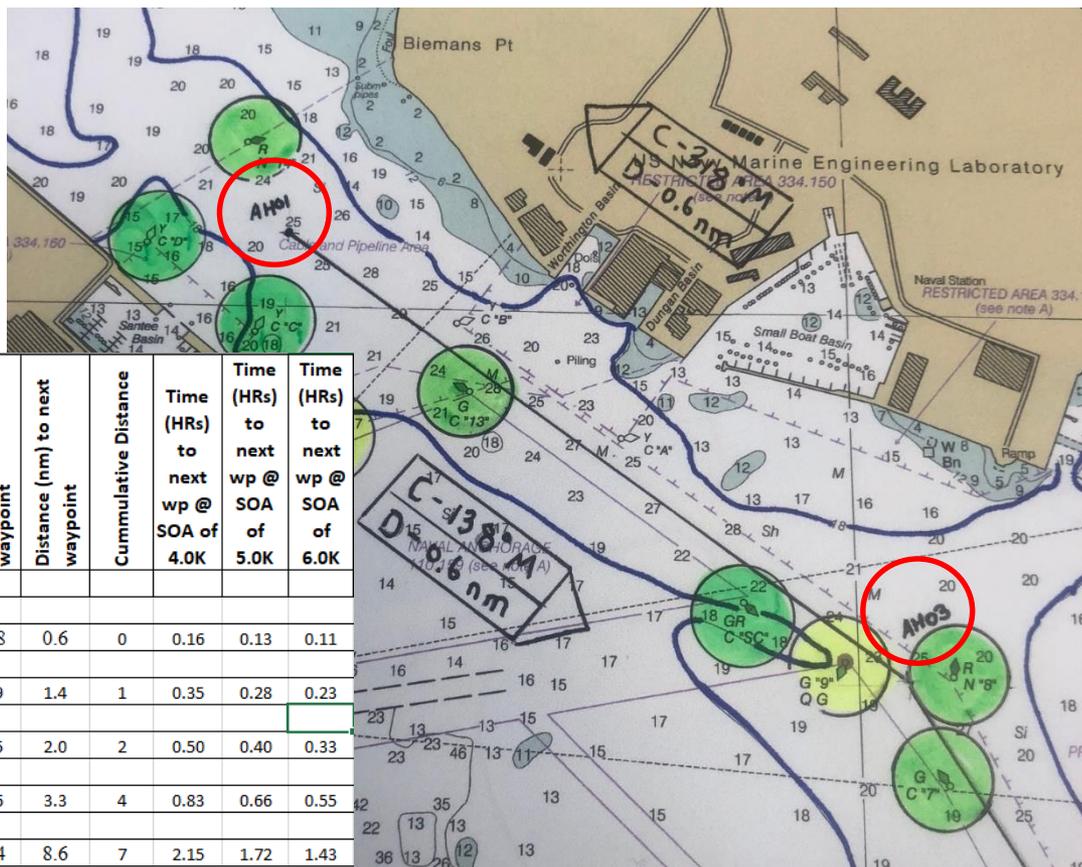




Waypoints



• ___ Waypoints: Plot all in pencil on each chart using the waypoint list provided by the Operations Officer. Waypoints shall be a 1/8" solid round dot (no crosshairs), labeled with the four digit alpha numeric name of the waypoint (AH01) to coincide with the waypoint list. Create the track specified on the waypoint list with a pencil.



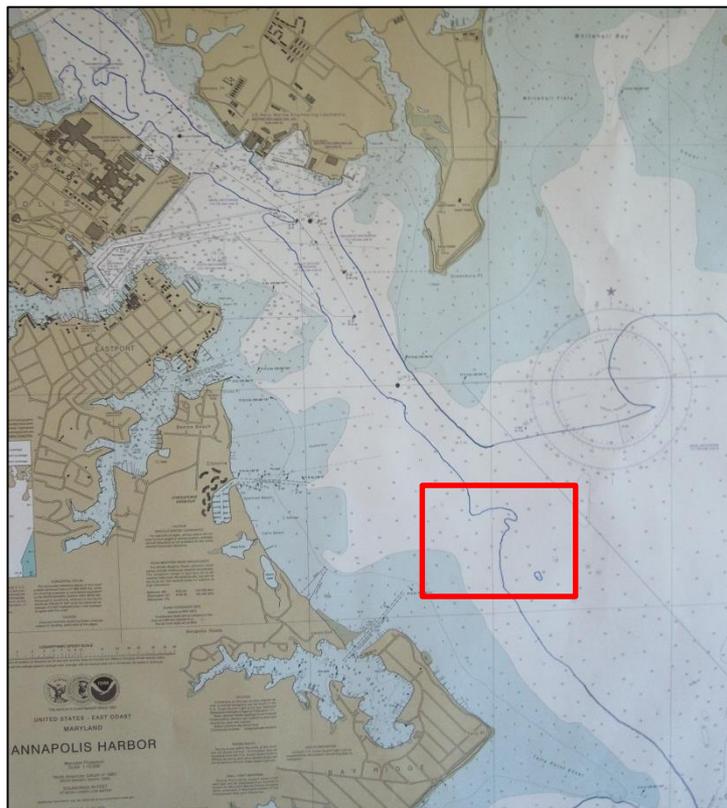
Waypoint Sequence	Waypoint Name	Description	Chart (s)	Latitude			Longitude			Bearing (M) to next waypoint	Distance (nm) to next waypoint	Cumulative Distance	Time (HRs) to next wp @ 4.0K	Time (HRs) to next wp @ 5.0K	Time (HRs) to next wp @ 6.0K
				Deg	Min	Sec	Deg	Min	Sec						
1	AH01	Santee Basin	12283	38	59	04	76	28	37	138	0.6	0	0.16	0.13	0.11
2	AH03	Seyern River	12283	38	58	41	76	27	57	159	1.4	1	0.35	0.28	0.23
3	AH05	Greenbury Point	12270/12283	38	57	30	76	27	00	125	2.0	2	0.50	0.40	0.33
4	AH07	Tolley Point East	12270	38	56	41	76	24	38	196	3.3	4	0.83	0.66	0.55
5	CS01	Thomas Point	12270	38	53	23	76	25	00	204	8.6	7	2.15	1.72	1.43



Shoal Water



___ Shoal water (18 foot contour): Outline on the chart with a blue Sharpie Permanent Marker, Ultra Fine Point. Outline all shallow areas (18 feet or less) within the deeper water. Outline all fish traps and fish haven areas in 18 feet or less. Outline security areas (such as Cove Point LNG terminal).





Fish Havens

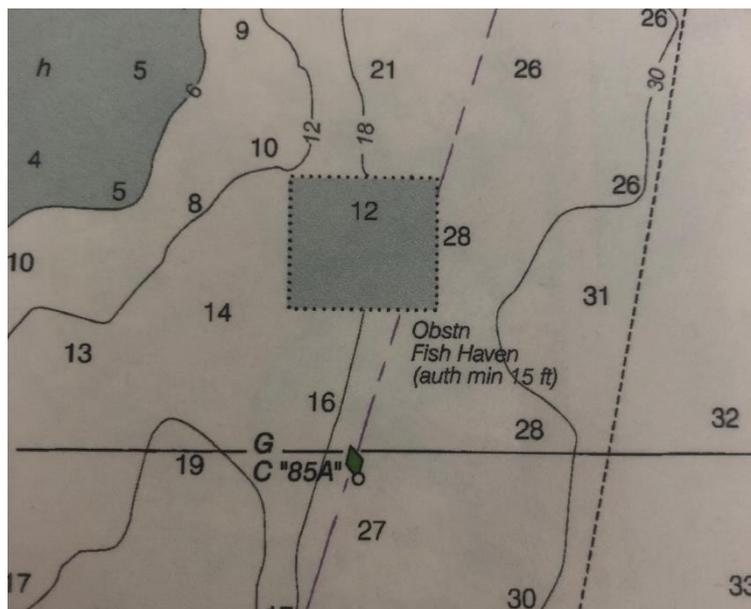


Fish Haven: artificial shelters constructed of rocks, rubble, boxcars, boats, concrete, special designed precast structures to enhance fish habitats, remnants of oil well structures, etc., that are placed on the sea floor to attract fish.

Note the “authorized minimum clearance (safe vessel clearance) for each reef boundary

We can transit over a Fish Haven if the minimum clearance is greater than 18’

AVOID ANCHORING IN A FISH HAVEN!





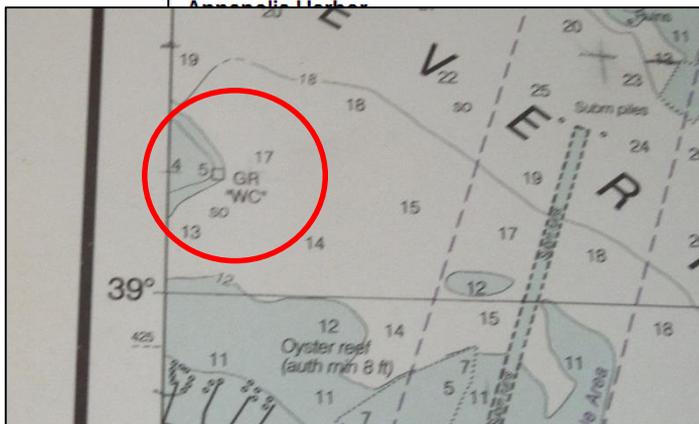
NTM Corrections



___ Corrections: Mark on the chart using the NTM and LNTM. Make ALL corrections to aids to navigation, and other corrections (shoal water, new obstructions, moved buoys, new fish trap areas, etc.) that occur in water 18 feet or deeper. Use Chart No. 1 as a reference to put new information on the chart, and the chart correction template to draw symbols.

Chart: 12283, Current Edition: 28, Print Date: May. /2012

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Latitude	Longit
N 39° 00' 26.000"	W 076
N 38° 59' 55.600"	W 076
N 39° 00' 27.700"	W 076
N 38° 59' 56.300"	W 076
N 38° 59' 55.000"	W 076
N 39° 00' 25.400"	W 076
N 39° 00' 09.170"	W 076
18 N 39° 00' 10.260"	W 076
18 N 39° 00' 11.370"	W 076

Relocate	Weems Creek Junction Daybeacon WC	GR "WC"	N 39° 00' 05.291"	W 076° 29' 56.399"	LNM 22/12, 5th Dist	642	12283_1	6/5/2012
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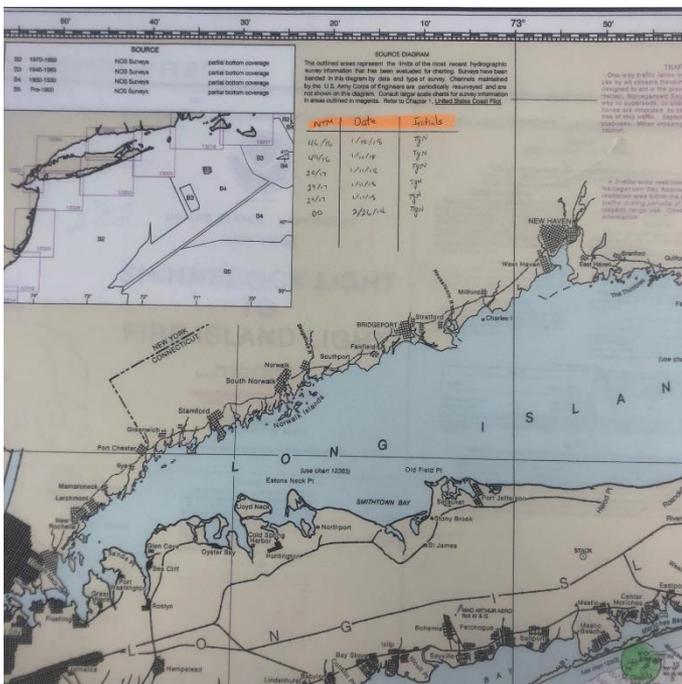


NTM Correction Tree



___ Correction tree: create a tree with three columns on. The first column will be the NTM or LNTM number (designated by the week/year it was made, for example 42/11 is week 42 of 2011). The second column is the date the correction was made by the chart preparer (1JUN12) and the third column is for the initials of the chart preparer (RM).

Highlight the Correction tree in **ORANGE**



NTM	Date	Initials
42/11	1Jun16	RM

·NTM	Date	Initials
00	1Jun16	RM

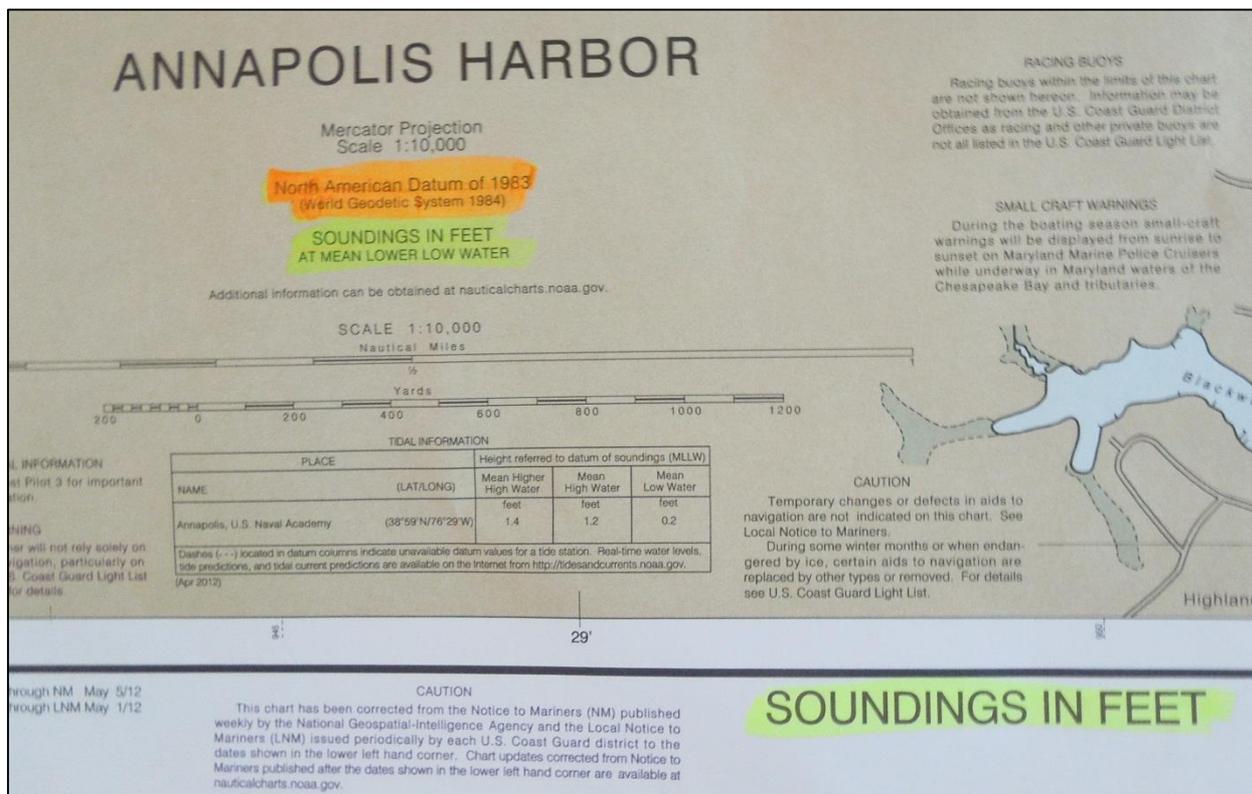


Highlight Chart Data



___ Chart sounding datum: Highlight in yellow fluorescent highlighter.

___ Geodetic Datum: Highlight in orange highlighter.

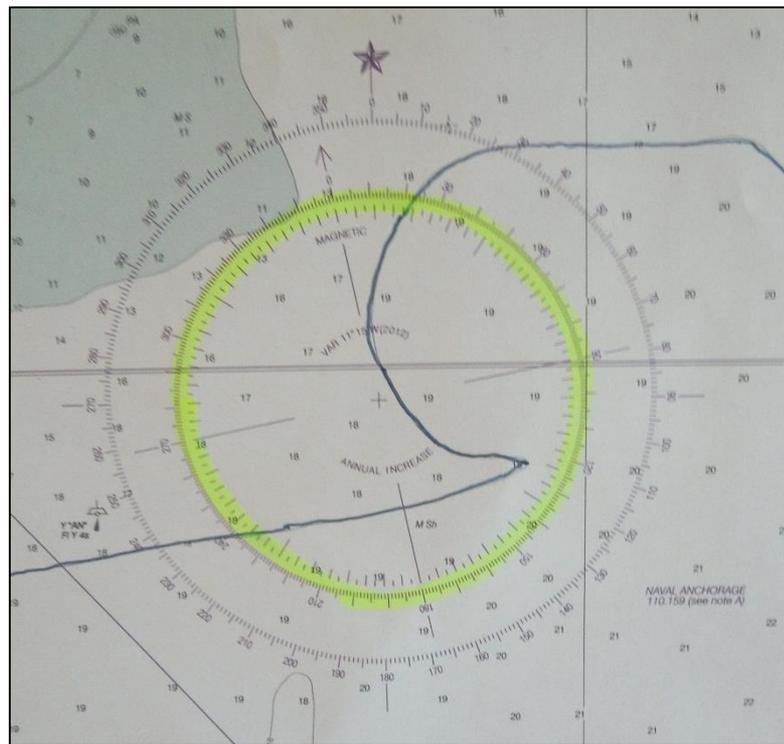
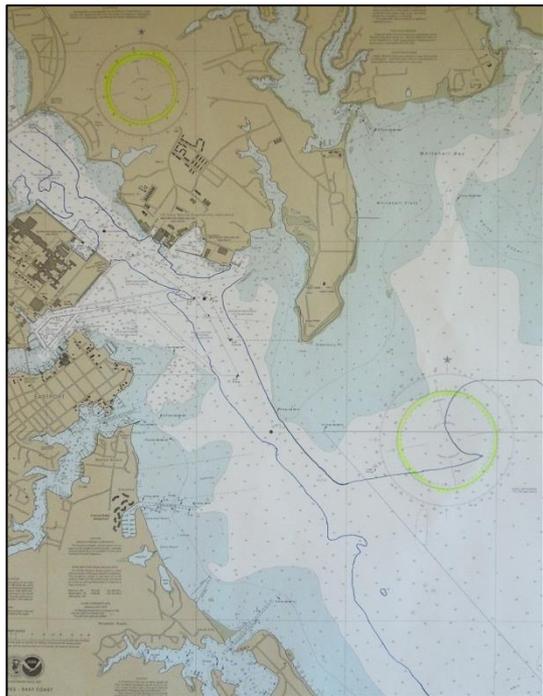




Highlight Compass Roses



___ Magnetic ring of compass roses: Highlight all on the chart in yellow highlighter. Highlight variation if true only (offshore charts).

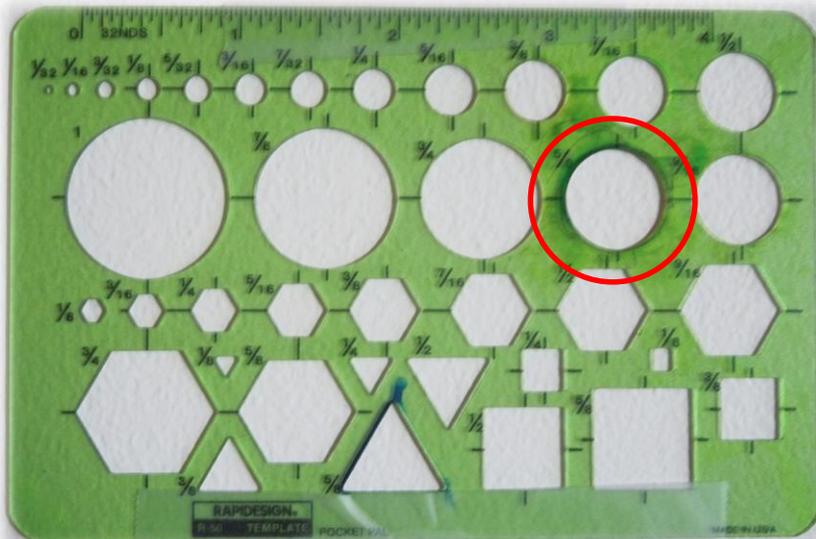




Identify Unlit Buoys



- ___ Unlit buoys: Identify all unlit beacons (buoys, shoal poles, etc.) by a 5/8" circle using a template; outline in black pen, and color with a green highlighter. Do not make "green" using a yellow and blue highlighter – it cannot be read under a red light at night.





Buoys



Can Buoy

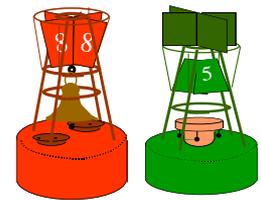


Nun Buoy

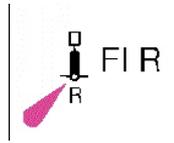


Sound Buoy

BELL	BELL
GONG	GONG
WHIS	WHIS



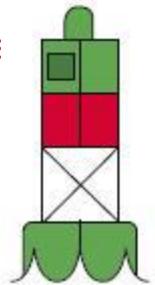
Lighted buoy



Combination Buoy



Preferred Channel Aids



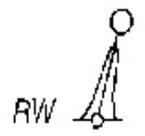
Cardinal Aids



Special Marks



Safe Water Marks



Danger Mark





Visual Ranges



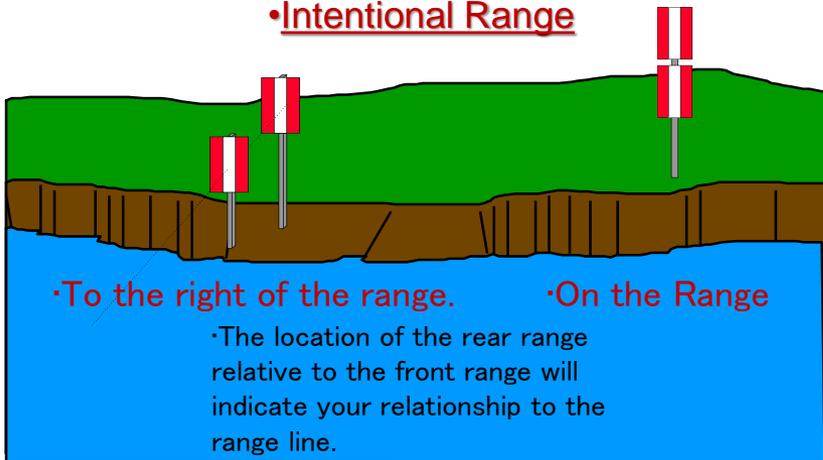
- _____ Visual Ranges: Highlight all visual range lines with yellow highlighter.



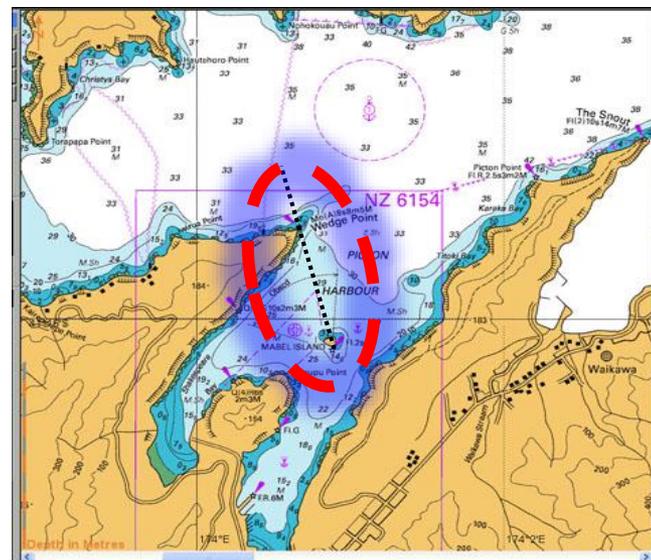
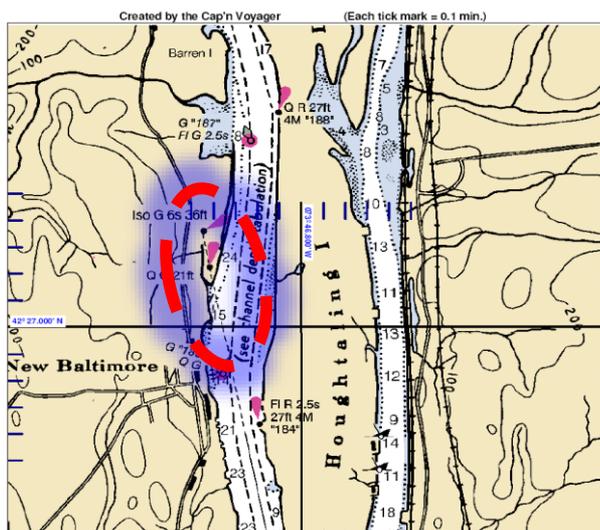
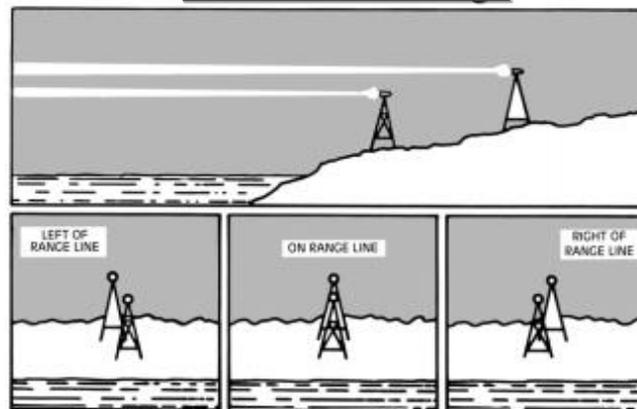
Ranges



• Intentional Range



• Coincidental Range





Red Sector



Red Sectors: Highlight arc of navigation aid red sectors with yellow highlighter

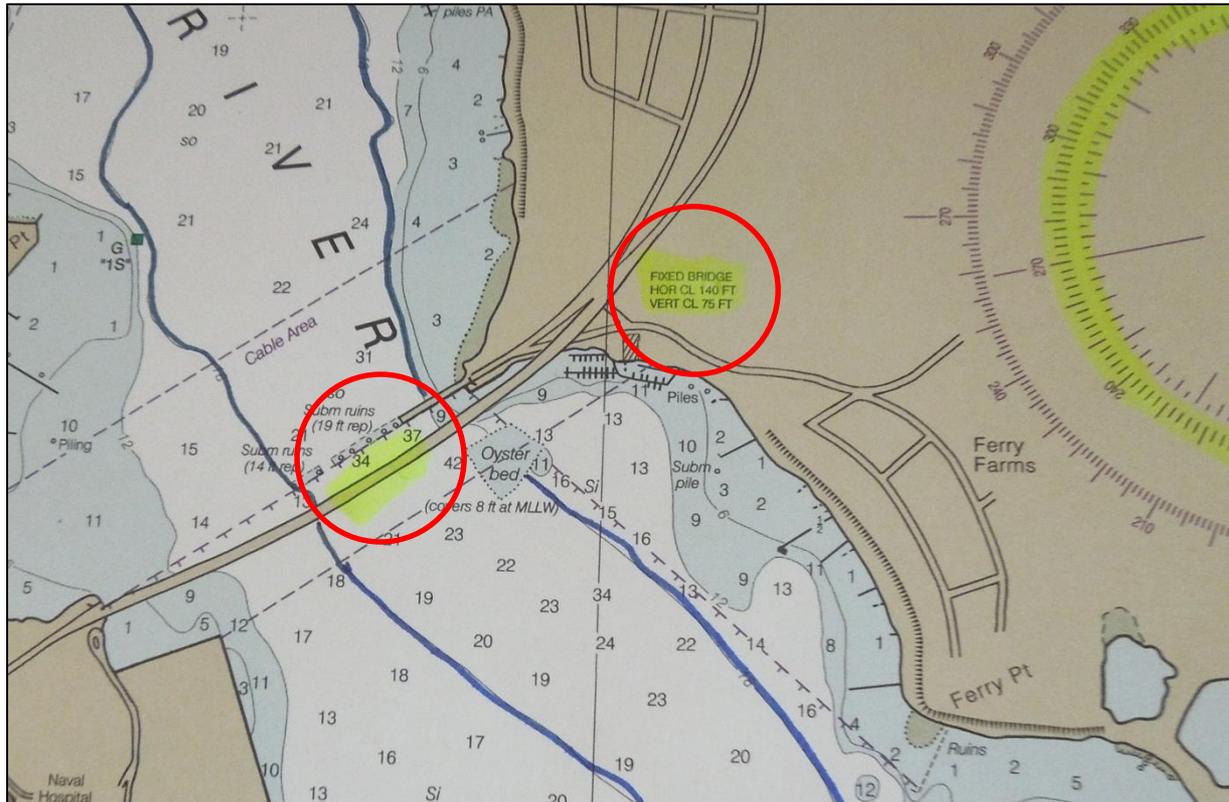




Highlight Bridge Data



___ Bridges: For all bridges on track, highlight bridge controlling height, crossing point and center span location in yellow highlighter.

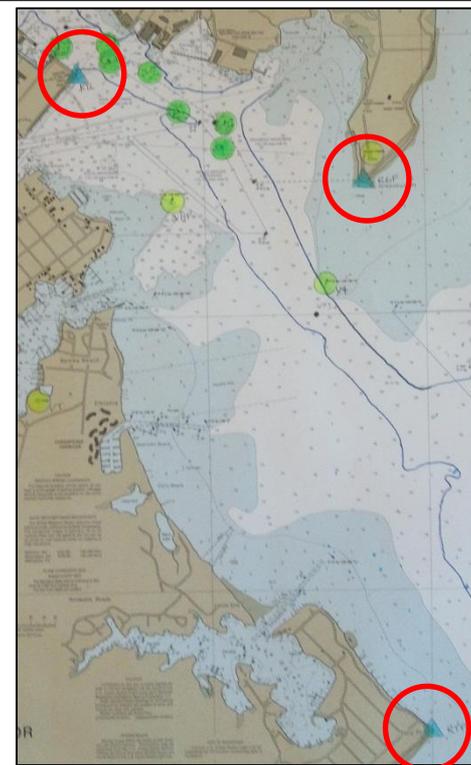
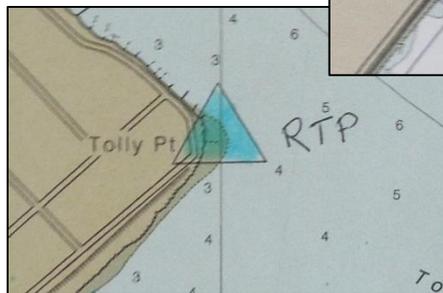
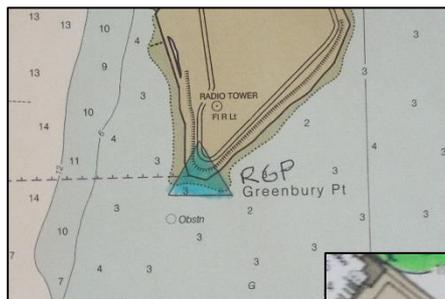




Identify *RADNAV* Aids



___ Radar navigation aids: (navigation aids with a RACON and prominent points of land)
Identify using a 5/8" triangle using a template; outline in black pen, and color with a blue highlighter. Radar nav aids will have a two or three figure identifier, with "R" as the first letter for Radar. RACON buoys will be labeled by their buoy number. Land or land based objects will use one or two letters following "R", i.e. "R P" for a pier or "R TP" for Turkey Point.





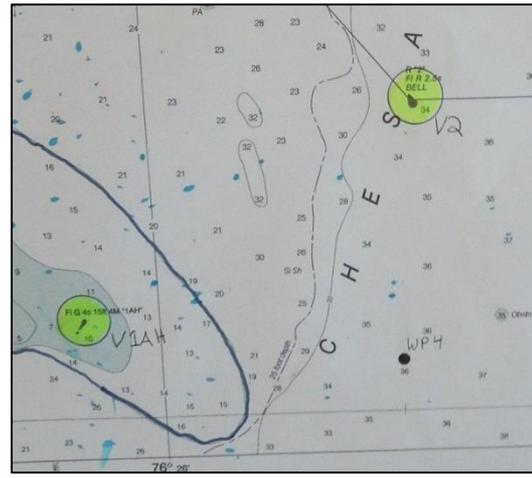
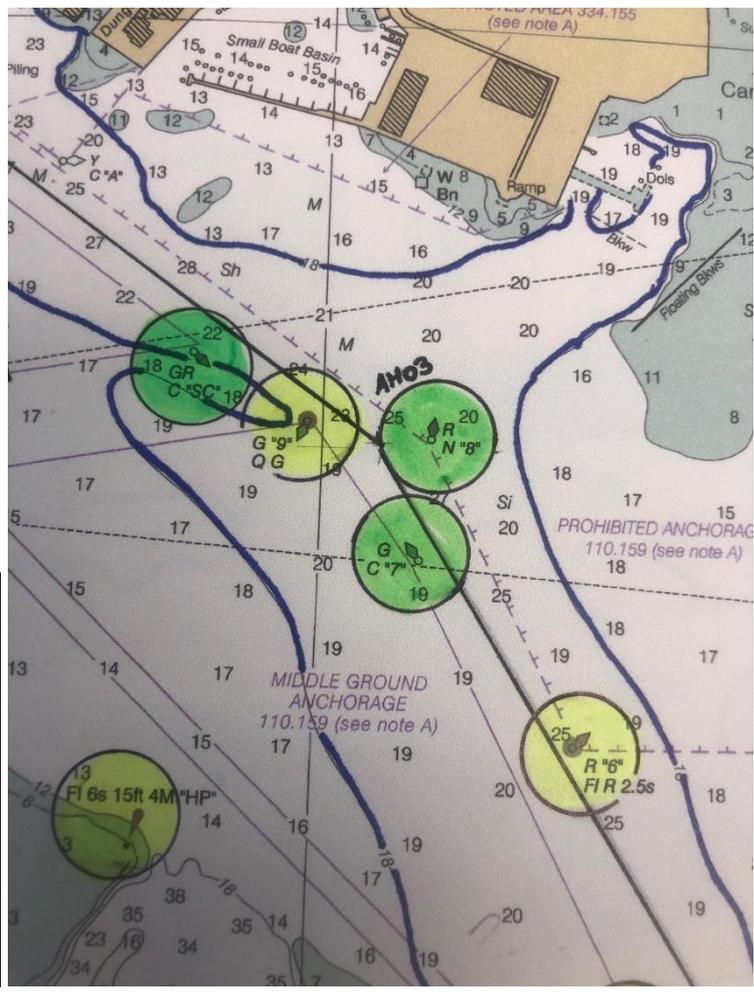
Identify Visual NAVAIDS



___ Visual navigation aids: (lit and unlit buoys can be used in addition to land based visual aids such as lights on fixed structures, tanks, spires, and prominent points of land) Identify by using a 5/8" circle using a template; outline in black pen, and color with a yellow highlighter. Visual aids are used for shooting a line of position (LOP) and will have an identifier starting with "V" as the first letter. Buoys will be labeled by "V" and their buoy number, i.e. V 87 for buoy 87 on the Chesapeake Bay. Land based aids will use up to three letters or numbers following "V" i.e. V CD for Chapel Dome or V RT1 for Radio Tower 1. Ensure visual aids on overlapping charts have the same identifier for recording in the bearing log. Choose navigation aids that can be used in daylight and/or night, and that you can triangulate for a fix.



Identify Visual NAVAIDS

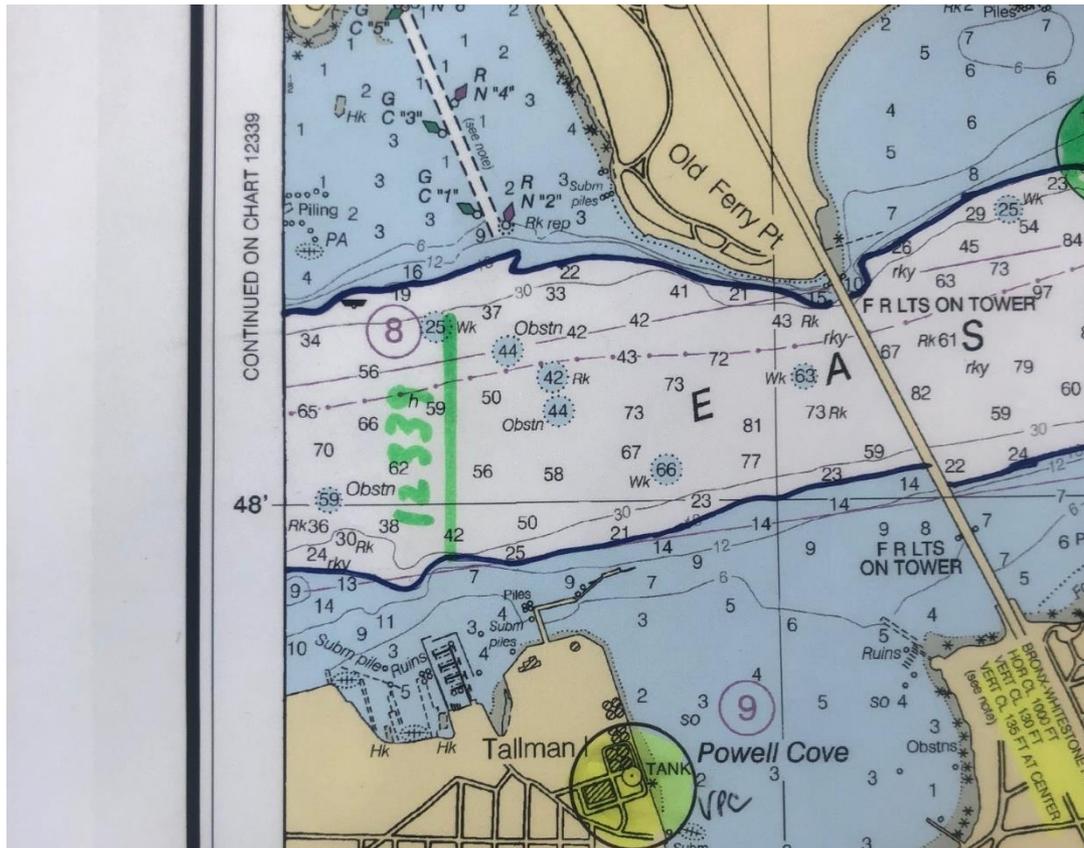




Label Chart



Label and fold the chart: Label the number of the next chart near the track at the intersecting margin. Mark a line with green highlighter, and write the next chart number between the line and the chart margin.





Label Chart



With the chart face up fold right to left, bottom to top. Lay the chart down so that there is a single fold at the lower right hand corner. Label the chart in this corner. When the chart is placed in the navigation desk you should be able to see only a single fold and the label will be in the right hand corner. Label the chart number and name in legible 1" block letters on the bottom right hand corner of the folded chart. Immediately above the label, write the number of the connecting chart (from the chart list provided by the relevant sailing program Operations Officer); immediately below the label, write the chart number of the following chart. The numbers of the previous and following charts should be 1/3" letter. For example:

·Chart: 13224

·Chart: 13223 NARRAGANSET BAY INCLUDING NEWPORT HARBOR

·Chart: 13218



Plot Track



___ Track: When approved by the Skipper, mark it with a black Sharpie, Ultra Fine Point. Each straight-line segment of the track will be labeled with the magnetic course (C xxxM) and Distance (D xx.x NM) in a track box. This marking will be placed along each segment at least once. The reciprocal course shall be placed along each segment if used as a return track, with the arrow pointing the opposite direction.

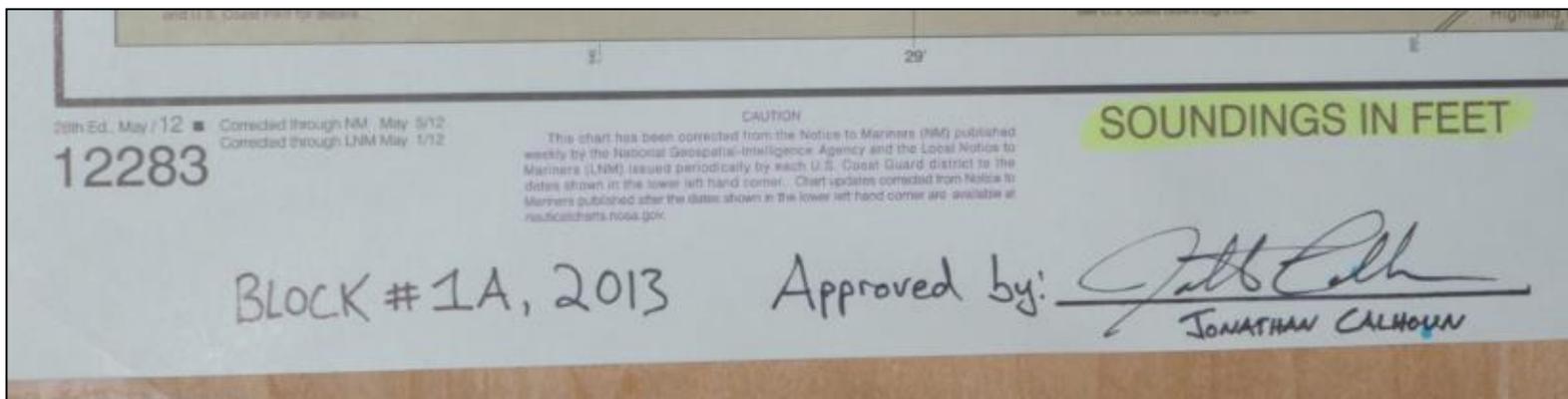




Skipper Signature



• ___Approval: DNAS or the Program Director (OSTS/VOST) is responsible for the final approval of all charts. After review and making any necessary corrections, DNAS or the Program Director will sign Block #___, (year)___ Approved by:_____ (DNAS or Program Director signature). (NOTE: This does not alleviate the responsibility of each Skipper and XO to review and sign their own charts prior to departure.)





Narrative Log



Time	NA-__	Narrative Log	Block __	Date__
		Narrative comments - to include at a minimum: watch relief, sail changes, fix intervals, and weather		
0800		Underway from Santee Basin to conduct 48 hour sail down the bay. 1/C George is on the helm. Crew embarked: Skipper LT Crown, XO LT Sampson, 1/C George, 1/C Burke. 3/C Mahan, 3/C Jones, 3/C Perry, 3/C Chabot, 3/C Halsey, 3/C Lunsford. Fix Interval 15 Minutes		
0810		Raised Main and #1 Genoa. Wind west at 10 knots. Secured the engine		
0815		Port Watch assumed the watch. 1/C George is watch captain. 3/C Lunsford in on the Helm.		
0830		Took the #1 Reef in the main for training. Shook the reef		
0845		Passed Thomas Point Light to starboard		
0900		3/C Halsey relieved the helm		
1000		3/C Mahan relieved the helm		
1015		Changed Headsails for training. Raised the #2 Genoa		
1025		Agreed to a port to port 1 Bell meeting on Ch 13 with the tug Cherl Ann northbound with a long tow 3 miles south of TPL.		
1050		Passed Bloody Point Light abeam to port		
1100		3/C Lunsford on the helm. Checked to make sure the on-coming watch was getting ready to eat.		
1130		Started engine to charge batteries. Still sailing		
1150		Started watch relief process. Nav briefed oncoming watch		
1200		Starboard watch on duty. 1/C Burke is watch Captain, 3/c Jones at the helm		
1245		Skipper changed fix interval to 10 minutes		
1300		3/c Perry relieved the helm		
1330		Switched from chart 12270 to 12266		

Skipper/XO Review ___/___

Time /



Offshore Log



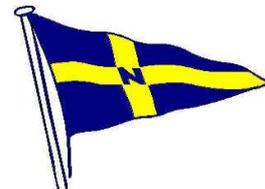
Time (local)	Fix Type	Position		Depth (ft)		Course (°M)	Speed (kts)	True Wind		Seastate		Bar (mb)	Engine			Battery Voltage		Bilge strokes
		Latitude	Longitude	Fatho	Chart			(°M)	(kts)	(°M)	(ft)		ON/OFF	Hrs	Fuel(gal)	House	ENG	
1400	V	38 57.2N	076 25.5 W	36	35	180	5.2	280	10	100	1	1004	On	1505	35	12.9	12.9	1
1415	V	38 52.0 N	076 25.2 W	43	44	200	5.8						On					
1430	V	38 51.4 N	076 27.7 W	38	41	180	5.2						On					
1445	V	38 50.5 N	076 29.5 W	45	47	220	5.8						On					
1500	V	38 50.0 N	076 26.4 W	38	37	240	5.8	280	12	100	2	1002	Off	1506		12.6	12.9	2
1515	G	38 48.5 N	076 29.5 W	40	40	230	5.7											
1530	G	38 47.3 N	076 29.4 W	45	46	215	5.9											
1530	R	38 46.5 N	076 26.6 W	42	41	175	6.3											
1545	G	38 45.9 N	076 25.9 W	38	37	240	6.1											
1600	V	38 45.1 N	076 24.9 W	41	41	225	5.8	280	13	100	2	1000	On	1506	34	13.5	13.4	3
1615	V	38 44.7 N	076 27.5 W	44	46	217	5.6						On					

All data should be entered on the hour, other data as it applies (significant course and speed change, or engine on/off). Depth should be checked and recorded after each fix to verify. Start each day on a new page. Make all entries in ink as legible as possible. The Skipper and XO should review and initial at least two times per page.

Nav Standards: minimum entry every fix – time/fix type/position/instrument depth/chart depth



Bearing Log



<u>Place</u>				<u>Magnetic Only</u>		
Date Time						Depth
23-JAN-14	V-R2	V-R90	V-G87			
1230	258	42	162	V-TPL	V-IAH	46
1300			082	214	318	40
		V-MT	V-R88			
1530	232	108	160			36

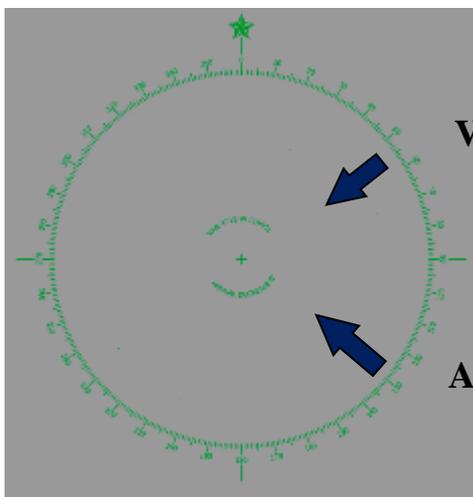
Review – adding and dropping visual aids in bearing log



Variation



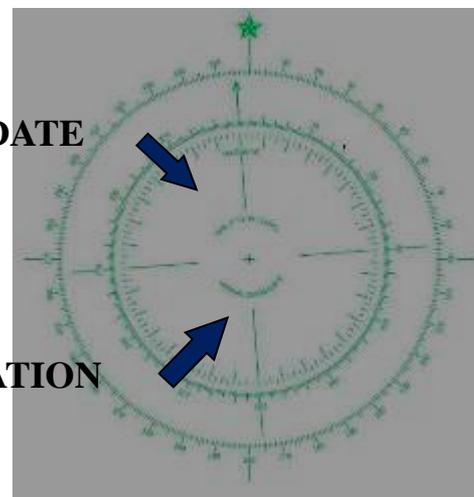
- Generally, no magnetic compass rose on offshore charts



Offshore

VARIATION AS OF CHART DATE

ANNUAL CHANGE IN VARIATION



Coastal

- The center of the compass rose will tell you Variation
West is Best (+) East is Least (-)



Questions?



- **Next Class:**
 - NAV Exam