U.S. Department of
Homeland Security

**United States
Coast Guard**

Coast Guard Navigation Standards Manual

COMDTINST M3530.2E

U.S. Department of Homeland Security

United States Coast Guard

Commandant
United States Coast Guard

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COMDTINST M3530.2E
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COMMANDANT INSTRUCTION M3530.2E

Subj: COAST GUARD NAVIGATION STANDARDS MANUAL

Ref: (a) United States Coast Guard Regulations 1992, COMDTINST M5000.3 (series)
        (b) Cutter Training and Qualification Manual, COMDTINST M3502.4 (series)
        (c) U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Volume I, COMDTINST M16114.32 (series)
        (d) U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Volume II, COMDTINST M16114.33 (series)
        (e) U.S. Navy Ship Control and Navigation Personnel Qualification Standard (PQS), NAVEDTRA 43492 (series)
        (f) Personnel Qualification Standard (PQS) Officer of the Deck (OOD), COMDTINST M3502.5 (series)
        (g) Risk Management, COMDTINST 3500.3 (series)
        (h) Cutter Organization Manual, COMDTINST M5400.16 (series)
        (i) Information and Life Cycle Management Manual, COMDTINST M5212.12 (series)
        (j) Procedures for the Preparation and Disposition of Cutter Logs, COMDTINST M3123.12 (series)
        (k) Coast Guard Publication 1, Doctrine for the United States Coast Guard
        (l) Coast Guard Directives System, COMDTINST M5215.6 (series)
        (m) Telecommunication Tactics, Techniques, and Procedures, COMDTINST M2000.3 (series)
        (n) Team Coordination Training, COMDTINST 1541.1

1. PURPOSE. Per reference (a), the Commanding Officer of a vessel is responsible for the safe navigation of that vessel. Cutter and station Commanding Officers (COs) and Officers-in-Charge (OICs) must draft unit-specific Navigation Standards to support this instruction. This Manual provides guidance and procedures for CO/OICs in the development of Command Navigation

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	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X		X		X	X				
B	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
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NON-STANDARD DISTRIBUTION:

Standards that enable safe navigation of cutters, cutter boats, and shore-based boats during mission execution within varied, challenging, and unique Areas of Operations (AORs).

2. ACTION. All Coast Guard Unit Commanders, COs, OICs, Deputy/Assistant Commandants, and Chiefs of Headquarters staff elements must comply with the provisions of this Manual. Internet release is authorized.

3. DIRECTIVES AFFECTED. Coast Guard Navigation Standards, COMDTINST M3530.2D, is cancelled.

4. DISCUSSION.

   a. On 20 October 1978, the CGC CUYAHOGA and the Argentinean general cargo vessel SANTA CRUZ II collided in the Chesapeake Bay, VA. On 28 January 1980, the CGC BLACKTHORN and the U.S. tankship CAPRICORN collided in Tamp Bay, FL. Thirty-four cuttermen perished because of these two accidents. The significance of these events compelled our Service to make needed improvements to cutter policy, doctrine, training and standardization.

   b. Navigation remains a critical basis for all underway operations and a fundamental competency. This Manual assists the CO/OIC, Navigator, Officer of the Deck (OOD), and Coxswain in carrying out their responsibilities as outlined in Coast Guard Regulations. New updates leverage the proven reliability of internationally accepted electronic navigation (eNav) systems while retaining the capability to fix position using visual lines of position (LOPs) and radar ranges.

5. DISCLAIMER. This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is intended to provide guidance for Coast Guard personnel and is not intended to, nor does it, impose legally binding requirements on any party outside the Coast Guard.

6. MAJOR CHANGES.

   a. This Manual update was designed to improve guidance to allow COs/OICs the flexibility to tailor Command Navigation Standards to the capabilities of their unit(s) and their AOR.

   b. Updates to the Manual include format changes that better display where navigation standards differ between cutters and boats.

   c. Updates to the Manual reflect the enhanced capabilities and reliance on eNav systems now installed in Coast Guard cutters and boats as the primary means of navigation.

   d. Updates to the Manual provide guidance for integration of eNav systems into Command Navigation Standards to ensure safe navigation of cutters and boats while using eNav systems as the primary means of navigation.

7. ENVIRONMENTAL ASPECT AND IMPACT CONSIDERATIONS.

   a. The development of this directive and the general policies contained within it have been thoroughly reviewed by the originating office and are categorically excluded under current USCG categorical exclusion (CE) # 33 from further environmental analysis, in accordance

with Section 2.B.2 and Figure 2-1 of the National Environmental Policy Act Implementing Procedures and Policy for Considering Environmental Impacts, COMDTINST M16475.1 (series).

b. This directive will not have any of the following: significant cumulative impacts on the human environment; substantial controversy or substantial change to existing environmental conditions; or inconsistencies with any Federal, State, or local laws or administrative determinations relating to the environment. All future specific actions resulting from the general policies in this Manual must be individually evaluated for compliance with the National Environmental Policy Act (NEPA), Department of Homeland Security (DHS) and Coast Guard NEPA policy, and all other environmental mandates.

8. <u>DISTRIBUTION</u>.   No paper distribution will be made of this Manual. An electronic version will be located on the following Commandant (CG-612) web sites. CG Portal: https://cgportal2.uscg.mil/library/directives/SitePages/Home.aspx.

9. <u>RECORDS MANAGEMENT CONSIDERATIONS</u>.   This Manual has been thoroughly reviewed during the directives clearance process, and it has been determined there are no further records scheduling requirements, in accordance with Federal Records Act, 44 U.S.C. 3101 et seq., National Archives and Records Administration (NARA) requirements, and Information and Life Cycle Management Manual, COMDTINST M5212.12 (series). This policy does not create significant or substantial change to existing records management requirements.

10. <u>FORMS/REPORTS</u>. The forms referenced in this Manual are available in USCG Electronic Forms on the Standard Workstation or on the Internet: http://www.uscg.mil/forms/; CG Portal https://cgportal2.uscg.mil/library/forms/SitePages/Home.aspx; and Intranet at http://cgweb.comdt.uscg.mil/CGForms. Chief of Naval Operations (OPNAV) Forms are available here: https://navalforms.documentservices.dla.mil/web/public/forms.

11. <u>REQUEST FOR CHANGES</u>.   Commandant (CG-751) will coordinate changes to this Manual. This Manual is under continual review and will be updated as necessary. Time-sensitive amendments will be promulgated via message, pending their inclusion in the next change. All users are urged to provide recommendations for improvement to this Manual via the chain of command.

John P. Nadeau /s/
Rear Admiral, U.S. Coast Guard
Assistant Commandant for Capability

RECORD OF CHANGES			
CHANGE NUMBER	DATE OF CHANGE	DATE ENTERED	BY WHOM ENTERED

COMDTINST M3530.2E

LIST OF TABLES

LIST OF FIGURES

ENCLOSURES

(1) ANCHORING
(2) CELESTIAL NAVIGATION
(3) NAVIGATION TEAMS
(4) LINE HANDLING COMMANDS
(5) HELM COMMANDS
(6) NAVIGATION PLOTTING SYMBOLS
(7) GPS OUTAGE REPORTING
(8) CUTTER LOGS AND RECORDS
(9) SAMPLE CUTTER GETTING UNDERWAY CHECKLIST
(10) SAMPLE CUTTER ENTERING PORT/APPROACHING RESTRICTED WATERS CHECKLIST
(11) ELECTRONIC AND PAPER CHART USE QUICK REFERENCE FLOW CHART

CHAPTER 1.   **COMMAND RESPONSIBILITIES AND TRAINING**

A. Cutter/Boat Tables.

This Manual uses tables formatted in line with document text in areas where standards differ for cutters and boats. The example table below provides instructions on how to read these sections. Text outside of these table sections applies to both cutters and boats.	
Cutters	**Boats**
1. This section applies only to cutters.	1. This section applies only to boats. Applicability differences between cutter boats and shore-based boats will be noted in the text.
2. Any row merged over both columns indicates that the section applies to both cutters and boats.	
a. This section applies only to cutters.	a. This section applies only to boats.
b. This section applies only to cutters	Not Required (this section is not required for boats)

B. General.

1. This Manual provides uniform standards and guidance to ensure the navigational accuracy and safety of Coast Guard cutters, boats, and their crews.

2. Documents that drive and guide navigation standards and decisions to ensure safe navigation of Coast Guard cutters and boats span from the national to the unit level and include, but are not limited to, the list and examples provided below. Awareness and knowledge of these documents contribute to the development of Command Navigation Standards and safe navigation of Coast Guard cutters and boats.

    a. Federal Level.

        (1) Laws and Regulations. Code of Federal Regulations (CFR): Title 33 – Navigation and Navigable Waters, specifies navigation requirements for private, commercial, and public vessels.

        (2) Doctrine. Includes publications by the National Geospatial-Intelligence Agency (NGA) and other governmental sources (e.g., The American Practical Navigator (Bowditch), Pub 9). These documents contain the cumulative wealth of generations of seagoing professionals and serve as the foundation of navigation knowledge and skills.

    b. Organization/Program Level.

        (1) Publications at the Coast Guard organizational and program levels include policy, doctrine, and tactics, techniques, and procedures (TTP). Reference (l) further defines these publication types, their relationships to each other, and their various

audiences.

(2) The Office of Cutter Forces, Commandant (CG-751), and the Office of Boat Forces, Commandant (CG-731), provide organizational guidance for cutter and boat acquisition, navigation, and maneuvering in the form of requirements, policy, doctrine, and TTP.

c. Unit Level. Provides local policy, doctrine, and TTP that amplify procedures required to ensure compliance with national and program policies and doctrine. If unit-level doctrine or TTP does not align with higher-level doctrine or TTP, local doctrine or TTP must describe and justify the local differences (e.g., Command Navigations Standards, Standard Operating Procedures (SOP), and checklists).

d. Other Non-Governmental Standardization Documents. Consensus Standards (e.g., Navigation Standards established by the International Maritime Organization (IMO) Maritime Safety Committee) provide industry standards for systems design, performance, and evaluation. Consensus standards are particularly applicable to electronic navigation.

3. Analysis of operational mishaps and studies have shown that risks associated with navigation can be systematically controlled by:

a. Strong knowledge and skills in navigational doctrine and techniques, which can prevent over-reliance on automated systems.

b. Preventing accumulation of errors in the information flow.

c. Verifying vessel position using all available means.

d. Strong knowledge regarding the structure, capabilities, and limitations of electronic charting and Global Positioning System (GPS) data.

e. Compliance with established navigational procedures.

C. Commanding Officer (CO) and Officer-in-Charge (OIC) Responsibilities.

Cutters	Boats
1. Promulgate Command Navigation Standards within 90 days of assuming command. Prior Navigation Standards remain in effect until superseded (see Chapter 6 for more information).	
2. Ensure compliance with the provisions of this Manual and alignment with program doctrine.	
3. Ensure local operating doctrine and TTP align with national maritime doctrine, program doctrine, and Coast Guard TTP to the maximum extent feasible.	
4. Assign, train, and certify navigation personnel in accordance with references (a) through (f), as appropriate.	

5. Designate a Navigator in accordance with reference (a). The Navigator must be an experienced underway OOD that is an Officer, Chief, or Petty Officer who possesses the required proficiency, training, maturity, and judgment required of this position. The Navigator must complete applicable parts of reference (e). Schools listed in reference (e) are recommended but not required.	5. For **Shore Based Units,** designate a Navigation Petty Officer in accordance with reference (c).
6. Ensure a primary navigation team is trained and proficient (see Enclosure (3) for more information).	6. Ensure boat crews are trained to provide navigation support functions to the Coxswain (see Enclosure (3) for more information).
7. Maintain crew proficiency in precision anchoring in accordance with reference (b) (see Enclosure (1) for more information).	Not Required
8. Maintain crew proficiency in celestial navigation for WAGB, WMSL, WHEC, WMEC, WIX, and D14/D17 WLB class cutters (see Enclosure (2) for more information).	Not Required
9. For cutters with a Combat Information Center (CIC), ensure a secondary navigation team (CIC) is trained and proficient (see Enclosure (3) for more information).	Not Required
10. Incorporate the principles of effective risk management into navigational planning in accordance with reference (g). Commands can tailor the risk assessment process to be consistent with the complexity of the specific mission but must not omit any step in the process.	

D. Training. Maintaining proficiency of navigation skills through training and practice is critical to safe navigation. Additionally, a thorough understanding of classic navigation techniques and principles is essential to the proper operation of equipment and sensors, understanding their limitations, and reducing the risk presented by over-reliance on any single source of information. CO/OICs must:

1. Conduct navigation exercises in accordance with references (b) and (d).

2. Maintain proficiency of basic navigation skills, including:

   a. Paper chart navigation.

   b. Electronic charting fundamentals.

   c. Operation of installed eNav system.

    d. Emergency transition from eNav to paper based navigation and, following restoration of eNav, the systematic transition back to eNav based navigation.

3. Consider the use of full mission simulation facilities, such as those at TRACEN Petaluma and the Coast Guard Academy, to provide training in higher risk scenarios. Simulation training should prioritize training of navigation doctrine over specific equipment operation.

4. Ensure training integrates Team Coordination Training (TCT) principles (e.g., observation and feedback) in accordance with reference (n).

5. In addition to requirements in references (b)-(f), include the following items when qualifying CO/OIC-designated members responsible for safe cutter/boat navigation:

    a. The approved configuration of the installed Coast Guard eNav system and indicators that the system capabilities are not performing as designed.

    b. Quality and limitations of electronic charts used in the eNav system.

    c. Route planning and route monitoring capabilities and procedures.

    d. Manual positioning procedures.

    e. Alarms or indications regarding displayed information or malfunctions.

6. Ensure that current and prospective personnel attend mandated navigation Class "C" courses in accordance with the appropriate cutter Master Training List (MTL) and reference (b).

CHAPTER 2. **COMMAND NAVIGATION STANDARDS**

A. <u>General</u>. The Command Navigation Standards integrate official guidance and local operational requirements into a cohesive navigational plan. This plan includes standards, processes, and actions that aim to reduce the risks presented to Coast Guard surface assets during mission execution within varied, challenging, and unique AORs.

B. <u>Command Navigation Standards Content</u>. CO/ OICs must publish Command Navigation Standards that incorporate the navigation requirements detailed in reference (a) and this Manual for cutters and boats under their command. For cutter boats, commands must integrate items located in the "Boats" column below into the cutter's Command Navigation Standards. The Command Navigation Standards must address the items below:

Cutters	Boats
1. Command Navigation Standards familiarization.	
a. Specification of personnel required to review.	
b. Review frequencies (e.g., following an update, prior to sailing on patrol, semi-annually).	
c. Specification of how review is documented (e.g., sign tracking sheet, email to Executive Officer (XO)/Executive Petty Officer (XPO)).	
2. Watch training and qualifications, including boat crew training, qualification and certification (references (b), (c), and (d)).	2. Boat crew training, qualification, and certification (references (c) and (d)).
3. Navigational information/definitions (Chapter 6):	3. Navigational information/definitions for each boat type (Chapter 6):
a. Cutter Information.	a. Boat information.
b. Navigational Zones/Areas (including any AOR risks, safe operating distances, or restricted operating areas).	
c. Fix Frequency.	
4. Charts:	
a. Electronic Charts (Chapter 4.O).	
b. Paper Charts (Chapter 5.B).	
c. Ready Charts (Chapter 6.C).	c. Ready charts/boat or unit navigation kit requirements (Chapter 6.C).
5. Electronic navigation system information (Chapter 4):	
a. eNav Display (Chapter 4.F).	
b. Route Planning (Chapter 4.G).	

Cutters	Boats
c. Set and Drift (Chapter 4.K).	
d. System Configuration and Settings (Chapter 4.L).	
e. Profile (Chapter 4.M.).	
f. Alarm Settings (e.g., depth alarms, transducer offsets, cross track distance) (Chapter 4.N).	
g. Method for distinguishing CO/OIC-approved tracklines.	
6. Navigation Modes (Chapter 3.C):	
a. Mode I navigation.	
b. Mode II navigation.	
c. Mode III navigation.	
7. Position verification and fix evaluation requirements/guidance (Chapter 3.C).	
8. Precaution/risk mitigation actions (Chapter 3.C).	
9. Navigation Planning (Chapters 3.C and 6):	
a. Effective risk management incorporated.	
b. Preliminary planning.	
c. Restricted waters transit planning.	
d. Unrestricted waters transit planning.	
e. Tracklines.	
f. Navigation equipment.	
g. Navigation brief/boat crew brief requirements.	
10. Chart plotting symbology (Enclosure (6)).	
11. Standard commands (Enclosures (4) and (5)):	
a. Helm Orders.	
b. Line Handling.	
c. Engine Orders.	Not Required
12. Unit navigation checklists.	
13. Navigation requirements for tactical/high speed boat operations.	
14. Procedures for maintenance and correction of charts and publications.	
15. Navigation logs (Enclosure (8)).	

CHAPTER 3. **GENERAL NAVIGATION REQUIREMENTS**

A. <u>General</u>. This section sets forth navigational requirements for all Coast Guard cutters and boats. COs/OICs must tailor this chapter's requirements and incorporate them into their Command Navigation Standards to facilitate safe navigation of cutters and boats under their command.

B. <u>Discussion.</u> Navigation is fundamental to safe operations afloat. These requirements reflect the proven reliability and accuracy of internationally accepted eNav systems as well as the need to retain the capability to fix position using other traditional methods.

1. <u>Electronic Navigation (eNav)</u>. Electronic navigation systems automate the process of integrating real-time positions with the chart display, thus allowing immediate assessment of vessel position. Electronic navigation systems also allow the integration of other operational data, such as ship's course and speed, depth soundings, and radar information, into the display. Alarms from sensors and from chart data can warn of potentially dangerous situations well in advance. Over-reliance on eNav systems can cause tunnel vision or ignorance of fundamental signs of danger. To prevent this, it is critical to understand system functions and use foundational navigation skills to properly prepare these systems and detect errors.

2. <u>Paper Chart Navigation</u>. This is the foundation for learning navigation concepts, skills, and plotting mechanics. Once trainees learn traditional navigation skills, they are ready to apply these concepts and techniques across all methods of navigation, including eNav. A strong grasp of paper-based navigation techniques enables a navigator to better understand variances between navigation modes and prevent over-reliance on any one method.

C. <u>Requirements</u>. In addition to the items identified above, Coast Guard cutter and boat commands and crews must:

1. Verify essential systems are ready for navigation.

Cutters	Boats
a. Prior to getting underway, all ready charts and any additional patrol specific charts and required publications (Coast Pilot, Light List, Tide Tables, and Navigation Rules) necessary for safe navigation are currently corrected and onboard.	a. Updated chart of local area and required publications (Coast Pilot, Light List, Tide Tables, and Navigation Rules) are onboard prior to getting underway (not required for cutter boats operating in the vicinity of the cutter and in the Open Ocean or Coastal Navigation Zones).
b. Prior to getting underway or entering restricted waters, conduct a steering test and propulsion check in accordance with reference (a).	b. Daily and, if possible, prior to mooring, conduct a steering test and propulsion check.
c. Prior to getting underway, entering port and, if possible, prior to entering restricted waters, conduct a navigation brief (see	c. Prior to getting underway and, if possible, prior to entering restricted waters, conduct a boat crew brief (see Chapter 6 of this

Chapter 6 of this Manual for more information).	Manual for more information).
d. Prior to getting underway, verify all positioning sources and navigational equipment (e.g., GPS, radar, gyrocompass/alternate heading source, etc.) for accuracy.	d. Daily, verify all positioning sources and navigational equipment (e.g., GPS, radar, gyrocompass/alternate heading source, etc.) for accuracy.

2. Set appropriate watch station manning levels (e.g., Special Sea Detail or assigning boat crew specific navigation support functions).

3. Select and prepare for the appropriate navigation mode in accordance with Table 3-1 below:

Navigation Mode	Definition	Position Source	Chart	System	Other
Mode I (eNav)	Installed eNav system, with automatic positioning input, used as primary means of navigation (see Chapter 4 for additional information).	Automatic Input	(1) Approved electronic chart (see Chapter 4 for more information). (2) Currently corrected electronic chart database (see Chapter 4 for more information). (3) Current edition of paper chart is onboard. Designated Ready Charts are currently corrected. (Exception applies as stated in section 3.C.1.a Boats above.)	(1) eNav system configured IAW Command Navigation Standards. (2) Route planning information is loaded into the system.	Ensure ability to transfer to paper plot within one fix interval if eNav system fails. Command Navigation Standards must define the level of system failures and response actions.
Mode II (eNav)	Installed eNav system, with manual positioning input, used as primary means of navigation (see Chapter 4 for more information).	Manual Input	(1) Approved electronic chart (see Chapter 4 for more information). (2) Currently corrected electronic chart database (see Chapter 4 for more information). (3) Current edition of paper chart is onboard. Designated Ready Charts are currently corrected.	(1) eNav system configured IAW Command Navigation Standards. (2) Route planning information is loaded into the system.	Ensure ability to transfer to paper plot within one fix interval if eNav system fails. Command Navigation Standards must define the level of system failures and response actions.
Mode III (Paper Chart)	Traditional paper navigation used as primary means of navigation (see Chapter 5 for more information).	Manual Input	(1) Approved chart (see Chapter 5 for more information). (2) Currently corrected chart (see Chapter 5 for more information).	N/A	Prepare paper charts for navigational use per Command Navigation Standards.

Table 3-1: Navigation Mode Requirements

4. Enable appropriate sensor and system alarms.

   a. Depth Alarm (properly configured for transducer offset and set to activate at depth equal-to or more-than Navigational Draft).

   b. Maximum allowable Cross Track Error.

5. Fix Vessel Position. At the fix intervals prescribed in the Command Navigation Standards, determine – then verify and evaluate – the vessel's position using visual or electronic means. Record the fix and label it with the time and proper symbol, consistent with the navigation mode in use and capability of the eNav system (if applicable). Enclosure (6) contains standard navigation plotting symbols.

   a. Visual Fix. The common intersection of three or more LOPs (including LOPs from celestial bodies) obtained from simultaneous observations.

   b. Electronic Fix. The use of installed electronic equipment to develop a position fix includes:

      (1) Latitude and longitude provided by installed equipment.

      (2) The common intersection of three or more radar ranges obtained from simultaneous observations.

      (3) The use of radar/chart matching. Radar/chart matching involves fixing the vessel's position with the vessel's electronic chart using the radar to match features that appear on both (e.g., Radar overlay feature on eNav System or Fisher Plotting).

      (4) The use of a combination of visual LOPs and radar ranges is an electronic fix.

6. Verify Vessel Position. To avoid over-reliance on a single source of information, verify vessel position at each fix using all means available.

   a. Vessels must use all available means to verify their position and ensure safe navigation. Techniques include secondary positioning source fix, soundings, visual observations, danger ranges/bearings, set and drift, and positive identification and relative position of aids to navigation.

   b. Do not erase or delete fixes because they appear in error.

   c. If position ambiguity exists, all appropriate team members (e.g., OOD, Conning Officer, Coxswain) must be verbally informed and another fix taken immediately to ascertain the vessel's position.

7. Evaluate Position Fixes. Current eNav systems provide reliable, robust navigation capabilities including the ability to fix, record, and display the vessel's position. A critical element to safe navigation is the ability of the person(s) responsible for navigating the vessel to accurately evaluate the vessel's position. At each prescribed fix interval, members

responsible for the safe navigation of cutters and boats must ensure evaluation of the vessel's position with due regard to, at a minimum, the proximity of shoal water, environmental conditions, and mission parameters.

8. <u>Take Appropriate Precautions</u>. If at any time fix quality comes into question, particularly while operating in high risk areas (e.g., near shoal water or obstructions), crews must initiate appropriate actions to minimize risk to the vessel and crew in accordance with the Command Navigation Standards. Some actions may include:

   a. Reducing speed.

   b. Taking all way off.

   c. Increasing fix frequency.

   d. Turning away from the danger.

9. Monitor GPS correction, check GPS accuracy, and report GPS outages.

   a. <u>GPS Corrections</u>. National Differential GPS (NDGPS) system and the Wide Area Augment System (WAAS) are the only GPS corrections currently authorized for Coast Guard vessel use in high-risk (e.g., restricted waters) navigational zones/areas.

   b. <u>GPS Receiver and WAAS</u>. Units equipped with a GPS receiver that is capable of receiving GPS corrections from the WAAS are authorized to use this feature. WAAS is a satellite-based GPS augmentation system implemented by the Federal Aviation Administration to support lateral and vertical navigation for all phases of flight in the US.

   c. <u>GPS Accuracy</u>. Command Navigation Standards must define times and intervals for verifying GPS equipment accuracy to ensure safe navigation (e.g., before getting underway and entering restricted waters, daily for cutters operating in rivers or harbors, daily for boats, etc.). Units should not normally use another GPS unit to determine the accuracy and proper operation of the primary GPS unit.

   d. <u>Outage Reporting</u>. All Coast Guard GPS/NDGPS/WAAS users must report GPS outages. Enclosure (7) provides detailed information concerning outage reporting.

CHAPTER 4. **ELECTRONIC NAVIGATION (MODES I & II)**

A. <u>General.</u> Coast Guard installed eNav systems vary in complexity and in their ability to mitigate navigational risk. System capabilities range from display of a GPS position on an approved electronic chart to systems that integrate onboard navigation sensors. Additionally, some Coast Guard eNav systems interface with external tactical systems, thereby providing a seamless navigational and operational situation display.

B. <u>Electronic Navigation Systems.</u> Commandant (CG-761) is the program manager responsible for Coast Guard electronic navigation capabilities for cutters and boats. The following components generally comprise a Coast Guard eNav system:

1. Hardware consisting of computers, sensors, displays, and associated networks.

2. Software consisting of the navigation program running on the navigation computers, and in some cases, in the sensors themselves (e.g., radar).

3. System data, which flows over the network between navigation computers and integrated sensors. Integrated sensors allow continuous feed of sensor data, such as Position, Heading, and Depth. Data can also include the radar image, Automatic Radar Plotting Aid (ARPA) track information, etc.

4. A chart database, which may contain charts with different formats (see paragraph O in this chapter for additional information).

5. A user interface that allows the user to change system parameters, enter data, control the display, and operate the various functions of the system. Radar/ARPA control may be available in the eNav user interface to improve navigation and collision avoidance capabilities.

C. <u>Restricting Applications</u>. On computers designated specifically for navigation or situational awareness, only navigation related applications should be open. The navigation software must be the active application and operators should only minimize it when using another navigation-related application (e.g., Total Tides, System to Estimate Latitude and Longitude Astronomically (STELLA)).

D. <u>Personal Navigation Applications.</u> The use of personal navigation applications using cellular/GPS technology is not permitted for navigation aboard Coast Guard cutters and boats.

E. <u>Electronic Navigation as Primary Means of Navigation.</u> In lieu of paper charts, the use of Coast Guard installed electronic navigation systems is approved as the primary means of navigation aboard Coast Guard cutters and boats, provided the conditions below are met. Table 3-1 displays the basic requirements to use Mode I, II, or III as the primary means of navigation. Additionally, enclosure (11) provides a quick-reference flowchart on appropriate chart usage.

F. <u>eNav Display</u>.

1. The Command Navigation Standards must include guidance for eNav display parameters necessary to ensure safe navigation of the cutter or boat.

2. <u>Display Category</u>. Normally eNav display objects fall into one of three categories.

   a. <u>Display Base</u>. The chart content that cannot be removed from the display. This represents the minimum set of information and is not intended to be sufficient for navigation. Shallow water, safety contour, and isolated hazards to navigation are included in the display base based on cutter or boat depth information entered into the eNav system (see Table 4-1 and Figure 4-1 for depth terminology and graphic representation).

   b. <u>Standard Display</u>. The minimum information required during route planning and route monitoring for safe navigation of the vessel. CO/OICs must include standard display information in the Command Navigation Standards for all cutters and boats under their command.

   c. <u>All Other Information</u>. To be displayed individually (by class) on demand. CO/OICs must provide guidance on conditions when other information must be displayed, in addition to the standard display, to ensure safe navigation of cutters and boats.

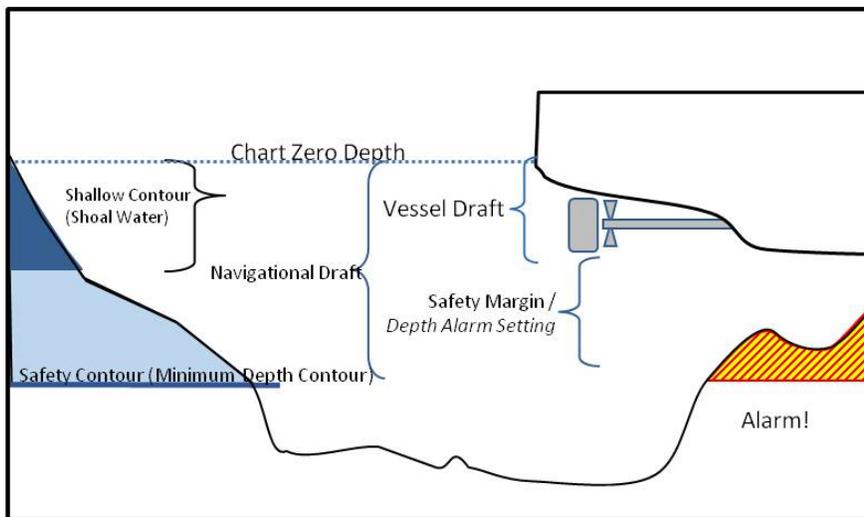| Term	Vector Chart	Paper Chart
Minimum Depth Contour	Safety Contour	Penned in a color and weight that will stand out, even under night lighting.
Shoal Water (*areas within the Minimum Depth Contour)*	Shallow Contour	
Shoal Areas (Where a safety contour is not available)	Safety Depth	

Table 4-1: Depth Terminology

Figure 4-1: Safety Depth Diagram

G. <u>Route Planning.</u> The eNav process includes the planning of a voyage, route, or tracks for a vessel to ensure safe navigation to its destination. Command Navigation Standards must provide guidance for eNav route planning and must include, at a minimum:

 1. Identification and impact of Notice to Mariner/Local Notice to Mariner (NTM/LMN) issued since electronic chart data update.

 2. CO/OIC approved track lines and waypoints (this includes cutter boats operating in Restricted Waters, but it does not apply to cutter boats operating in the vicinity of the cutter and in the Open Ocean or Coastal Navigation Zones).

 3. Maximum allowable cross track error along each track leg.

H. <u>Vessel Position.</u> While operating in Mode I or Mode II, crews must use all navigational information to verify vessel position, and evaluate the fix with due regard to the proximity of shoal water, weather conditions, and mission parameters to ensure the safe navigation of the vessel.

I. <u>Advance of Vessel Position.</u> Vessel position is advanced (direction and speed) between fixes based on the selected own vessel velocity vector. Several means of direction and speed may be available, depending on the positioning source in use and system capabilities. Each input available for direction and speed provides specific data that operators must comprehend to ensure safe navigation of the vessel. Ordered course and speed differs from course over ground and speed over ground or course and speed through the water. The input for own vessel direction and speed must be in accordance with the Command Navigation Standards.

J. <u>Dead Reckoning (DR).</u> A properly maintained DR plot is the foundation for maintaining an acceptable estimate of the vessel's position between fixes, and it provides valuable information in evaluating the effects of external forces on the vessel and ensuring the safe navigation of the vessel. When DR features are available in the eNav system, use them in accordance with the Command Navigation Standards.

K. <u>Set and Drift.</u> eNav systems have two ways to calculate set and drift. A thorough understanding of each method is essential to proper navigation, especially in restricted waters.

 1. <u>Computed</u>. Continuously updated set and drift obtained by comparing own ship heading to course over ground and own ship speed to speed over ground. This gives a constantly fluctuating "in the moment" set and drift.

 2. <u>Ordered</u>. Ordered course and speed are entered, set and drift is calculated over the entered fix interval, resulting in a long term set and drift, similar to paper chart calculations (i.e. instead of every second, set and drift is calculated every designated fix interval).

L. <u>System Configuration and Settings.</u> When using an eNav system as the primary means of navigation, it is critical to ensure members responsible for the safe navigation of the vessel have an understanding of the underlying eNav doctrinal principles (e.g., alarm hierarchy). It is possible for well-intended operators to set eNav system settings, configurations, or display to function against safe navigation practices, thereby increasing risk to the vessel. Settings and configurations refers to those system settings/configurations that support navigation Mode I and II (e.g., display options, task

assignments, and primary-secondary sensors). The Command Navigation Standards must detail system configuration and settings for:

1. Each navigation zone/area.

2. Each navigation evolution requiring unique configuration (e.g., anchoring).

3. Navigation Modes I and II.

M. Profiles. Installed eNav systems have the capability to set and save operator settings in a profile. CO/OICs must include appropriate profile information in the Command Navigation Standards for specific Navigational Zones/Area to facilitate safe navigation for cutters and boats under their command. This allows transition from one Navigation Zone/Area to another quickly and reliably, with the same set of settings applied consistently. For instance, the DR interval and chart features displayed onscreen vary depending on the navigational zone/area. Changing profiles applies all of the settings with one action. It is also possible (and recommended) for the operator to create profiles for vessel-specific evolutions (e.g., anchoring, or working a buoy on the port or starboard side that changes the safety-checking region accordingly).

N. Alarms. There are numerous alarms available to the operator that provide valuable information only if they are properly configured for the prevailing navigational situation. Too few alarms increase the risk to the safe navigation of the vessel. However, setting too many alarms creates distractions and makes it difficult or impossible to identify risk to the safe navigation of the vessel. Operators must ensure that alarm settings are in accordance with Command Navigation Standards for the appropriate Navigation Zone/Area.

1. Hierarchy. Generally, Coast Guard eNav systems have three alarm levels as described below. For units with eNav systems that do not use this three-alarm hierarchy, ensure operators know the corresponding alarm levels and functions for the eNav system in use.

a. Danger. The system produces a continuous audible alarm and flashes red. Danger alarms alert the user to issues that require immediate attention.

b. Warning. The system produces a brief audible alarm and flashes yellow. Warning alarms alert the user to issues that, if left uncorrected, could compromise safety of navigation.

c. Caution. The system flashes yellow. Caution alarms are normally advisory.

2. Chart Objects. Users can select specific chart objects (e.g., Aids to Navigation (ATON), Cautionary Areas, Land) and assign a specific alarm level based on distance to the object and other factors.

3. Sensors. The system can produce an alarm when a sensor fails, the connection is lost, or the data of the sensor is not valid.

4. Targets. Users can configure alarms for targets by changing the minimum Closest Point of Approach (CPA) distance or time. Setting both distance and time to a value of zero is considered disabling the target alarm.

O. <u>Electronic Charts.</u> There are two general types of electronic chart data: vector and raster. Both vector and raster chart data have inherent limitations. Vector charts are the preferred electronic chart type with Coast Guard eNav systems.

1. <u>Vector Charts</u>. These charts include Electronic Navigation Charts (ENC), Inland Electronic Navigation Charts (IENC), and Digital Nautical Charts (DNC).

    a. Vector charts consist of points, lines, and area data that represent real world objects. Since each object is separate, it allows for more information than can be displayed for each object to be stored in the chart data, allowing the user to query the chart. It also allows the navigation system to test each object for grounding or height alarms.

    b. The charting system displaying vector charts must be able to hide or display certain vector chart objects based on zoom level and operator preference. The system constantly displays a set of base information, but the user must add other filters and objects in accordance with Command Navigation Standards to ensure safe navigation. The user can save these filters as part of the Profiles feature on eNav systems to ensure constant display of Command Navigation Standards objects.

2. <u>Raster Charts</u>. Raster charts are flat images of paper charts. Each paper chart has a corresponding raster chart that is its digital equivalent. Users cannot query raster chart data for more information or use raster data for alarms. Over-scaling is readily apparent on a raster chart.

3. <u>Approved Electronic Chart Hierarchy</u>. The Coast Guard has approved the electronic chart data below for use with Coast Guard eNav systems. Based on data accuracy, CO/OICs must follow the hierarchy in Table 4-2 to the maximum possible extent. CO/OICs have discretion to authorize situational variances (due to chart quality, etc.), provided such variances are briefed to the command and the navigation team (normally at the navigation brief) prior to deviation. The Command Navigation Standards must also document any deviation from Table 4-2.

    a. <u>Electronic Navigational Charts (ENC)</u>. Government-authorized hydrographic offices produce and issue official ENCs.

    b. <u>Inland Electronic Navigational Charts (IENC)</u>. US Army Corps of Engineers (USACE) produces and issues IENCs, basing them on the ENC format. These charts cover the Western Rivers and have additional symbols specific to this region that ENCs do not have.

    c. <u>Digital Nautical Charts (DNC)</u>. NGA produces and issues DNCs for use outside of US waters, where NOAA does not have ENC coverage. NGA publishes DNCs in general, coastal, approach, and harbor libraries. NGA updates DNCs monthly, and users should downloaded DNCs directly from NGA's website. Like all charts, including paper, the data is only as reliable as the host country's Hydrographic Office.

    d. <u>Raster Navigational Charts (RNC)</u>. Government-authorized hydrographic offices produce and issue RNCs. The chart name usually aligns with the equivalent paper chart.

Electronic Chart Type Hierarchy
Official ENC/USACE IENC
NGA DNC
Official RNC
Commercial Vector Chart
Commercial Raster Charts

Table 4-2: eChart Hierarchy

4. <u>Currently Corrected Electronic Chart Data</u>. The section below lists the requirements for currently corrected electronic charts, and Figure 4-2 shows the process for updating chart databases and eNav systems to ensure they render a currently corrected chart.

Cutters	**Boats**
a. A chart is currently corrected if it has been corrected within the last 45 days.	a. A chart is currently corrected if it has been corrected within the last 6 months.
b. Full file replacement of the electronic chart data is the recommended method to update electronic charts (e.g., cell, library, chart, or chartlet). Creative Map Corps (CMC) issues monthly discs containing full file replacement ENC and RNC charts. When available, these should be the normal method of updating charts. NGA's website provides DNC full file replacement charts, which is the only approved method of updating DNC charts.	b. The Coast Guard has contracted to provide updated electronic charts for Scalable Integrated Navigation System (SINS) equipped shore based boats every 6 months. Purchasing updated electronic charts for SINS equipped cutter boats is at the discretion of the CO/OIC. In the event that SINS electronic charts are out of date (longer than 6 months old) CO/OICs may authorize use of SINS as primary means of navigation if a currently corrected and prepared paper chart is immediately available (out and ready).

Cutters	Boats
c. Users can enter manual corrections into the eNav system when connectivity or mail delivery prevents crews from obtaining full file replacements. Cutters should use this method on a limited basis. The following are approved sources for manual corrections: (1) The cognizant hydrographic office (e.g., NOAA, USACE, NGA, Canadian Hydrographic Services (CHS), United Kingdom Hydrographic Office (UKHO) etc.) (2) LNM (3) NTM	c. SINS does not provide capability to accurately update the electronic chart display manually. If NTMs/LNMs have been issued past the manufacturer's electronic chart base date, then CO/OICs can authorize use of SINS as a primary means of navigation if a currently corrected and prepared paper chart is immediately available (out and ready). *Example: The date is 01 Apr. Electronic chart base date is 01 Jan. No NTMs have been issued on the chart. SINS is authorized as primary means of navigation. On 15 Apr an NTM is issued. The CO/OIC can authorize SINS as primary means of navigation, if a currently corrected and prepared paper chart is out and immediately available.*

d. <u>Links</u>. The following are links to approved hydrographic office sites that contain the most up-to date charts. NOAA and NGA update these electronic charts weekly.

(1) NOAA ENC: http://www.charts.noaa.gov/ENCs/ENCs.shtml

(2) NOAA RNC: http://www.charts.noaa.gov/RNCs/RNCs.shtml

(3) NGA Registration: https://pki.geointel.nga.mil/servlet/RegistrationForm

(4) NGA DNC: https://www.geointel.nga.mil/products/dnc/#updated

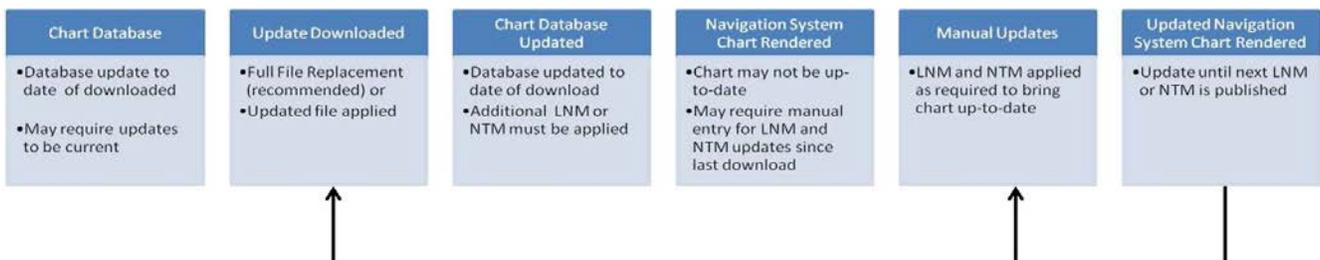*NOTE: Use only the Update Libraries section to update DNCs.*

Figure 4-2: eChart Update Process

    5.   Electronic Chart Data Scaling.

        a. Viewing. Electronic chart data is most accurate when displayed at its source scale. Scaling/zooming in or out distorts the visually perceived relative distance between chart objects. In addition, cursor-indicated positions for charted features vary when scaling the chart.

        b. Display Matching. Display matching ensures displayed information is consistently oriented to the viewer, thereby preventing errors in interpretation.

           (1) When the system displays radar and electronic chart data together in overlay mode, the display must match in scale, orientation, and projection. For example, scaling out the radar to 24 NM when the electronic chart scale is at 3 NM can cause misinterpretations.

           (2) Display Matching and Chart Matching are not the same; Chart Matching is a positioning source, Display Matching is not.

    6.   Charting Symbols.

        a. NOAA's RNCs use US Chart 1 symbology.

        b. ENC data use US Chart 1 symbology.

        c. DNCs present data using NGA's Geospatial Symbols for Digital Displays, which corresponds to the International Hydrographic Organization (IHO) Electronic Chart Display and Information System (ECDIS) Presentation Library and IHO Chart INT 1.

        d. RNCs other than NOAA's RNCs use symbols base on International Chart 1 and contain variants as determined by the producer.

    7.   Discrepancies.

        a. Report chart display discrepancies and discrepancies in chart data to the Coast Guard Navigation Center via priority message to COGARD NAVCEN ALEXANDRIA VA//NIS//.

        b. For ATON chart discrepancies, notify the appropriate CG District Waterways (dpw) office via priority message traffic, with COGARD NAVCEN ALEXANDRIA VA//NIS// and COMDT COGARD WASHINGTON DC//CG-NAV// as information addressees. In all cases, reporting units must provide an ENC Cell Name and a detailed description of error(s).

P. Additional Information. Additional information to support unit electronic navigation capabilities is available at the Cutter Forces website http://cgweb.comdt.uscg.mil/CG-751/programs/NAV.htm.

CHAPTER 5.   **NAVIGATION USING PAPER CHARTS (MODE III)**

A. <u>General</u>. While eNav systems have become accurate and reliable enough to use as the primary means of navigation for Coast Guard cutters and boats, a thorough understanding of paper chart navigation is critical to asset and crew safety.

B. <u>Charts.</u> For Mode III navigation, use only currently corrected charts produced by an approved IHO, giving priority to NOAA and NGA charts. Paper charts are currently corrected if they are both the most current edition and corrected up to the latest LNM and NTM.

> **NOTE**: *For units underway and not able to receive charts in a timely manner, paper charts are considered currently corrected if the chart is corrected up to the latest LNM and NTM. The unit should obtain the most current edition as soon as possible.*

> **NOTE**: *Print-on-Demand (POD) charts, if used, must be maintained by applying LNM and NTM corrections subsequent to dates listed on the POD chart.*

C. <u>Navigation</u>.

   1. <u>Fixes</u>. Command Navigation Standards must detail fix intervals when using paper charts as the primary means of navigation. The fix intervals should ensure safe navigation given the risks present for the navigation zone/area.

      a. When three LOPs are not simultaneously available, advance previous LOPs to a common time to create a running fix.

      b. Do not erase a fix because it appears to be in error. Rather, take another fix immediately to ascertain the vessel's position and the source of the error. Upon determining the source of the error, correct for the error so that it does not recur.

   2. <u>Set and Drift</u>.

      a. If fix interval is three minutes or greater, determine set and drift with every fix.

      b. If the fix interval is less than three minutes, determine set and drift with every second fix.

      c. If there is no fix, consider set and drift as part of determining an estimated position (EP).

3. <u>Dead Reckoning (DR)</u>. When plotting DRs, properly label and project the track for at least two fix intervals. An accurate DR plot is the foundation for maintaining an acceptable estimate of the ship's position between fixes and provides valuable information to evaluate the vessel's position and ensure safe navigation. The following general rules apply in constructing and maintaining the DR plot when using a paper chart as the primary means of navigation.

   a. Plot a DR position at least every hour on the hour.

   b. Plot a DR position at every course change.

   c. Plot a DR position at every speed change.

   d. Regenerate DR plot after each fix or running fix.

   e. Plot a DR position when obtaining a single line of position.

CHAPTER 6.   **NAVIGATION PLANNING AND BRIEFS**

A. Navigation Planning.

1. Purpose. Navigation planning encompasses the development of long and short-term plans as well as contingency plans for an operation. Command Navigation Standards, Standing Orders, operational bills, and navigation checklists constitute pre-established long-term operational plans for safe and successful navigation. These plans provide a framework for executing a mission and guide the short-term plans that commands can tailor to meet the unique requirements of each operation. Short-term plans include chart preparations as well as navigation and boat crew briefs. These short-term plans could be very elaborate, consisting of complete tracklines, piloting procedures, patrol areas, etc. or they may simply be a brief to the crew before launching a boat.

2. References and Resources.

   a. All nautical publications are available on NGA's Digital Nautical Publications-Quarterly Update DVD-ROM (NGA Reference No.: CDPUBQTLY). All units are on automatic distribution for the Quarterly Update and publications are currently corrected as of the production date of the DVD; therefore, units must apply additional corrections as they occur.

   b. When preparing charts and developing navigation or crew briefs, consult currently corrected nautical and hydrographic publications (or the electronic equivalents). For example:

      (1) Coast Pilot* (available on the NOAA website at http://www.nauticalcharts.noaa.gov/nsd/cpdownload.htm. NOAA updates Coast Pilots weekly and posts the updates along with a complete edition containing all applicable corrections).

      (2) Fleet Guides.*

      (3) Sailing Directions* (available on the NGA website at http://msi.nga.mil/NGAPortal/MSI.portal).

      (4) Code of Federal Regulations, Title 33 (available on the Government Publishing Office website at http://www.ecfr.gov/).

      (5) Operations Order (OPORDERS).

      (6) Coast Guard Navigation Center, Navigation Information Service (see the Navigation Center's website at http://www.navcen.uscg.gov/ for more information).

      (7) Naval Operating Area Instructions.

      (8) Light List(s) and List of Lights* (Light Lists are available on the Navigation Center's website at http://www.navcen.uscg.gov/?pageName=lightLists with weekly updates at http://www.navcen.uscg.gov/?pageName=lightListWeeklyUpdates. Light Lists and List

of Lights are also available on the NGA website at
http://msi.nga.mil/NGAPortal/MSI.portal).

(9) Radio Aids to Navigation, PUB 117* (available on the NGA website at
http://msi.nga.mil/NGAPortal/MSI.portal).

(10) Notices to Mariners, Local Notices to Mariners, Broadcast Notices to Mariners, and
Notices to shipping, as applicable (see the Navigation Center's website at
http://www.navcen.uscg.gov/?pageName=lnmMain for more information).

(11) NAVAREA, HYDROLANT, HYDROPAC Messages (available on the NGA website at
http://msi.nga.mil/NGAPortal/MSI.portal).

(12) Tide Tables* (available on the NOAA website at https://tidesandcurrents.noaa.gov/).

(13) Tidal Current Tables* (available on the NOAA website at
https://tidesandcurrents.noaa.gov/).

(14) Nautical Almanac.

(15) Navigation Rules, International – Inland* (available on the Navigation Center's website
at http://www.navcen.uscg.gov/?pageName=navRulesContent).

(16) World Port Index* (available on the NGA website at
http://msi.nga.mil/NGAPortal/MSI.portal).

(17) Local weather resources.

(18) Other local navigation guides.

> *NOTE: * Units may request hard copy from Government Printing Office.*

B. <u>Planning Requirements</u>. CO/OICs must ensure completion of the following items as part of the
navigation planning process.

1. Specify navigational information for cutters and boats to assist the navigation planning process.

Cutters	Boats
a. Navigational Draft.	
b. Length overall.	
c. Vessel Beam.	
d. Line handling commands. See Enclosure (4).	
e. Standard Helm commands. See Enclosure (5).	
f. Masthead height (fixed and unfixed, if	f. Fixed and unfixed height.

Cutters	Boats
applicable).	
g. Unclassified tactical data.	g. Speed/RPM curve.
h. Full load draft.	Not Required
i. Height of bridge above the waterline.	Not Required
j. Location of GPS antenna.	Not Required
k. Distance from hawsepipe to alidade.*	Not Required
l. Distance from hawsepipe to GPS antenna.*	Not Required
m. Distance from hawsepipe to stern.*	Not Required
n. Distance from radar antenna to hawsepipe.*	Not Required
o. Distance from GPS antenna to stern.*	Not Required
p. Distance from radar antenna to stern.*	Not Required
q. Engine order commands vary between cutter classes based on engine configuration and equipment. COs/OICs must ensure Command Navigation Standards include standard lee helm commands as appropriate for the cutter.	Not Required
*Note – Not required for cutters without anchors.	

2. Identify the appropriate fix interval. Fix intervals are identified for each navigational zone/area based on risk. Intervals must not exceed one hour without CO/OIC authorization. Regardless of navigation mode in use, this interval structures the recurring assessment of the vessel's navigation and maneuvering situation (e.g., speed of the vessel, proximity of shoal water, weather conditions, and mission parameters) to ensure the safe navigation of the vessel. Include fix intervals in the Command Navigation Standards.

3. Identify the appropriate navigation mode and the unit specific equipment/configurations. Include equipment configurations in the Command Navigation Standards. See table 3-1 for more information.

C. Chart and Publication Preparations. Charts (electronic and paper, as appropriate) must be currently corrected to ensure proper display and highlighting of hazards to navigation (e.g., overhead obstructions, prohibited areas, shoal water, etc.) along the intended route and within the AOR. The CO/OIC must approve tracklines and principal navigation routes. On all charts used for navigation, crews must verify information is identical on each chart to ensure navigation decision-makers have the same navigational information/picture.

1. <u>General Chart and Publication Preparation Requirements</u>.

   a. Conduct annual review of chart and publication requirements, and route any requests for new products or allowance changes via the chain of command.

   b. Maintain unit contact information in the Account Management Provisioning System (AMPS). Conduct annual account information verification.

   c. Maintain a portfolio of charts that are kept currently corrected and ready for immediate service (commonly referred to as ready charts) to ensure safe navigation of cutters and boats.

   d. Select the best scale chart. Best scale may involve compromise between scale, accuracy, and features.

   e. Prepare charts to meet or exceed requirements of navigational zones/areas specified in the Command Navigation Standards. Navigation zones/areas reflect the risk associated with locations within a unit's normal AOR. The following table describes the zones/areas normally associated with cutters and shore-based boats.

Cutters	Shore-Based Boats
(1) Shoal Water.	(1) Shoal Water.
(2) Restricted Waters.	(2) Restricted Waters.
(3) Coastal Waters.	(3) Coastal Waters.
(4) Open Ocean.	(4) Open Ocean.
(5) Principle Navigation Routes.	(5) Principle Navigation Routes.
Not Required	(6) AOR Key Waypoints.
Not Required	(7) AOR Key Areas.
Not Required	(8) Wake/Speed Restrictions.

2. <u>Paper Chart Preparations</u>.

   a. Label CO/OIC approved tracklines on applicable ready charts and restricted waters transits with the following:

Cutters	Boats
(1) True Course (only required for vessels fitted with a gyrocompass).	(1) True Course (only required for vessels fitted with a gyrocompass).
(2) Magnetic Course.	(2) Magnetic Course.
(3) Distance of each track leg.	(3) Distance of each track leg.
(4) Visual and radar navigation points. See Enclosure (6). Also listed in a	(4) Radar navigation points. See Enclosure (6).

Cutters	Boats
gazetteer in accordance with Enclosure (8).	
(5) Danger bearings/ranges to navigational hazards not marked by navigation aids.	Not Required
(6) Turn bearings/ ranges.	Not Required
(7) Slide lines for advance and transfer based on the ship's tactical data for the intended speed/ rudder combination.	Not Required
(8) Label chart shifts on all charts. Bridge and CIC (if applicable) must not shift paper charts at the same time or immediately prior to a turn.	Not Required

  b. When plotting tracklines on paper charts for use outside of restricted waters, label with the following:

    (1) True Course (only required for vessels fitted with a gyrocompass).

    (2) Magnetic Course.

    (3) Distance of Track Leg.

 3. <u>Electronic Chart Preparations</u>.

  a. If the eNav system permits, all tracklines on electronic charts used in restricted waters must display the following labels:

    (1) True Course.

    (2) Magnetic Course.

  b. The Navigator/Navigation Petty Officer must consult electronic chart and information products applicable to the intended route or AOR to ensure all available updates and precautions for the route or area are accounted for.

D. <u>Navigation Briefs/Boat Crew Briefs</u>. Briefs are a critical element of the navigational planning process and ensure safe navigation of Coast Guard cutters and boats. They are tailored specifically to operations and serve to ensure all members involved have a common understanding of the risks present and actions to mitigate those risks. Per reference (c), Area of Responsibility (AOR) familiarization ensures Coxswains of shore-based boats are well versed in local navigation requirements. Per reference (c), cutter boat Coxswains are not required to complete an AOR familiarization. Therefore, briefs for cutter boats operating in restricted waters are more extensive

than those required for shore-based boats and must address appropriate sections of the cutter navigation planning and briefing tasks outlined in the table below.

Cutters (Navigation Briefs)	Boats (Boat Crew Briefs)
1. Conducted prior to getting underway, entering port, and, if possible, prior to entering restricted waters.	1. Conducted prior to getting underway and, if possible, prior to entering restricted waters.
2. Requirements: Briefs must include the following information, when applicable:	
a. Conduct risk assessment in accordance with reference (g).	
b. Assignment of Navigation Team positions and review of duties as outlined in Enclosure (3).	b. Assignment of crew positions (includes navigation support functions, if assigned).
c. Review of charts and intended track including results of scanned route.	c. Review of charts and intended track/patrol area.
d. Planned speed of advance and maximum safe speed.	d. Safe speed for mission and conditions.
e. Identification of hazards to navigation and how the risks will be controlled, including: Navigation warnings, danger bearings/ranges, danger soundings, bridge vertical clearances, proximity-guard alarms, depth alarms, etc.	e. Identification of hazards to navigation and how the risk will be controlled, in accordance with Command Navigation Standards.
f. Anticipated traffic (cutters should plan to avoid meeting deep draft vessels at turns or intersections and include Automatic Identification System (AIS) correlation procedures).	f. Anticipated traffic and AIS correlation procedures if available.
g. Agreed-upon rendezvous/recovery point for cutter boats	
h. Environmental considerations including tides, currents, weather, and environmentally sensitive areas (e.g., marine sanctuaries). NOTE: Tide and current data should be available at all conning stations and CIC.	h. Environmental considerations including tides, currents, weather (e.g., winds, precipitation, visibility), and environmentally sensitive sea areas (e.g., marine sanctuaries).
i. Maximum allowable deviation from track and confirmation that electronic chart cross track warnings are aligned with max deviation from track, if applicable.	
j. Electronic chart selection, specific type (e.g., ENC, DNC, etc.) and paper chart selection, and any known chart offset.	Not Required

Cutters (Navigation Briefs)	Boats (Boat Crew Briefs)
k. Anticipated time of setting the Special Sea Detail, Anchoring and Mooring Bills, Engineering Restricted Maneuvering Doctrine, and Navigation Detail.	Not Required
l. Chart shifts.	Not Required
m. Restricted, prohibited, and cautionary areas along intended track.	Cutter boats only
n. Chart datum (e.g., WGS 84) and verification of positioning source datum.	Not Required
o. Planned fix interval.	Not Required
p. Intended speed/rudder combination for turns, if different than specified standards.	Not Required
q. International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) buoyage system and whether inbound or outbound.	Not Required
r. Expected sightings and descriptions of key aids to navigation.	Not Required
s. ATON discrepancies along track or other items of note from LNM, NTM, or current Broadcast Notice to Mariners.	Not Required
t. Navigation equipment status.	Not Required
u. eNav back up arrangement, if applicable.	Not Required
v. Areas where the cutter can/cannot anchor in an emergency.	Not Required
w. Status of electronic position fixing systems (GPS/NDGPS) to include expected accuracy and outages.	Not Required
x. Engineering plant status.	Not Required
y. Traffic Separation Schemes.	Not Required
z. Port or Vessel Traffic Service (VTS) requirements including speed limits, pilotage, and check in points.	Not Required
aa. Communication requirements.	Not Required

Cutters (Navigation Briefs)	Boats (Boat Crew Briefs)
bb. Mooring or anchoring arrangements including time to moor/ unmoor and berth heading.	Not Required
cc. Review of pertinent information from Fleet Guide and Coast Pilot.	Not Required
dd. AIS mode to be used (e.g., normal, receive only, encrypted, etc.). Method and date of most recent AIS vessel information verification for cutters and cutter boats. Ensure encrypted AIS key is current per Chapter 5 D.6 of reference (m).	dd. Method and date of most recent AIS vessel information verification.
3. Conduct debriefs following navigation evolutions to evaluate and recognize performance.	3. Conduct a post-operations debrief to evaluate and recognize performance.

LIST OF ACRONYMS

ACRONYM	DEFINITION
AIS	Automatic Identification System
AMPS	Account Management Provisioning System
AOR	Area of Responsibility
ARPA	Automatic Radar Plotting Aid
ATON	Aids to Navigation
BAF	Boat Assault Force
CE	Categorical Exclusion
CFR	Code of Federal Regulations
CHS	Canadian Hydrographic Service
CIC	Combat Information Center
CMC	Creative Map Corps
CO/OIC	Commanding Officer/Officer- in-Charge
COG	Course Over Ground
CONN	Conning Officer
CPA	Closest Point of Approach
DHS	Department of Homeland Security
DNC	Digital Nautical Chart
DR	Dead Reckoning
DVD-ROM	Digital Versatile Disc – Read Only Memory
ECDIS	Electronic Chart Display and Information System
eNAV	Electronic Navigation
ENC	Electronic Navigational Chart
EP	Estimated Position
GPS	Global Positioning System
JQR	Job Qualification Requirements
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IENC	Inland Electronic Navigational Chart
IHO	International Hydrographic Organization
IMO	International Maritime Organization
LAN	Local Apparent Noon
LNM	Local Notice to Mariners
LOP	Line of Position
MOVREP	Movement Report
MTL	Master Training List

ACRONYM	DEFINITION
NARA	National Archives and Records Administration
NDGPS	Nationwide Differential Global Positioning System
NEPA	National Environmental Policy Act
NIST	National Institute of Standards and Technology
NGA	National Geospatial-Intelligence Agency
NOAA	National Oceanic and Atmospheric Administration
NM	Nautical Mile
NTM	Notice to Mariners
OOD	Officer of the Deck
OPORDER	Operations Order
POD	Print on Demand
PQS	Personnel Qualification Standard
RNC	Raster Navigational Chart
RPM	Revolutions Per Minute
SINS	Scalable Integrated Navigation System
SOG	Speed Over Ground
SOP	Standard Operation Procedures
STELLA	System To Estimate Latitude and Longitude Astronomically
TBD	To Be Determined
TTP	Tactics, Techniques and Procedures
UKHO	United Kingdom Hydrographic Office
USACE	United States Army Corps of Engineers
VTS	Vessel Traffic Service
WAAS	Wide Area Augmentation System
WAGB	U.S. Coast Guard Icebreaker
WIX	U.S. Coast Guard Training Barque Eagle
WHEC	U.S. Coast Guard High Endurance Cutter
WLB	U.S. Coast Guard Seagoing Buoy Tender
WMEC	U.S. Coast Guard Medium Endurance Cutter
WMSL	U.S. Coast Guard Maritime Security Cutter, Large
XO/XPO	Executive Officer/Executive Petty Officer
YDS	Yards

ANCHORING

A. General. This section states the basic requirements for anchoring. Ships must maintain navigational awareness while approaching an anchorage, while anchored, and while weighing anchor.

D. Proficiency.

1. Cutter Class. All cutters must maintain proficiency in anchoring in accordance with reference (b). Cutters can tailor precision anchoring drills to the specific capabilities of their class.

2. Requirements. To be considered proficient, cutters must be able to:

   a. Prepare appropriate charts or plotting sheets for a precision anchorage.

   b. Approach an anchorage or precision anchorage.

   c. Anchor the ship.

   d. Determine ship's position while at anchor.

   e. Weigh anchor.

3. Opportunities. Weather and operations permitting, cutters must take advantage of opportunities to maintain proficiency in anchoring.

E. Requirements.

1. Documentation. The Ship's Log must include time of anchorage, depth of water, which anchor used, scope of chain, type of bottom, ship's head, and bearings to objects designated by the Navigator. The anchor watch must use the ship's Standard Bearing Book (OPNAV 3530/2 or equivalent) to record time, vessel position, ship's head, bearings to objects designated by the Navigator, and depth of water.

2. Calculations.

   > *NOTE: eNav systems may use more complex and accurate calculations for these definitions below, which will result in different distances than manual calculations described below.*

   a. The Letting Go Circle, centered on the anchoring location, has a radius equal to the distance from the hawsepipe to the pelorus, radar antenna, or GPS antenna.

   b. The Swing Circle, centered on the anchoring location, has a radius equal to length of the vessel added to the length of anchor chain released.

   c. The Drag Circle, centered on the anchoring location, has a radius equal to the distance from the hawsepipe to pelorus, radar antenna, or GPS antenna, added to the length of the anchor chain released.

3. <u>Navigation Team Responsibilities</u>. (In addition to responsibilities listed in Enclosure (3) of this document.)

   a. Determine Set and Drift as soon as possible when approaching the anchorage to account for it in course recommendations.

   b. As the anchor is let go, the navigation team must immediately mark a round of bearings, ranges, and record the ship's head.

   c. After plotting the fix, the navigation team must extend a line from the fix in the direction of the ship's head and mark hawsepipe to pelorus distance along the line, thus plotting the position of the anchor at the moment of letting go.

   d. The navigation team must continue to take fixes until it is determined the anchor is holding.

   e. Approved eNav systems feature various anchor dragging alarms and plotting options. Use these features in lieu of a paper chart/plotting sheet as long as the eNav system is fully operational.

   f. Command Navigation Standards must address specific anchoring procedures for the navigation team, including verifying position accuracy by other than primary means at regular intervals.

CELESTIAL NAVIGATION

A. <u>General</u>. This section states the basic requirements for celestial navigation. Nothing in this section relieves members of their responsibility to complete celestial navigation portions of references (f) and (h).

B. <u>Proficiency</u>.

1. <u>Cutter Class</u>. WAGB, WMSL, WHEC, WMEC, WIX, and D14/D17 WLB class cutters must maintain proficiency in the art of celestial navigation.

2. <u>Requirements</u>. To be considered proficient, cutters must be able to:

   a. Determine the time of sunrise, sunset, moonrise, moonset, and Local Apparent Noon (LAN).

   b. Determine gyro error by azimuth and amplitude of the sun or other celestial body.

   c. Obtain a LOP from the sun.

   d. Compute latitude by observing LAN.

   e. Obtain the ship's position by reducing celestial objects to a fix.

   f. Compute latitude and gyro error by Polaris.

3. <u>Opportunities</u>. Weather and operations permitting, cutters must take advantage of opportunities to maintain proficiency in celestial navigation.

4. <u>Training</u>. The unit Master Training List (MTL) identifies the personnel required to complete Celestial Navigation Training (course code 500940) to ensure proficiency as described in this manual. At their discretion, Commanding Officers can require additional members to complete this training to ensure proficiency in celestial navigation.

C. <u>Other Requirements</u>.

1. <u>Documentation</u>. Document all celestial work in the ship's Navigation Workbook.

2. <u>Computer Computations</u>. Units using the STELLA computer software application to perform celestial computations must follow the guidelines in Enclosure (8) to properly log the celestial sight information.

3. <u>Chronometers</u>. There is no longer a requirement to carry chronometers onboard. Crews can obtain observation time(s) from an electronic clock synchronized with the GPS time signal or the National Institute of Standards and Technology (NIST) radio station WWVH broadcast.

NAVIGATION TEAMS

A. Boat Navigation Team Organization. The Coxswain may assign navigation support functions to members of the boat crew. If the Coxswain decides to do this, then he or she must used the Bridge Navigation Team roles described in this Enclosure (modified as needed to address boat navigation capabilities and crewing). Combining roles may be necessary, depending on boat crew size. For example, the Coxswain can assign a crewmember as Helmsman and assign another crewmember as Plotter/Navigation Evaluator.

B. Bridge Navigation Team Organization. Per reference (b), bridge navigation teams must complete applicable sections of reference (e) and cutter specific job qualification requirements (JQR) for their assigned billets. Assign Navigation Team positions as appropriate for the method of navigation in use. The following are standard navigation team positions and duties:

1. Navigation Evaluator. If not the Navigator, this person is responsible to the Navigator and must:

    a. Coordinate the actions of all bridge navigation team members.

    b. Use all available information to ensure the safe passage of the vessel including electronic fixes plotted on a paper chart, or displayed on an electronic navigation system.

    c. Evaluate fix accuracy from the Bridge and CIC (if equipped).

    d. Evaluate ship's projected movements.

    e. Make reports to the Conn as specified in the Command Navigation Standards.

2. Navigation Plotter. The Navigation Plotter should not be the same individual as the Navigation Evaluator, unless there is a lack of available cutter personnel. The Navigation Plotter must maintain the navigation plot as follows:

    a. Paper chart navigation:

        (1) Plot and label each fix on the chart in use.

        (2) Extend the DR at least two fix intervals.

        (3) Compute set and drift since last fix.

        (4) Identify nearest hazard to navigation.

        (5) Determine time and distance to the next course change.

        (6) Revise turn bearings.

        (7) Complete other tasks as directed by the Navigator/Navigation Evaluator.

    b. Electronic navigation:

        (1) Plot various types of fixes as applicable, based on the installed electronic navigation system.

        (2) Complete other tasks as directed by the Navigator/Navigation Evaluator.

3. <u>Bearing Book Recorder</u>. When the cutter is navigating with paper charts, the recorder must:

    a. Maintain the Standard Bearing Book (OPNAV 3530/2 or equivalent) in accordance with this Manual.

    b. Maintain communications with the Bearing Takers.

    c. Mark fixes at intervals specified by the Navigation Evaluator.

    d. Pass pertinent information to the Navigation Plotter/Navigation Evaluator.

4. <u>Bearing Takers</u>.

    a. Obtain accurate bearings to navigation aids designated by the Navigation Plotter/Navigation Evaluator.

    b. Advise the Navigation Plotter regarding the navigation aids available for use, including when navigation aids are acquired visually or lost from sight.

5. <u>Bridge Radar Observer</u>.

    a. Provide all radar navigation data as directed by the Navigation Plotter/Navigation Evaluator.

    b. Perform the duties of Navigation/Shipping Radar Operator on cutters without a CIC.

6. <u>Leadsman</u>. Pass soundings to the bridge navigation team for comparison with the fathometer and charted depth.

C. <u>CIC Navigation Team Organization</u> (*this section only applies to CIC-equipped cutters*).

1. Cutters with a CIC must maintain a capability to stand up a secondary navigation team (i.e. CIC Navigation Team).

2. COs may direct use of the CIC Navigation Team at their discretion. Normally, the CIC Navigation Team supports the Bridge Navigation Team in higher-risk evolutions (e.g., unfamiliar port transits, adverse environmental conditions, night/low visibility transits, transits with significant shipping traffic). The CIC Navigation Team verifies vessel position using methods such as radar ranges or radar chart matching, which contributes to the shipping picture and safe navigation of the vessel.

3. Command Navigation Standards must list conditions when the CIC Navigation Team is required.

4. CIC Navigation Team members must complete applicable sections of reference (e) and cutter specific JQR for their assigned billets in accordance with the reference (b).

5. On cutters without a CIC, some sections of this PQS might apply to the Bridge Navigation Team (e.g., shipping officer, shipping radar operator).

6. The following are recommended CIC navigation team positions for Mode I and II:

   a. <u>CIC Evaluator</u>. Provide recommendations to the Navigation Evaluator in regards to safe navigation of the vessel. The CIC Evaluator must:

      (1) Evaluate fix accuracy and the surface picture.

      (2) Make recommendations to the navigation evaluator based on CIC's navigation plot.

      (3) Verify that the recommended course is clear of all surface contacts.

   b. <u>Navigation/Shipping Radar Operator</u>.

      (1) Provide all navigation radar data as directed by the CIC Evaluator.

      (2) Provide all shipping radar data as directed by the CIC Evaluator.

      (3) Maintain CIC's navigation plot.

   c. <u>Navigation Recorder</u>.

      (1) Log all CIC Evaluator recommendations as well as the standard fix report.

      (2) Assume responsibility from the Bearing Book Recorder for designating times of fixes when CIC has been designated as the primary navigation plot.

7. The following are recommended CIC navigation team positions for Mode III:

   a. <u>CIC Evaluator</u>. Provide recommendations to the Navigation Evaluator in regards to safe navigation of the vessel. The CIC Evaluator must:

      (1) Evaluate fix accuracy and the surface picture.

      (2) Make recommendations to the navigation evaluator based on CIC's navigation plot.

      (3) Verify that the recommended course is clear of all surface contacts.

   b. <u>Shipping Radar Operator</u>. Provides all radar data as directed by the CIC Evaluator.

   c. <u>Navigation Radar Operator</u>.

      (1) Provide all navigation radar data as directed by the CIC Evaluator.

      (2) Maintain communications with, and keep the Navigation Plotter informed of designated points available for use.

   d. <u>Navigation Plotter</u>. Maintains CIC's navigation plot.

      (1) Plot and label each fix on the chart in use.

      (2) Extend the DR at least two fix intervals.

        (3) Compute set and drift since last fix.

        (4) Identify nearest hazard to navigation.

        (5) Determine time and distance to the next course change.

        (6) Revise turn bearings.

        (7) Complete other tasks as directed by the CIC Evaluator.

    e. <u>Navigation Recorder</u>.

        (1) Logs all CIC Evaluator recommendations as well as the standard fix report.

        (2) Assumes responsibility from the Bearing Book Recorder for designating times of fixes when CIC has been designated as the primary navigation plot.

LINE HANDLING COMMANDS

This enclosure provides a list of standard line handling commands to meet the requirements of this manual.

| COMMAND	ACTION
PUT OVER/PASS (line number)	Pass the specified line to the pier and provide enough slack to allow line handlers to place the line over the bit, cleat, or bollard.
HOLD (line number)	Do not let any more line out even though the risk of parting may exist.
CHECK (line number)	Hold heavy tension on the specified line but render it as necessary to prevent parting the line.
SURGE (line number)	Hold moderate tension on a line but render it enough to permit movement of the ship.
EASE (line number)	Let a line out until it is under less tension, but not slacked.
SLACK (line number)	Take all tension off a line.
TAKE THE SLACK OUT OF (line number)	Take all the slack out of a line, but do not take a strain.
SHIFT (line number)	Move a line to the specified location.
HEAVE AROUND ON (line number)	Take a strain on a line.
TAKE (line number) TO POWER	Take the specified line to the capstan or gypsy head and make ready to heave around (DO NOT heave around until told to do so).
SINGLE UP (line number)	Take in all but one bight so there remains a single part to the line. Can also be used to single up all normal mooring lines.
DOUBLE UP (line number)	Pass an additional bight on the specified line so there are three parts to the line. This can also be used to double up all normal mooring lines. Cutters without sufficient mooring line for three parts should just pass the bitter end of the single up to the pier.
AVAST or AVAST HEAVING (line number)	Stop taking a strain on a line with capstan.
CAST OFF (line number)	When using another ship's lines to secure your ship, it means to cast off the ends of their lines.
TAKE IN (line number)	Allow the pier line handler enough slack to take the line off the fitting and bring the line aboard. Used when secured with your own line.

HELM COMMANDS

This enclosure provides a list of commonly used helm commands that units can tailor appropriately to meet the requirements of this manual. Standard phraseology governing orders to the Helmsman is required to ensure the Helmsman understands and promptly executes all orders. The Helmsman must repeat each command word-for-word and must report when the ordered action is complete. The Conning Officer/Coxswain must acknowledge the Helmsman's responses with "VERY WELL."

Helm Commands

COMMAND	ACTION
RIGHT (LEFT) STANDARD (FULL) RUDDER	Apply the ordered rudder. Standard rudder is the amount required to turn the ship on its standard tactical diameter. The rudder angle varies from ship to ship. Full rudder is normally the amount required for reduced tactical diameter.
RIGHT (LEFT) ## DEGREES RUDDER	Apply the ordered rudder. The Conn can follow this order with a new course for the Helmsman to steer, such as "STEADY ON COURSE 256" or another rudder command. If the Conn does not specify a course, the Helmsman must call out the heading at 10-degree increments, such as "PASSING 150, PASSING 160," until the Conn orders a course.
INCREASE YOUR RUDDER TO RIGHT (LEFT) ## DEGREES	Increase the rudder angle the amount specified to cause the ship to turn more rapidly. The Conn can follow this order with a new course for the Helmsman to steer or another rudder command. If the Conn does not specify a course, the Helmsman must call out the heading at 10-degree increments until the Conn orders a course.
EASE YOUR RUDDER/EASE YOUR RUDDER TO RIGHT (LEFT) ## DEGREES	Decrease the rudder angle by half the amount currently applied or by the amount ordered. The Conn can follow this order with a new course for the Helmsman to steer or another rudder command. If the Conn does not specify a course, the Helmsman must call out the heading at 10-degree increments until the Conn orders a course.
RUDDER AMIDSHIPS	Place the rudder at zero degrees.
MEET HER	Use the rudder as necessary to check the swing of the ship without steadying on any specific course.
STEADY, STEADY AS SHE GOES, STEADY ON COURSE ###	Steer the course on which the ship is currently headed or the ordered course. If the ship is turning and the Conn gives the command STEADY or STEADY AS SHE GOES, the Helmsman notes the heading and brings the ship back to the heading. The Helmsman should then reply "STEADY; COURSE ###."

COMMAND	ACTION
SHIFT YOUR RUDDER	Move the rudder to the same angle in the opposite direction from where it is currently ordered. The Conn can only give this order when a specific rudder angle is in effect.
NOTHING TO THE RIGHT (LEFT) OF COURSE ###	Steer nothing to the right (left) of the course specified.
HOW'S YOUR RUDDER	This is a query from the Conn to ascertain the current rudder placement. The Helmsman replies, "MY RUDDER IS RIGHT(LEFT) ## DEGREES."
MARK YOUR HEAD	A command to the Helmsman to state the heading of the ship at the moment the command was given. The Helmsman responds, "MARK ###."
COMMAND	The Helmsman's response to the Conn if he/she did not hear a command, misunderstood a command, or believes a command is improper.
STEER ON	The Helmsman steers on a range or object identified by the Conning Officer.
MIND YOUR HELM	A command from the Conn, CO, OOD (if separate), or the Navigator to the Helmsman to pay closer attention to his/her steering.

NAVIGATION PLOTTING SYMBOLS

1230
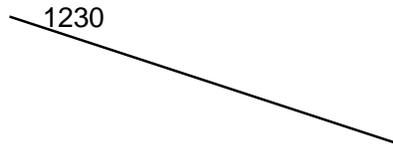
Single line of position
(Same for visual and electronic LOP)

1330

Visual fix

1440
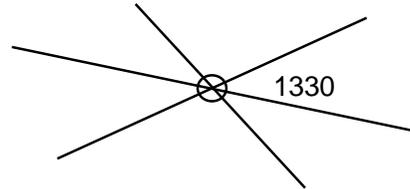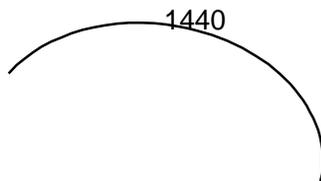
Distance arc or range

1420 - 1440
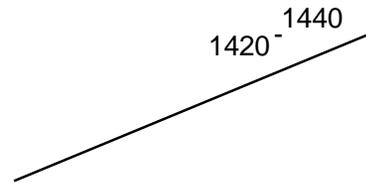
Advanced LOP
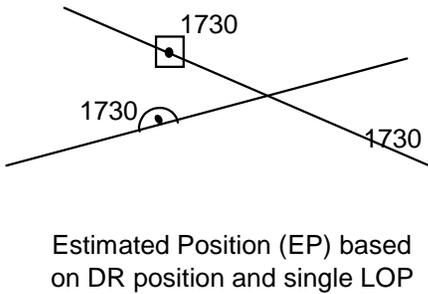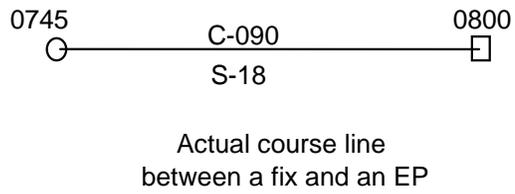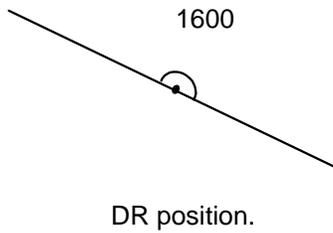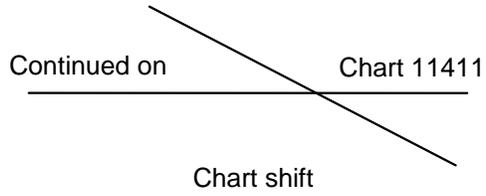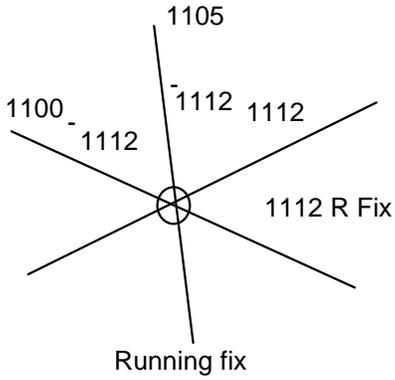Original time and time LOP advanced to

1503

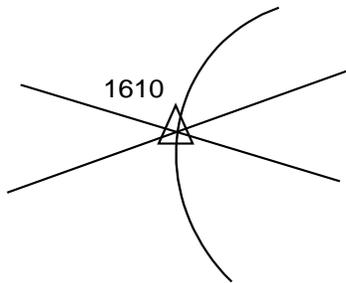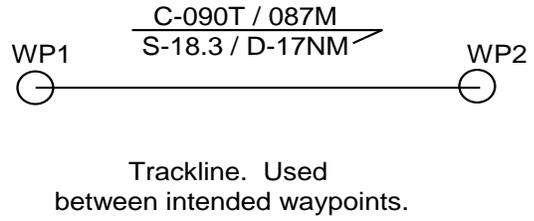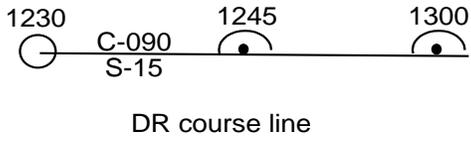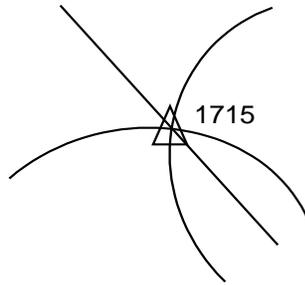Electronic fix

1524
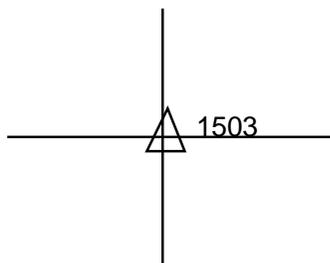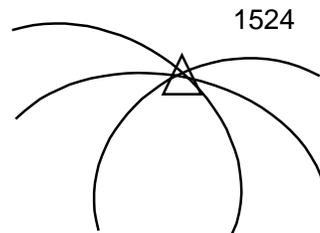
Electronic fix
using radar ranges

1

1105

1100 -1112
1112
1112

1112 R Fix

Running fix

Continued on   Chart 11411

Chart shift

1600

DR position.

0745   C-090   0800
S-18

Actual course line
between a fix and an EP

1730

1730   1730

Estimated Position (EP) based
on DR position and single LOP

1620

EP based on two LOPs.

1230   1245   1300

C-090
S-15

DR course line

WP1   C-090T / 087M   WP2
S-18.3 / D-17NM

Trackline. Used
between intended waypoints.

1610

Two visual bearings
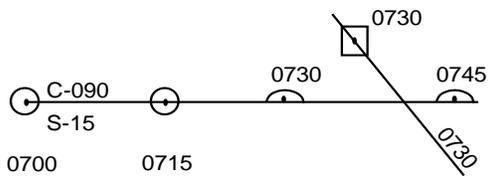and one radar range

1715

Two radar ranges
and one visual bearing.

0730

C-090   0730   0745
S-15
0700   0715   0730

0745

0800   0815
0745 R Fix   C-090
S-15
0730 - 0745
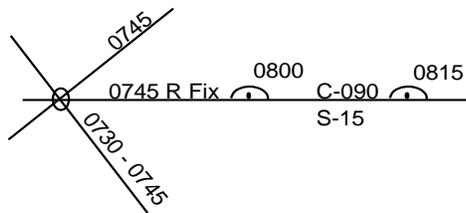
Examples of a DR course line with an EP and a DR course line with a running fix

3
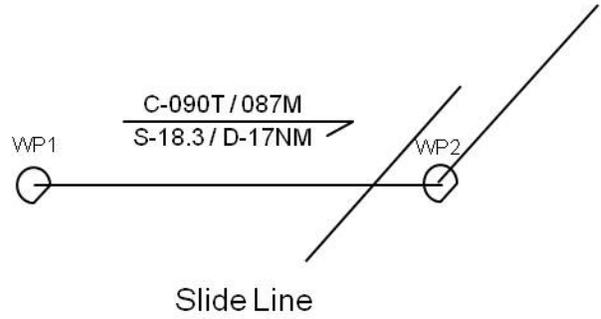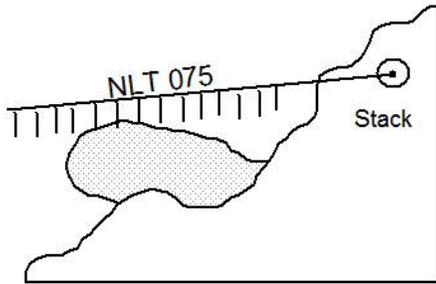
Danger bearing No Less Than 075 Deg T

Slide Line
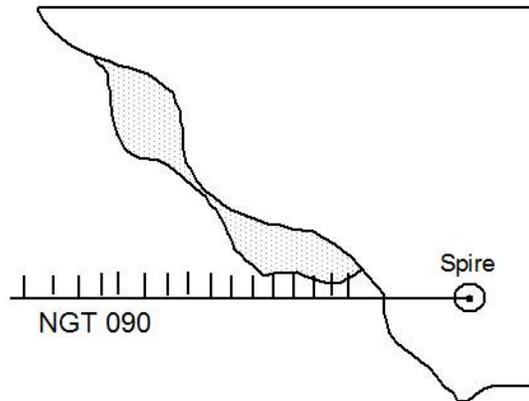
Danger bearing No Greater Than 090 Deg T

Marking of Visual and Radar Navigation Points		
Symbol	**Type of Aid**	**Highlighted Color**
⬤	Visual Object – sequentially labeled V1, V2, V3, or VA,VB, VC, etc.	Yellow
▲	Radar Object – sequentially labeled R1, R2, R3, or RA, RB, RC, etc.	Orange
◉	Used for both (visual and radar) – sequentially labeled VR1, VR2, VR3, or VRA, VRB, VRC, etc.	Yellow and Orange

GPS OUTAGE REPORTING

A. <u>General</u>. All Coast Guard GPS/NDGPS/WAAS users must adhere to the following:

B. <u>GPS and WAAS</u>. Units must report degradations, outages, and other incidents or anomalies to the Navigation Center via the GPS Problem Worksheet located at http://www.navcen.uscg.gov/?pageName=gpsUserInput.

C. <u>NDGPS</u>. Units must report degradations, outages, and other incidents or anomalies at http://www.navcen.uscg.gov/?pageName=dgpsUserInput.

D. <u>Connectivity Restricted Units</u>. Users must submit reports via priority message to COGARD NAVCEN ALEXANDRIA VA//NIS//.

   1. GPS reports must contain the following information, if available:

      a. Start time of outage/anomaly.

      b. End time of outage/anomaly.

      c. Location where the outage/anomaly occurred.

      d. GPS user equipment make/mode.

      e. Elevation of GPS antenna.

      f. GPS frequencies (L1/L2) in use at time of outage/anomaly.

      g. Number of satellites the system was tracking at time of outage/anomaly.

      h. Which satellites the system was tracking at time of outage/anomaly.

      i. Summary (provide additional information, unusual screen display indicating problem).

      j. Point of contact.

   2. NDGPS reports must contain the following information, if available:

      a. Start time of outage/anomaly.

      b. End time of outage/anomaly.

      c. Location where the outage/anomaly occurred.

      d. NDGPS user equipment make/mode.

      e. Elevation of NDGPS antenna.

    f. NDGPS beacon in use at time of outage/anomaly.

    g. Availability of standard positioning via GPS at time of outage/anomaly.

    h. Summary (provide additional information, unusual screen displays indicating problem, steps taken to troubleshoot/resolve).

    i. Point of contact.

3. WAAS reports must contain the following information, if available:

    a. Start time of outage/anomaly.

    b. End time of outage/anomaly.

    c. Location where the outage/anomaly occurred.

    d. WAAS user equipment make/mode.

    e. Elevation of WAAS-capable GPS antenna.

    f. Availability of standard positioning via GPS at time of outage/anomaly.

    g. Summary (provide additional information unusual screen displays indicating problem, steps taken to troubleshoot/resolve).

    h. Point of contact.

CUTTER LOGS AND RECORDS

A. <u>General</u>. This section, in conjunction with references (i) and (j), outlines the procedures and requirements for maintaining navigational records. This section provides guidance for the following logs and records.

1. Log-Remarks Sheet, Form CG-4380A.

2. Log-Weather Observation and Operational Summary Sheet, Form CG-4380B.

3. Log-Navigation Data Sheet, Form CG-4380C.

4. Navy Navigation Workbook, OPNAV 3530/1.

5. Standard Bearing Book, OPNAV 3530/2.

6. Ship Position Log. OPNAV 3100/3.

7. Combat Information Center (CIC) Navigation Log.

8. Captain's Night Orders.

9. Unit Checklists.

B. <u>OPNAV Logs/Workbooks.</u> The Navy Navigation Workbook, OPNAV-3530/1; Standard Bearing Book, OPNAV-3530/2; and Ship's Position Log, OPNAV-3100/3 are available through the Naval Forms Online website (https://navalforms.documentservices.dla.mil). Registration and use of a government credit card is required. Once registered, conduct a search using the name or OPNAV number.

C. <u>Permanent and Temporary Records</u>. Cutter logs and records are official records and are either permanent or temporary records.

1. <u>Permanent Records</u>. Log Remarks Sheet, Form CG-4380A and Log-Weather Observation and Operational Summary Sheet, Form CG-4380B are permanent records. Unit must retain, maintain, and permanently transfer these records to the appropriate Federal Records center in accordance with references (i) and (j).

2. <u>Temporary Records</u>. All other logs and records listed above are temporary records. Units must maintain these records locally and dispose of them in accordance with this manual and references (i) and (j).

D. <u>Electronic Logs and Records</u>.

1. Units using an eNav system as their primary means of navigation are authorized to use the system's voyage-recording feature in lieu of Log-Navigation Data Sheet, Form CG-

        4380C; Ship Position Log, OPNAV 3100/3; and Standard Bearing Book, OPNAV 3530/2 if the system records, at a minimum, the following information:

    a. Date/Time.

    b. Primary positioning source in use.

    c. Latitude/ longitude position from primary positioning system.

    d. Course over ground (COG)/ Speed over ground (SOG).

    e. True heading.

    f. Logged speed.

    g. Chart the system is using.

    h. Visual/radar objects and LOPs used (if applicable).

    i. Depth.

2. <u>Compass Checks and Deviation Tables</u>. If the cutter meets the requirements listed above, compass checks normally recorded in the Log-Navigation Data Sheet, Form CG-4380C are no longer required. These standards recommend that OODs verbally receive a compass check every half hour and on every course change. Additionally, cutters equipped with alternate heading sources are not required to post deviation tables, but they are required to ensure that the compasses and all remote repeaters are operating within the limits specified in the manufacturer's technical manuals. At a minimum, units must calibrate these compasses (in accordance with the manufacturer's instructions) annually and immediately following major maintenance availabilities. Record all calibrations in the unit's smooth log. Units should further check the compasses for accuracy before every underway period.

3. <u>Maintenance</u>.

    a. Save electronic navigation records locally on the system or on removable media, or print and maintain them locally for three years after the date of the final entry. After this period, destroy or delete them.

    b. <u>Removable media storage</u>. Units storing records on removable media must ensure the records remain readable on the currently installed system throughout the three-year period.

E. <u>Additional Guidance</u>.

1. <u>Deck Logs</u>. Maintain Log Remarks Sheet, Form CG-4380A; Log-Weather Observation and Operational Summary Sheet, Form CG-4380B; and Log-Navigation Data Sheet, Form CG-4380C in accordance with reference (j).

2. <u>Navy Navigation Workbook, OPNAV 3530/1</u>. This is a record of observations and computations for ship navigation, including celestial lines of position, tides, currents, and gyro error. In view of the large amount of data that users typically record, ships can

organize data into separate notebooks at the CO/OIC's discretion. The Navigator must review each computation and sign the workbook as appropriate. Maintain the workbook and all electronic records locally for three years after the date of the final entry, and then destroy them.

a. Computer Software. When using software for computations, units can print out and maintain the results with the navigation workbook or stored electronically in a retrievable format.

b. System to Estimate Latitude and Longitude Astronomically (STELLA). Units using STELLA software to perform celestial computations must print out the STELLA navigation log after each celestial observation and attach the printout to the workbook.

c. Strip Forms. If used, affix or record locally prepared strip forms in the workbook.

d. Calculator Use. If calculators are used, the user must record enough data in the workbook to reconstruct the computation.

3. Standard Bearing Book, OPNAV 3530/2. This is a record of data that determines the ship's position, including visual bearings, sextant angles, radar ranges, and electronic LOPs. Maintain this book per the procedures below. Maintain this log locally for three years after the date of the final entry, and then destroy it.

a. Chart Number. Each day, record the chart number in use at the top of the initial page, and note each chart shift in the first available blank line.

b. Time Zone and Date. Indicate current time zone and date.

c. Radar Ranges. Label radar ranges YD (yards) or NM (nautical miles).

d. Soundings. Record soundings with each fix, and label them FT (feet), FM (fathoms), or M (meters).

e. Bearings. All bearings are true, unless otherwise indicated by R (relative) or M (magnetic). When shifting to relative, note the shift on the first available blank line, and record the ship's heading with each fix.

f. Abbreviations. All abbreviations must be in accordance with Nautical Chart Symbols, Abbreviations, and Terms, Chart No. 1.

g. Gyro/Radar Error. Record gyro error each day at the top of the initial page. Note any revised gyro error in the first available blank line. Enter radar range error, if determined, at the top of the initial page each day.

h. Navigation Aids. Crews must maintain a list of navigation aids in the bearing book or as part of a gazetteer with lists of charted objects for all piloting charts. If maintaining a gazetteer, it must remain close to the plotting station for ready

reference. Object lists must include the chart number, proper object name, latitude and longitude, and alphanumeric designation of the object. Object lists maintained in CIC and the Bridge must be identical.

i. <u>Signature</u>. At the end of the watch or navigation detail, the bearing recorder must sign the Standard Bearing Book on the next available line.

4. <u>Ship Position Log, OPNAV 3100/3</u>. A Ship Position Log is a record of latitude and longitude positions and soundings from all positioning sources. Use this log during coastal and open ocean navigation. If using visual bearings and radar ranges to determine the cutter's position, crews can secure the Ship Position Log and use the Standard Bearing Book. Maintain this log locally for three years after the date of the final entry, and then destroy it.

5. <u>Combat Information Center (CIC) Navigation Log</u>. The CIC Navigation Log is a record of data that determines the ship's position by radar when navigating on paper charts. When in use, CIC must maintain this log in accordance with the procedures described below. Maintain this log locally for three years after the date of the final entry, and then destroy it.

a. <u>Page Labeling</u>. Enter the date, chart number, and gyro error at the top of each page. Note any revised gyro error in the log. Enter the radar range error, if determined, at the top of the initial page each day.

b. <u>Fix Recording</u>. Record the following with every fix:

(1) Identification of landmarks used.

(2) Ship's position relative to track.

(3) Recommended course and speed.

(4) Nearest shoal water.

(5) Distance to turn.

(6) Time to turn.

(7) Nearest aid to navigation.

(8) Sounding at each fix, labeled FT (feet), FM (fathoms), or M (meters).

(9) Set and drift (as required).

(10) Any pertinent remarks (e.g., Conn does/does not concur).

c. <u>Securing the Log</u>. When the navigation detail secures, make an entry on the next available line in the log. Draw a single line through the remainder of the page with the log keeper's signature on the line.

d. <u>Radar Ranges</u>. Record radar ranges in yards (YDs) or nautical miles (NM).

e. <u>Abbreviations</u>. All abbreviations must be in accordance with U.S. Chart 1, Nautical Chart Symbols and Abbreviations, unless promulgated separately in the log.

f. <u>Navigation Aids</u>. Requirements are the same as those described above in paragraph D.3.h of this enclosure.

6. <u>Captain's Night Orders</u>. Units have traditionally maintained the Captain's Night Orders Book in a bound ledger or in loose-leaf form. The CO writes and signs the orders for each night as reference (a) requires. They include such items as courses and speeds to maintain throughout the night, expected sightings, engineering data, the tactical situation, and supplementary orders to the OOD. Instead of paper orders, CO/OICs can use electronic media to convey night orders to the crew. With either option, units must institute safeguards to ensure that Deck Watch Officers and other key personnel acknowledge the orders. Classified Nightly Battle Orders or Fighting Intentions are optional and used in addition to Night Orders if the tactical situation warrants. Maintain these orders locally for three years after the date of the final entry, and then destroy them.

> *NOTE: Reference (a) requires that units keep a night order book containing standing orders and all other orders affecting the navigation and operation of the vessel.*

7. <u>Checklists</u>. Per enclosures (9) and (10), cutters must create, maintain, and complete getting underway and entering port/approaching restricted waters checklists. Maintain checklists locally for 90 days after completion of the evolution, and then destroy them.

8. <u>Record Retention</u>. Per reference (j), and regardless of any authorization contained in this Manual, do not destroy records that directly relate to the following matters until after final clearance or settlement:

a. <u>Claim</u>. An outstanding claim for or against the United States.

b. <u>Litigation</u>. A case under litigation.

c. <u>Investigation</u>. An incomplete investigation.

SAMPLE CUTTER GETTING UNDERWAY CHECKLIST

This enclosure provides a sample checklist containing common actions that units must take prior to getting underway. Units can tailor this checklist as appropriate to ensure safe navigation of the vessel.

<u>Time prior to</u>	<u>Event</u>
48 Hours	Establish getting underway schedule covering: propulsion plant light off, shift from shore to cutter power, disposal of cutter vehicles, light off and testing of electronic suite, U.S. and Guard Mail dispatch and receipt.
	Release Movement Report (MOVREP).
24 Hours	Conduct navigation brief
	Verify arrangements for tugs/pilots/line handlers.
	Verify schedule for lighting-off power plant.
	Energize gyrocompasses.
	Check navigation lights for proper operation (Preferably at night).
	Ascertain schedule of other vessel movements in harbor on underway day.
4 Hours	Energize all radars except those prohibited by local electromagnetic emissions restrictions.
	Energize and configure eNav system, if so equipped.
	Validate accuracy of alternate heading source if so equipped.
	Validate NDGPS/GPS datum.
	Reconfirm tugs/pilots/line handlers.
	Verify arrangements for terminating shore services.
	Verify removal of floats, barges, containment booms
2 Hours	Ascertain from the XO/XPO any anticipated deviations from the Plan of the Day.
	Promulgate underway time to all hands.
	Energize and initialize all electronic navigation equipment. (Coordinate with shift from shore to cutter power.)
	Energize and calibrate all radar repeaters. (Post errors at each repeater and for navigation plotters.)

	Determine and post gyro, steering, and navigation repeater errors and enter into electronic navigation system, as applicable. Check/energize all other electronic equipment (e.g., fathometer, radar, etc.).
	Conduct radio checks on all required circuits (include bridge-to-bridge radiotelephone).
1 Hour	Set Material Condition Yoke.
	Tune and optimize radars.
	Post tide/current/aids to navigation information on the bridge and CIC.
45 Minutes	Fix ship's position using all available positioning sources.
	Record draft of cutter fore and aft in cutter's deck log.
30 Minutes	Station the Special Sea Detail and Anchor Detail.
	In reduced visibility:
	1. Station the low visibility detail.
	2. Set material condition Zebra on main deck and below.
	Embark pilot. Display CODE HOTEL.
	Check steering in all available modes.
	Test sound-powered phone circuits in use.
	Receive department reports for readiness to get underway.
	Test anchor windlass.
	Prepare anchor(s) for letting go.
	OOD shift watch to the bridge.
15 Minutes	Obtain CO/OICs permission to shift to pilot house control (when equipped) and test main engine(s).
	Direct engineering control accordingly after ensuring that the screw(s) are clear.
	Test cutter's whistle/general alarms.
	Single up lines.
	Make SECURITE calls.
	Take in the brow and break all shore connections.
	Conduct time check.
	Report when "ready for getting underway" to the XO/XPO.
10 Minutes	Notify engineering control to standby to answer all bells or of impending pilothouse control maneuvers.
	Set Special Sea Detail/Mooring Stations

Underway	Shift colors
	Close up international call sign (if appropriate).
	Establish radio guard
	Make SECURITE calls.
	Report underway to VTS if appropriate.
After U/W	Return checklist to Navigator for filing.

SAMPLE CUTTER ENTERING PORT/APPROACHING RESTRICTED WATERS CHECKLIST

This enclosure provides a sample checklist containing common actions that units must take prior to Entering Port/Approaching Restricted Waters. This checklist is an example, and units can tailor it to match the circumstances of the navigational situation and to ensure safe navigation of the vessel.

Time prior to	Event
TBD by CO/OIC	Conduct navigation brief.
3 Hours	Determine and post gyro, steering, and navigation repeater errors and enter into electronic navigation system, as applicable.
1 Hour	Pass the word, "Make all preparations for entering port. Cutter will anchor (berth _____ side to) at about _____. All hands shift into the Uniform of the Day."
	Lay out mooring lines if required.
	Set up and monitor all harbor and tug radio frequencies.
	Check into VTS when appropriate.
	Ascertain schedule of other vessel movements in harbor.
45 Minutes	Test cutter's whistle/general alarms.
	Prior to approaching restricted waters, check steering in all available modes.
	Test backing bells.
	Hoist international call sign when entering inland waters (if applicable).
30 Minutes	Station Navigation Detail
	Station the Special Sea Detail and Anchor Detail.
	Make anchor(s) ready for use.
	Inform the Anchor Detail of depth of water at anchorage, type of bottom, ready anchor, and scope of chain to be used.
	Inform First Lieutenant as to range of tide and time of high water.
	Receive readiness reports for entering port.
	Make SECURITE calls.
	Request permission to enter port from the proper authority.
15 Minutes	If mooring to a buoy, lower boat with buoy detail as directed.

Station line handlers.

Upon Mooring   Secure main engines on _____ hour standby.

Secure gyros and navigational radars as directed.

Check out of VTS as appropriate.

Secure radio guard

If anchored, obtain navigation bearings and ranges, and determine swing and drag circles.

Record draft of cutter fore and aft.

Shift watch to quarterdeck.

Return checklist to Navigator for filing.

Release arrival MOVREP

ELECTRONIC AND PAPER CHART USE QUICK REFERENCE FLOW CHART
(See Chapters 3-5 of this manual for further information)

Enter

eNav system has primary positioning source and approved, currently corrected electronic chart data?

No → Navigate using currently corrected Paper Charts

Yes

eNav system has adequate back-up system and back-up positioning source?

No → Navigate with eNav system. Currently corrected Paper Charts broken out and ready for use

Yes → Navigate with eNav system. *Uncorrected* current edition Paper Charts carried onboard