



COMMANDER NAVAL AIR FORCES
NAVAL AIR STATION, NORTH ISLAND
P.O. BOX 357051
SAN DIEGO, CALIFORNIA 92135-7051
AND
COMMANDER NAVAL SURFACE FORCES
2841 RENDOVA ROAD
SAN DIEGO, CALIFORNIA 92155-5490

COMNAVAIRFOR/COMNAVSURFORINST 3530.4
Code CNAF N3/CNSF N7
26 Feb 02

COMNAVAIRFORINST/COMNAVSURFORINST 3530.4

Subj: SURFACE SHIP NAVIGATION DEPARTMENT ORGANIZATION AND
REGULATIONS MANUAL

Ref: (a) CINCLANTFLT/CINCPACFLTINST 3530.1 SURFACE SHIP AND
SUBMARINE SEAMANSHIP AND NAVIGATION
(b) OPNAVINST 9420.2 IMPLEMENTATION OF THE ELECTRONIC
CHART DISPLAY AND INFORMATION SYSTEM-NAVY (ECDIS-N)
CERTIFICATION PROCESS
(c) COMNAVSURFLANT/COMNAVSURFPACINST 3502.2E SURFACE
FORCE TRAINING MANUAL
(d) COMNAVAIRPAC/COMNAVAIRLANTINST 3500.20C CV/N TRAINING
MANUAL
(e) U.S. NAVY REGULATIONS
(f) CINCPACFLT 3140.3 (SERIES)/CINCLANTFLT 3140.9
(SERIES), CHART AND PUB ALLOWANCES

1. Purpose. To publish TYCOM navigation guidelines to be
observed by COMNAVSURFOR and COMNAVAIRFOR vessels.

2. Cancellation. COMNAVSURFLANT/COMNAVSURFPAC/COMNAVAIRPAC/
COMNAVAIRLANTINST 3530.4A.

3. Revision. Changes are extensive, and individual paragraphs
where changes have been made have not been marked. Therefore,
it is necessary to review this instruction in its entirety.
Forward recommendations for changes, additions or deletions to
your respective TYCOM.

4. Action

a. Effective upon receipt, this instruction will be used to
improve navigational accuracy. Personnel assigned

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

responsibility for navigation duties are required to read and demonstrate knowledge of the contents of this instruction before assuming these duties.

b. Commanders are advised to become thoroughly familiar with the accuracy and use of all available methods for determining navigational position.

c. Immediate Superiors in Command (ISICs) are required to conduct navigation assessments once per Inter- Deployment Training Cycle (IDTC). Consolidated and sanitized reports of common deficiencies discovered during navigation assessments shall be forwarded to the appropriate Type Commander using **Appendix A**, "ISIC Navigation Assessment Checklist." The Navigation assessment will also be reported as an exercise in TRAREPs.

d. Each Commanding Officer will tailor Chapter 2 of this instruction as necessary to conform to the ship's configuration and organization, and issue it as the ship's Navigation Bill.

(Signed)
R. A. SPICER
Deputy and
Chief of Staff
COMNAVSURFOR

(Signed)
M. E. PURCELL
Deputy and
Chief of Staff
COMNAVAIRFOR

Distribution: (COMNAVSURFLANT NOTE 5216)
21A1, 26A1, 26E1, 26DD1, 28, 29, 31, 32
COMNAVSURFRESFOR

Distribution: (COMNAVSURFPAC)
SNDL Parts 1 and 2
24E7 Commander Mine Warfare Command
26A2 Amphibious Group PAC
26V2 Landing Force Training Command PAC
26FF Mine Warfare Inspection Group
26000 Eastern Pacific Mobile Training Team
28A2 Carrier Group PAC
28B2 Cruiser-Destroyer Group PAC
28C2 Surface Group PAC
28D2 Destroyer Squadron PAC
28E2 Surface Squadron PAC
28G2 Mine Squadron and Division PAC

COMNAVAIRFORINST 3530.4/
COMNAVSURFORINST 3530.4
26 Feb 02

28I2 Craft Opportunity Mine Squadron and Unit PAC
(COOPMINERON 11 only)

28J2 Combat Logistics Group, Squadron & Support Squadron PAC

28L2 Amphibious Squadron PAC

29A2 Guided Missile Cruiser PAC (CG)

29B2 Aircraft Carrier PAC (CV) (CVN)

29C2 Coastal Patrol Boat PAC (PC)

29E2 Destroyer PAC (DD) 963 Class

29F2 Guided Missile Destroyer PAC (DDG)

29AA2 Guided Missile Frigate PAC (FFG) 7 Class

30A2 Minesweeper, Ocean (Nonmagnetic) PAC (MSO)

30C2 Mine Countermeasures PAC (MCM 1) Class and Fleet
Introduction Team

31A2 Amphibious Command Ship PAC (LCC)

31G2 Amphibious Transport Dock PAC (LPD)

31H2 Amphibious Assault Ship PAC (LHA) (LPH)

31I2 Dock Landing Ship PAC (LSD) 41 Class

31J2 USS MT VERNON (LSD 39) only

31M2 Tank Landing Ship PAC (LST)

31N2 Multi-Purpose Amphibious Assault Ship PAC (LHD)

32C2 Ammunition Ship PAC (AE)

32G2 Combat Store Ship PAC (AFS)

32H2 Fast Combat Support Ship PAC (AOE)

32N2 Oiler PAC (AO)

32Q2 Replenishment Oiler PAC (AOR)

32S2 Repair Ship PAC (AR)

32X2 Salvage Ship PAC (ARS)

32EE2 Submarine Rescue Ship PAC (ASR)

32KK Miscellaneous Command Ship (AGF) (USS CORONADO only)

32QQ2 Salvage and Rescue Ship PAC (ARS)

FT35 Amphibious School (Coronado only)

FT43 Surface Warfare Officers School Command (PCO, PXO, DH,
BASIC)

FT30 Service School Command, Great Lakes (QM "A" School)
MARINE SAFETY INTERNATIONAL INC
Marine Air Terminal La Guardia Airport
Flushing NY 11371-1061

Distribution: (COMNAVAIRLANT/COMNAVAIRPAC)

A3 Chief of Naval Operations

FDO NAVOCEANCOMFAC San Diego CA

21A1 CINCLANTFLT

21A3 CINCUSNAVEUR

22 Fleet Commanders

24A Naval Air Force Commanders

24D Surface Force Commanders

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

24E Mine Warfare Commanders
24G Submarine Force Commanders
24H Fleet Training Centers
24J Fleet Marine Force Commands
26H2 Afloat Training Group Pacific
26J Afloat Training Group Atlantic
26KKK Tactical Training Group
28A Carrier Groups
28B Cruiser Destroyer Groups
29B Aircraft Carriers
42A Fleet Air Commands
42B Functional Wing Commanders
42J Carrier Air Wings
46B Marine Aircraft Wing

TABLE OF CONTENTS

CHAPTER 1. INTRODUCTION

1. Background
2. Transition to Electronic Navigation
3. Navigation Team Organization
4. Permissive Environment
5. Hostile or Uncertain Environment
6. Training
7. Purpose

CHAPTER 2. STANDARD NAVIGATION BILL

1. General
2. Responsibility for the Bill
3. Duties and Responsibilities
4. Organization of the Navigation Team
5. Navigation Team Duties Prior to Entering Restricted Waters
6. Navigation Team Duties While in Restricted Waters
7. Navigation Practices While in the Open Ocean
8. Fathometer Readiness
9. Depths for Electronic Navigation.

CHAPTER 3. BASIC SKILLS

1. General
2. Policy
3. Definitions
4. Dead Reckoning (DR) Procedures
5. Estimated Position Procedures
6. Integrated Navigation
7. Electronic Navigation Modes

CHAPTER 4. RECORDS, LOGS, AND FORMS

1. Purpose
2. Corrections
3. Ship's Deck Log
4. Ship's Position Log
5. Navigation Workbook
6. Standard Bearing Book
7. Chart/Publication Correction Files
8. Notice to Mariners/Summary of Corrections
9. Navigational Safety Warning Messages

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

10. Magnetic Compass Record
11. Ship's Position Reports
12. Captain's Night Order Book
13. Navigation Brief
14. Surface Weather Observation Form
15. Record Keeping for ECDIS-N Systems

APPENDICES

- Appendix A. ISIC Navigation Assessment Checklist
- Appendix B. Navigation Brief
- Appendix C. Checklists for Getting Underway, Entering Port/Restricted Waters, Low Visibility, Swept Channel, and Display Information For Electronic Navigation.
- Appendix D. Standard Day's Work in Navigation
- Appendix E. Sample QMOW Turnover Checklist
- Appendix F. Navigational Safety Messages Cover Sheet
- Appendix G. Ship's Position Report
- Appendix H. Electronic Chart Display Information System-Navy (ECDIS-N) Requirements.
- Appendix I. Digital Flux Gate Magnetic Compass (DFGMC)
- Appendix J. Figure Of Merit to Estimated Position Error
- Appendix K. Navigation Training Resources

LIST OF EFFECTIVE PAGES

The following is a list of pages in effect. "0" indicates the original as printed in this edition.

| <u>PAGE</u> | <u>CHANGE NUMBER</u> | <u>PAGE</u> | <u>CHANGE NUMBER</u> |
|-------------|--------------------------|-------------|--------------------------|
| i - ix | 0 | | |
| 1-1 - 1-7 | 0 | | |
| 2-1 - 2-25 | 0 | | |
| 3-1 - 3-5 | 0 | | |
| 4-1 - 4-10 | 0 | | |
| A-1 - A-12 | 0 | | |
| B-1 - B-4 | 0 | | |
| C-1 - C-10 | 0 | | |
| D-1 - D-2 | 0 | | |
| E-1 - E-1 | 0 | | |
| F-1 - F-1 | 0 | | |
| G-1 - G-2 | 0 | | |
| H-1 - H-12 | 0 | | |
| I-1 - I-6 | 0 | | |
| J-1 - J-1 | 0 | | |
| K-1 - K-2 | 0 | | |

CHAPTER 1

INTRODUCTION

1. Background. While special significance must always be placed on piloting in restricted waters, the advent of Over-the-Horizon Targeting (OTH-T), increasing use of Direct Support (DS) operations, and routine rendezvousing under EMCON conditions have caused increasing emphasis to be placed on precision open ocean navigation. Complex tactical operations that combine surface forces with submarines and long-range aircraft now demand accurate navigation not previously required. Studies have shown that navigation accuracy can be adversely affected by a number of factors, including:

- a. Accumulation of errors in information flow.
- b. Lack of proper emphasis on navigation accuracy.
- c. Improper determination of set and drift and failure to properly apply set and drift to Dead Reckoned positions.
- d. Improperly calibrated electromagnetic (EM) log and inaccurate or improper azimuth reference.
- e. Lack of user knowledge regarding the capabilities and limitations of Global Positioning System (GPS) positional data.

In light of a greater demand for navigational accuracy both in open ocean and restricted waters, it is essential to stress proper training of Navigation Team personnel and strong management of the navigation picture. This instruction was developed and implemented by Type Commanders from both coasts to provide uniform standards and comprehensive instruction to achieve these ends.

2. Transition to Electronic Navigation. To assist and facilitate the Navy's need for highly accurate real time navigation, the CNO and the Navigator of the Navy have directed the implementation of the Electronic Chart Display and Information System - Navy (ECDIS-N). Reference (b) contains specifics to support the transition of primary support for navigation and piloting from "paper" systems to an electronic environment.

- a. ECDIS-N is part of an extensive change in navigation

where vessels are navigated based on real time positional data.

b. This change in navigation will happen in three phases. During the first phase, conventional navigation as it is currently written within this document is still required. The second phase is transitional; current approved methods of navigation are still required, but electronic systems will also be used, tested, and validated by all commands. The third phase is a complete transition to ECDIS-N where ships will train towards and become certified in the use electronic navigation systems.

3. Navigation Team Organization. The Navigator must organize the Navigation Team so it is flexible enough to meet the demands and complexities of the ship's missions. Chapter Two provides a standard navigation bill, which will be tailored for each ship, to delineate duties and responsibilities. While the navigation detail is manned, navigation personnel will NOT abandon/leave their assigned duties without being properly relieved.

4. Peacetime Environment. The Navigator and/or designated Navigation Team Members will advise the CO and OOD of the ship's movements and of best courses to steer. The Navigator shall be responsible for oversight, operation, and coordination of maintenance of the ship's navigational equipment.

a. The Navigator receives aid from many personnel whose duties and expertise support his/her responsibilities. Quartermasters support the Navigator by maintaining the DR and Ship's Deck Log and by determining fixes or estimating the ship's position. The OOD supports the Navigator by reporting radar and visual navigation landmark sightings. The Quartermaster of the Watch is a vital assistant to the OOD, who must take an active role in making sure the ship is properly and safely navigated at all times. The Combat Information Center (CIC)/Combat Direction Center (CDC) Navigation Team provides radar bearings and ranges to known points and tracks ships and other hazards which might endanger the ship. The CICWO/CDCWO maintains an independent DR and track plot to support the bridge navigation efforts and must be prepared to assume primary plot as situations demand. CIC/CDC will maintain an effective exchange of information with the bridge and the navigation watch in order to reduce or prevent errors from occurring and aid in resolving potential differences.

b. The Navigator draws navigation data from all available

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

sources to determine the ship's position and its relationship to hazards to navigation. He/she, or personnel under his/her purview, provides the CO and OOD with ship's position and recommends courses and speeds. The Navigation Team must strive to determine navigation data that is as accurate as possible.

c. The checklist provided in **Appendix E**, "Sample QMOW Turnover Checklist," is a guide for properly turning over a watch and for maintaining standards of accuracy. All oncoming and offgoing QMOWs will use this guide or a similar checklist.

d. For the purposes of this instruction, a GPS fix shall be defined as a position reported by a Joint Program Office approved Global Positioning System receiver such as the AN/WRN-6, AN-PSN 11 PLGR, or Navigation Sensor System Interface (NAVSSI) Block III Build IV (or Block IV) GPS card. Commercial GPS receiver positions shall not be used to determine ship's position without written permission from the Commanding Officer per that ship's Navigation Bill. **Appendix H**, "Electronic Chart Display Information System-Navy (ECDIS-N) Requirements," details procedural requirements for use of electronic navigation equipment.

5. Hostile or Uncertain Environment. The Navigation Team is faced with additional duties when higher conditions of readiness are required. The Navigation Team must provide the CO and Tactical Action Officer (TAO) with timely geodetic positioning data. This data may be required to position the ship, acquire targets and employ all required weapons and tactics while fighting the ship. Numerous exercises have shown that position data supplied automatically to NTDS from inertial and navigation integrator devices result in the most geodetically accurate data links. However, the Navigator must constantly compare automatically supplied data to fix information obtained from all other sources, including other ships in company, and take action to override automatic data determined to be less accurate than his/her Navigation Team's position information. The ship's Battle Bill will describe procedures to ensure the Navigator's role in tactical situations is clearly defined.

a. In a tactical situation for ships not equipped with automatic GPS data feed to CIC/CDC, the Navigation Team becomes the TAO's primary source of geodetic data for the tactical plot. He/she receives inputs from all available sources to aid in determining the ship's position. He/she delivers this data to the TAO for display and/or input into the NTDS/ACDS. He/she communicates with the TAO to accommodate changes in the TAO's

requirements for accuracy and precision and provides for the detection and correction of errors.

b. A necessary ingredient in the maintenance of accurate navigation throughout the entire combat system is the detection and correction of errors. This can be accomplished by the following:

(1) The Navigation Team will use all available navigation systems and technologies in determining a fix.

(2) The users of navigation information should continuously compare data for accuracy and provide feedback as necessary.

6. Training. Maintaining the ship's position within the normally accepted accuracy standards found in Chapter 2, Table 2-A, demands an aggressive training program for all personnel involved in the ship's navigation. Electronic navigation and data systems can provide precise fix accuracy. However, a thorough understanding of principles of operation and use of various equipment is mandatory. Furthermore, basic conventional navigation skills, including celestial navigation and plotting accuracy, must be maintained through training and practice. Individual unit training programs must provide for accurate assessment and training necessary to educate, qualify, evaluate and periodically re-qualify assigned personnel. **Appendix K**, "Navigation Training Resources," details some of the resources available to assist Navigators and Training Officers in developing a training curriculum.

a. Watch Qualification

(1) Navigator. On all ships designated for command by officers in the rank of Lieutenant Commander or junior, the Executive Officer will be assigned in writing to duties as Navigator. Minimum qualifications of the Navigator will be:

(a) For NAVSURFPAC/NAVSURFLANT ships:

1. Qualified OOD underway (If BUPERS assigned, must complete OOD qualifications within 6 months of reporting).

2. Completed Navigator/Senior QM Refresher course (K-2G-2207).

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

3. Completed Celestial Refresher Course (K-2G-0603).
4. Completed ECDIS-N Navigation Operator Course (A-061-0030).
5. Completed Navigator/Assistant Navigator PQS (NAVEDTRA 43492-2).
6. If installed, NAVSTAR GPS AN/WRN-6 Operation STEP CD-ROM Course (NAVEDTRA A-102-0047).

(b) For NAVAIRPAC/NAVAIRLANT (NON-11XX) (also applies to Assistant Navigator):

1. BUPERS-assigned.
2. Conning Officer qualified.
3. Completed Navigator/Senior QM Refresher course (K-2G-2207).
4. Completed Celestial Navigation Refresher course (K-2G-0603).
5. Completed ECDIS-N Navigation Operator Course (A-061-0030).
6. Completed Tactics and Maneuvering Fundamentals course (K-2G-2208).
7. Completed Advanced Shiphandling (MSI-Marine Safety International) course.
8. Completed Navigator/Assistant Navigator PQS (NAVEDTRA 43492-2).

(c) Requests for waivers for any of the above requirements will be considered on a case-by-case basis and will be addressed to ship's Type Commander via the chain of command.

(2) The Senior Quartermaster will complete the following:

- (a) Navigator/Senior QM Refresher course (K-2G-2207).

(b) Celestial Navigation Refresher course (K-2G-0603).

(c) ECDIS-N Navigation Operator Course (A-061-0030).

(d) Assistant Navigator PQS qualifications as listed in NAVEDTRA 43492-2.

(e) If installed, NAVSTAR GPS AN/WRN-6 Operation STEP CD-ROM Course (NAVEDTRA A-102-0047).

(3) CIC/CDC Radar Navigation and Bridge Teams will complete Radar Navigation Team Refresher Course (J-221-0344). Navigator, CICO, RADNAV Officer, and Piloting Officer are required to attend. Piloting Officers and Display Operators will complete ECDIS-N Navigation Operator Course (A-061-0030).

(4) Each Navigation Team Member will have completed or be interim qualified (in writing) in the applicable PQS for assignment to watch stations.

(5) ECDIS-N Display Operators will have completed or be interim qualified in the applicable JQR for assignment to watch stations.

(6) Two Maintenance Technicians (per ship) will have completed Information Systems Maintenance Technician COI (A-150-2300).

(7) Helm Safety Officers will complete the required NAVEDTRA 43492-2, Watch Station PQS - (Helm/After Steering Helm Safety Officer).

(8) Watch station qualification will provide for a formal method to ensure minimum standards of knowledge are demonstrated for each watch station as detailed in the OPNAV PQS Managers Guide and type commander instructions. Qualification books specify areas to be knowledgeable in and require signatures of appropriately designated persons who will certify that minimum standards have been met for a specific area. The final qualification will include an oral and/or written examination and practical demonstration of skills, which are certified by the Commanding Officer or his/her designated representative.

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

(9) Watch station requalification will be required to ensure all qualified watch standers are maintaining an adequate level of knowledge. Requalification for a watch station, according to the *PQS Manager's Guide* (NAVEDTRA 43100-1(Series)), will be required when changes in procedures, equipment, or watch stander performance demand re-qualification in the judgment of the Senior Watch Officer, Navigator, or Commanding Officer.

7. Purpose. This document provides uniform navigation standards for Atlantic and Pacific Surface/Air Type Commanders and comprehensive instruction to achieve and maintain those standards. Organizational relationships, operational procedures, and required basic skills are discussed in depth. Minimum standards are established, and an extensive navigation bill is provided.

CHAPTER 2

STANDARD NAVIGATION BILL

Ref: (a) OPNAVINST 3120.32C SORM
(b) U.S. Navy Regulations
(c) CNSL/CNSP C3516

1. General. This chapter contains sections of a standard navigation bill that will be tailored for use by the ship's Navigation Team. It contains minimum standards to serve as the foundation for development of a ship's Navigation Bill.

2. Responsibility for the Bill. The Navigator is responsible for maintaining this bill.

3. Duties and Responsibilities. With respect to navigation, the following duties and responsibilities exist as stated in references (a) and (b), and as amplified below:

a. Commanding Officer. The Commanding Officer is responsible for safe navigation of the ship. As stated in reference (a), "**The presence of a pilot on board will not relieve the Commanding Officer or any subordinate from his or her responsibility for the proper performance of the duties with which he or she may be charged concerning the navigation and handling of the ship.**" Commanding Officers must be especially dutiful while operating in foreign waters to maintain the safety of the ship when evaluating the recommendations of an embarked pilot, especially when the pilot recommends deviating from the planned track to avoid shipping. Pilots, as advisors to the Commanding Officer and the Navigation Team, should be familiarized with ship's characteristics and planned navigation track prior to beginning the proposed transit. Items for discussion should include:

(1) Maneuvering characteristics of the ship and lowest depth projection.

(2) Allowable deviation from track.

(3) Unpublished hazards to navigation.

(4) Bridge-to-Bridge radio communications.

(5) Ship-specific piloting and conning procedures.

(6) Use of tugs.

(7) Material casualties that may affect maneuverability of the ship.

(8) Material condition of ship (oil leaks, steering system, etc.).

(9) Safe speed for all legs of proposed transit.

(10) Status of ECDIS-N system and correction status of electronic charts.

b. Executive Officer. The Executive Officer, next to the Commanding Officer, is the most experienced officer aboard with respect to navigation and safe shiphandling. The Executive Officer will be readily available to assist the Commanding Officer and Navigator during all restricted water transits and shall not be assigned to a specific watchstation so that he/she is free to supervise all aspects of the transit. Additionally, the Executive Officer will review the navigation brief, charts, and route plans in ECDIS-N for completeness as outlined in **Appendix B**, "Navigation Brief."

c. Navigator. The Navigator is responsible, under the Commanding Officer, for the safe navigation of the ship. The Navigator will receive all orders relating to his/her navigational duties directly from the Commanding Officer and will make all reports in connection therewith directly to the Commanding Officer. Additional duties of the Navigator include:

(1) Advising the Commanding Officer and Officer of the Deck as to the ship's movements and, if the ship is running into danger, a safe course to be steered. To this end, he/she will:

(a) Maintain or cause to be maintained an accurate plot of the ship's position by all available means, including celestial, visual, radar, and electronic and other appropriate means. **No single source of navigation information will be used to the exclusion of others.**

(b) Establish a close liaison between CIC/CDC and the Bridge for comparison of navigation information.

(c) Ensure the Navigation Team obtains the ship's position by all available means before getting underway. Fixes

from various sources will be compared to determine fix error. In addition, fix data from the paper plot will be compared to the Electronic Navigation System fix to determine error. When error is considered excessive per Commanding Officer's Standing Orders, the Navigator will investigate and resolve the problem. Conditions permitting, the same procedure will be employed before entering restricted waters.

(d) Notify the Commanding Officer, Officer of the Deck, Conning Officer, and Executive Officer immediately when the determination is made that the ship is standing into danger. Ensure this report is acknowledged, and make course and speed recommendations to prevent the ship from entering dangerous waters. Record recommendations in the Ship's Deck Log. Use of ECDIS-N alerts and recommendations are encouraged but should be compared to information on the paper plot and any visual references.

(e) Give careful attention to the ship's course and speed and available depth of water when approaching land or shoals.

(f) Maintain records of all observations and computations made for navigating the ship, with results and dates included. Such records will form a part of the ship's official records.

(g) Report in writing to the Commanding Officer, with copy to embarked staff, when underway, the ship's position at 0800, 1200, and 2000 each day and at such other times as the Commanding Officer may require.

(h) Procure and maintain all navigational charts, including Digital Nautical Charts (DNCs), and publications as directed by the Commanding Officer and higher authority. A DNC is a vector-based digital database containing selected maritime features suitable for marine navigation. It is a relational database based upon the Vector Product Format (VPF) data structure. VPF is a standard format, whose structure, and organization for large geographic databases is based on a georelational data model and intended for direct read access in ECDIS-N systems.

(i) Establish adequate inventory control procedures to ensure required navigation charts, Digital Nautical Charts, and publications are stocked on board in accordance with

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

CINCPACFLT 3140.3 (Series)/CINCLANTFLT 3140.9 (Series) allowances and that all material is properly maintained and stowed for deployment. Inventory checks must include Paper as well as Digital Nautical Charts (DNCs).

(j) Review chart requirements (including DNCs) and allowances annually, and provide any requests for new products or changes to unit allowances to the TYCOM via the chain of command.

(k) Recommend to the Commanding Officer which ready charts (including DNCs) and publications are to be kept continuously up to date.

(l) Ensure records of corrections affecting such charts (including DNCs) and publications are maintained.

(m) Ensure those corrections to operational charts (including DNCs) and publications are made prior to use, according to directions published in the National Imagery and Mapping Agency (NIMA) Notice To Mariners.

(n) Personally supervise navigation of the ship when the ship is in restricted waters and when at battle stations, unless specifically designated by the Commanding Officer to stand another watch. In this case, another officer qualified to serve as Navigator will be directed in writing by the Commanding Officer to perform these duties.

(o) Before entering restricted waters, study all available sources of information concerning navigation of the ship therein.

(p) Prior to anchoring, ensure the appropriate chart and electronic display showing the ship's anchorage position and all navigation aids to be used are identified to the Officer of the Deck and CIC Piloting Officer. Once the Navigator has made the determination that the anchor is holding, plot swing and drag circles and establish fix intervals according to ship's Navigation Bill. Ensure comparison with CIC/CDC swing and drag circles.

(q) Prepare the Commanding Officer's Night Orders in such a format as prescribed by the Commanding Officer. At a minimum, include operating areas, night steaming instructions, aids to navigation, and fix interval (if other than prescribed

in the standing orders).

(r) For nuclear-powered ships, verify the ship will moor or anchor at an approved berth or anchorage according to OPNAVINST C3000.8 (Series).

(2) Ensuring proper operation, care and maintenance of navigational equipment. To this end, he/she will:

(a) Establish the requirement to conduct and record underway gyro comparisons (Gyro error) once daily and before restricted maneuvering situations. Log and report the results to the Commanding Officer. He/she will direct frequent comparisons of the Inertial Navigation System (INS), master gyro, auxiliary gyro and magnetic compass to be made and recorded.

(b) Adjust and compensate the magnetic compass per required PMS and prepare a table of deviations, making sure that copies are posted at the appropriate conning and plotting stations. Ships using digital magnetic compasses (flux gate) are not required to post deviation tables but are required to ensure that digital electronic compasses and all remote repeaters are operating within limits specified in appropriate technical manuals. During restricted water transit, the "ADJUST" switch of the FLUX GATE compass will be turned off, and heading displays will ONLY be MAGNETIC COMPASS HEADINGS (see **Appendix I**, "Digital Flux Gate Magnetic Compass (DFGMC)").

(c) Ensure the ship's clocks/chronometers are properly maintained and set. Ensure time checks are passed throughout the ship before any special evolution and logged in the Ship's Deck Log.

(d) Ensure the commencement and completion of the Special Navigation Evolution Checklist (i.e., Underway/Entering Port, Low Visibility, Replenishment at Sea, etc.) and log the commencement and completion of all checklists in the Ship's Deck Log.

(e) Ensure electronic navigation equipment assigned to him/her is kept in proper adjustment and if appropriate, that calibration curves or tables are maintained and checked at prescribed intervals. Any degradation to Navigation Systems will be reported to the Commanding Officer.

(f) Train and practice alternative methods of

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

determining compass error. NAVPUB 9 "Bowditch" explains numerous methods of determining compass error.

(3) Advise the Commanding Officer, OOD/Conning Officer, and CIC/CDC Watch Team of expected effects on the ship's maneuvering characteristics caused by casualties to the main propulsion or steering systems.

(4) Ensure the preparation and timely submission of the Deck Log. The Navigator will daily, and more often when necessary, inspect the Deck Log and take such corrective actions as may be necessary and within his/her authority.

(5) Ensure the preparation of such reports and records as are required in connection with his/her navigational duties, including those pertaining to the compasses, hydrography, oceanography, meteorology, and electronic navigation systems.

(6) Ensure the conduct of required navigational training for all required personnel, such as junior officers, boat coxswains and boat officers.

(7) Relieve the Officer of the Deck, as authorized or directed by the Commanding Officer.

(8) Report to the Commanding Officer in all matters about the navigation of the ship and to the Executive Officer in matters concerning the administration of the navigation department and the training of deck and watch officers. (He/she may report to the Senior Watch Officer for the training of deck and watch officers in navigation).

d. The Assistant Navigator. The Assistant Navigator will assist the Navigator in all aspects of navigation, piloting, and administration of the navigation department. He/she will ensure proper preparation of the various reports required by higher authority.

4. Organization of the Navigation Team. In addition to the Commanding Officer, Executive Officer, and Navigator, there are other key crew members responsible for safe navigation. Listed below are the duties and responsibilities of these other key members of the Navigation Team.

a. Navigation Team (Bridge)

(1) Navigation Evaluator. Maintains an accurate plot of ship's position by **visual and electronic** means. If not the Navigator, this person is responsible to the Navigator for evaluating fix accuracy (paper and electronic) from bridge and CIC/CDC and making fix reports as specified in this instruction. He/she supervises and coordinates the actions of all bridge Navigation Team members. This individual must have completed qualifications as prescribed for the Senior QM in chapter one. If the Navigator is not the Navigation Evaluator, the Senior Quartermaster should man this watch. The Navigation Evaluator shall have no additional duties during sea and anchor detail.

(2) Navigation Plotter. Maintains the navigation plot. He/she will plot and label each fix on the chart in use. He/she will extend the dead reckoning (DR) at least two fix intervals, compute or relay set and drift since last fix, and evaluate ship's projected movements. He/she will make recommendations to the Navigator/Navigation Evaluator. He/she will compute or relay such items as time and distance to the next course change, revised turn bearings, and any other tasks directed by the Navigator/Navigation Evaluator. The Navigation Plotter will plot and compare GPS fix data as frequently as possible and not to exceed every third fix.

(3) Display Operator. Maintains the ECDIS-N display. May be assigned other duties in the piloting party at the discretion of the Navigator, provided he/she is able to maintain an adequate ECDIS-N display. This watch may be combined with the Nav Radar Operator watchstation as required.

(4) Bearing Recorder. Acts as the Navigator's talker on the designated sound-powered or internal telephone circuit, relays information received to the Navigator, maintains the Standard Bearing Book (OPNAV Form 3530/3) according to current directives, and may give "marks" to the bearing takers, as directed by the Navigator/Navigation Evaluator. In addition, the Bearing Recorder will log GPS data and the Figure Of Merit (FOM) at every mark in the Bearing Book and/or Position Record Book. He/she will also report the FOM to the Navigator.

(5) Bearing Takers. Obtain accurate bearings to navigation aids designated by the Navigator. Advise the Navigator about navigation aids available for use, including the gaining and losing of navigation aids from sight. They will keep the aids in sight between shots. Additionally, they will know the location and use of pelorus benchmarks.

26 Feb 02

(6) Leadsman. A leadline shall be available when in restricted waters. If used, leadsman soundings will be sent over the maneuvering and docking circuit to the bridge. The Captain and the Officer of the Deck, as well as the Navigator, desire this information.

(7) Navigation Radar Operator. Provide all radar data as directed by the Navigator, Navigation Evaluator, and/or Display Operator.

(8) Fathometer Operator. Operates the Fathometer on a scale designated by the Navigator. Advises the Navigator whenever the scale is shifted and reports soundings to the Bearing Recorder. The minimum sounding expected should be known and reported if reached. The Navigator must be advised if difficulty is experienced obtaining a sounding. The Bearing Recorder may carry out this function on ships where a remote Fathometer readout is installed at the navigation station.

(9) Quartermaster of the Watch (QMOW). Maintains the Ship's Deck Log, Magnetic Compass Record, and weather observation sheet. Ensures all ordered courses and speeds, as well as recommendations to the Commanding Officer, Officer of the Deck, and Conning Officer, are dutifully recorded in the Ship's Deck Log.

b. Navigation Team (CIC/CDC)

(1) Piloting Officer. Maintains an accurate plot of the ship's position by **radar and electronic** means. Evaluates fix accuracy. Compares paper chart fix data to electronic chart fix data. Maintains direct communications with Bridge Phone Talker and Shipping Officer. Supervises and coordinates the actions of all CIC/CDC Navigation Team members. Keeps the Shipping Officer advised of impending course and speed changes in order to determine which contacts should be prioritized.

(a) Ensures the CIC/CDC Team obtains ship's position. Fixes from various sources will be compared to determine fix error. When error is considered excessive per the Commanding Officer's Standing Orders, the Piloting Officer will recommend all stop until the problem is resolved.

(b) Gives careful attention to ship's course and speed, and available depth of water when approaching land or shoal water.

(c) Ensures the following information is logged and passed to the Bridge Navigation Team:

1. Fix time.
2. Fix quality: Excellent, Good, Fair, or EP.
3. Fix method, if other than radar.
4. Fix position in relation to proposed track.
5. Nearest hazard to navigation (ship, shoal, or land).
6. Nearest aid to navigation.
7. Fathometer reading.
8. Distance/time to next turn (consider restrictions on the ship's maneuvering characteristics).
9. Course to next turn (report each leg and update as changes occur).
10. Any recommendation to regain/maintain proposed track.
11. Set/drift (once on each leg when less than 1000 yds and every third fix on legs greater than 1000 yds).

(2) Shipping Officer. Maintains direct communications with Piloting Officer and Bridge Phone Talker. Responsible for providing the evaluated surface display to the Conning Officer. Supervises and coordinates the CIC/CDC Radar Detection Team and the Lookouts. He/she will recommend proper actions to be taken according to the Rules of the Road. Additionally, ensures a record of all surface contacts encountered are logged and/or recorded.

(3) Display Operator. Maintains the ECDIS-N display. May be assigned other duties in the piloting party at the discretion of the Piloting Officer, provided he/she is able to maintain an adequate ECDIS-N display.

(4) Navigation Radar Operator. Provides all radar ranges as directed by the Navigation Plotter, Piloting Officer,

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

Shipping Officer, and/or Display Operator. Maintains communications with the Navigation Plotter, keeping him/her informed of designated points available for use.

(5) Navigation Plotter. Maintains CIC/CDC's navigation plot. He/she will plot and label each fix on the chart in use. He/she will ensure the DR is extended at least two fix intervals, compute and/or relay set and drift since last fix, and evaluate ship's projected movements. He/she will compute and/or relay such items as time and distance to the next course change, revised turning ranges, and any other tasks directed by the Piloting Officer. He/she will make recommendations to the Piloting Officer. Paper and electronic chart plots will be maintained.

(6) Navigation Recorder. Performs as a phone talker and monitors the Bridge Bearing Recorder and Fathometer Operator. Calls the "mark" for CIC/CDC Plotting Team and maintains the CIC/CDC Navigation Log to coincide with bridge Bearing Recorder "mark."

(7) Bridge CIC/CDC Phone Talker. Provides smooth flow of navigation information to Navigator, CIC/CDC Piloting Officer, and Shipping Officer. Ensures reports and recommendations from the Piloting Officer and Shipping Officer are received and acknowledged by the Navigator and that the stated intentions of the Commanding Officer, Navigator, Officer of the Deck, and Conning Officer are reported to and acknowledged by the Piloting Officer. As manning permits, the Bridge CIC/CDC Phone Talker should be manned by an OS who is experienced in all aspects of restricted water transiting and piloting.

5. Navigation Team Duties Prior to Entering Restricted Waters
Employ the following procedures before entering restricted waters:

a. The Navigator is charged with preparing a Navigation Brief as a plan for safe and prudent passage, including piloting. This plan will be reviewed and approved by the Commanding Officer. Keep the approved plan on file as required, but no less than six months. In preparing this plan, use **Appendix B** and consider the following:

(1) Consult Sailing Directions, Coast Pilots, Fleet Guides, Port Directories, Available Port Visit After-Action

Reports, and other navigational publications as appropriate. All references must be current editions and corrected to date.

(2) Charts (paper and DNC) to be used are corrected/updated using all available information and all area charts are compared to ensure that hazards to navigation are properly displayed and highlighted on all charts in use. When applicable, navigation charts will be selected from the optimum scale chart available. In the event the Navigator determines the largest-scale chart obtainable from the National Imaging and Mapping Agency (NIMA) is insufficient for use during the transit, he/she should take action as early as possible to obtain NIMA-sanctioned foreign-produced charts by forwarding a request up the chain of command. In the event a ship is unexpectedly tasked to pilot in waters not covered by sufficiently large-scale NIMA charts, Navigators must make every effort to obtain corrections via immediate message (or VDU: VPF Database Update) from NIMA for the chart being used. Navigators must also determine the datum, scale, units of measurement, and other pertinent characteristics of the chart prior to its use and take appropriate action to ensure the chart is safely and properly used.

(a) **Verify the geodetic system on which the chart is based and ensure GPS data is referenced to the correct datum.** The DoD standard datum - and the one to which GPS defaults - is WGS-84. For paper charts not developed on the WGS-84 datum, consult the chart and the GPS User's Manual to ensure appropriate adjustments are made to the position received in order to guarantee this position will plot accurately on the chart and display.

(b) Digital Nautical Charts are based on the WGS-84 datum. DNCs are the preferred chart for use in ECDIS-N systems.

(c) Electronic Navigational Charts (ENCs) (IHO S-57 format) may be used under the following conditions:

1. When DNCs are not available for a specific geographic area, or
2. When DNCs for the area are more than 90 days out of date, or
3. When required by joint operations governed by Warship ECDIS (WECDIS).

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

(3) The ship's proposed track and navigation information are identical on all charts and displays used for navigation, including those used by the CIC/CDC navigation team. On all tracks, the following items should be accurately plotted or indicated:

(a) The course (true and magnetic), speed, distance of each track leg, and distances remaining to turns.

(b) Danger bearings and ranges to navigation hazards not identified by navigation aids.

(c) Turn bearings in true and relative, turn ranges (in yards), and slide bars will be plotted allowing for the ship's advance and transfer tactical data on paper charts. ECDIS-N systems will utilize turnpoints to display the position (turnpoint) at which own ship should execute a turn maneuver in order to maintain (or gain) the trackline.

(d) A notation for each turn stating "Turn based on ____ knots and ____ rudder" combination.

(e) Bridge and CIC/CDC will indicate chart shift points (on paper charts) so both are not shifted at the same time and so they do not require shifting during, or at the time of, an impending turn. The Bridge or CIC/CDC will have a good fix plotted before the next station shifts charts.

(f) An extended range scale will be placed on paper charts to facilitate laying of radar ranges or distances.

(4) Restricted water track charts will be reviewed independently by the Senior Quartermaster and Senior Operations Specialist (or Piloting Officer) for accuracy and correctness and provided to the Navigator for review and submission to the Commanding Officer for approval. For ECDIS-N systems, the Commanding Officer will approve the ship's navigation route plan.

(5) Sound signal characteristics of all navigational aids will be determined and their specific characteristics labeled next to each NAVAID the ship will pass, if not already printed on the chart or shown on the ECDIS-N display.

(6) Restricted water track charts (paper and DNC) are annotated for shoal water, points of hazards, or dangers;

including overhead obstructions, with danger bearings or ranges laid out for hazards (which are not identified by a navigational aid).

(7) Indicate position along the track where the PIT SWORD will be raised and/or lowered.

(8) Determine, with concurrence of the Commanding Officer, when the Engineering Restricted Maneuvering Doctrine will be initiated.

(9) Charts (Paper and DNC) will be reviewed, signed, and dated, prior to initial use. All subsequent changes will be addressed in the Navigation brief. At a minimum, the following information will appear on the outside of every folded paper chart displaying a restricted water track and as a memorandum from the Navigator to the CO for Digital Nautical Charts:

_____ Prepared by:
_____ Reviewed by:
_____ Submitted by: (NAV)
_____ Approved by: (CO)

(10) Tide and currents will be determined for each reference station passed. Sub-stations along the track should be used where tides and currents are critical to the shiphandler. However, the number of sub-stations will be determined by the Navigator and will be marked on the charts.

(a) Graph tides using the "Quarter Tenth" method as described in the Tide tables. Graph currents using the "Straight Line" method based on slack, high, and low water ratios. Record all tide and current computations in the Navigation Workbook. Post all graphs at all ship control stations as described in Appendix B. The Commanding Officer may authorize a computer program for computing tides and currents. A copy of such graphs will be maintained for six months.

(11) In every instance, the Navigator will brief all members of ship control stations before getting underway or entering port and restricted waters transits. This briefing will conform to Appendix B and shall be conducted no more than 24 hours prior to the planned evolution.

b. The Navigator will ensure that the following are accomplished:

26 Feb 02

(1) All navigation equipment is on board, calibrated, and operating properly and that navigation pre-underway or entering port checks are completed according to the ship's standard operating procedures, navigation department check-off lists, and individual equipment operating procedures. He/she will also review the status of equipment pertaining to the safe navigation and operation of the ship. The appropriate department head will provide Estimated Time of Repair (ETR).

(2) Gyro error is to be determined frequently, at least daily underway. Master gyro and repeater errors are determined before getting underway or entering restricted waters and are checked against available navigational ranges. Changes to gyro error are entered in Bearing Record Books and the Magnetic Compass Record Book and applied to all fixes by the Navigation Plotter. Gyro error and repeater error must also be updated on all repeater placards.

6. Navigation Team Duties While in Restricted Waters. Employ the following procedures while underway in restricted waters:

a. The Navigator's plot is designated as the primary navigation plot. If ECDIS-N is installed, an electronic plot will be maintained in addition to a paper plot. The electronic plot will serve as a supplement to the paper plot and will ensure watchstanders become familiar with electronic plotting techniques. Navigation information maintained in CIC/CDC, designated as the secondary navigation plot, will supplement the Navigator's plot. The Commanding Officer may authorize a shift in the location of the primary plot to suit a particular situation. The Navigation Team should adhere, in so far as possible, to the following fundamental piloting principle: an optimum balance between accuracy and speed must be achieved while piloting. When operating in close proximity to shoals or hazards; accurate, present, and projected ship position information is required. In addition, such fix information must be updated as necessary to provide timely warning if the ship is standing into danger. This is particularly true when in restricted waters. The Navigator will always utilize at least three LOPs for each fix.

b. The Navigator will ensure:

(1) The ship's position is fixed at an interval that ensures safe navigation (recommended intervals are listed in Table 2-A). The interval between fixes may be adjusted by the

Navigator as a function of water depth, current, bottom contour, ship's draft, track, assessed position accuracy, width of channel, and other factors; or as set forth in the Commanding Officer's Standing Orders.

(2) Set and drift are accurately determined and logged in the Ship's Deck Log. Set and drift will be determined at least once on each leg less than 1000 yards and every third fix for legs greater than 1000 yards. Set and drift should be computed more often if conditions dictate. If required fixes cannot be obtained, apply set and drift to the DR to obtain an estimated position (EP).

(3) Every fix has a DR track properly labeled with course, speed, and times projected far enough ahead to include DR positions for at least the next two fix intervals, including beyond any turns encountered.

(4) Turn points are based on bearings plotted on the chart. Course changes take into consideration advance and transfer, set and drift, and slide bar.

(5) The DR track of the recommended course is clear of navigational hazards and does not endanger the ship.

(6) **A fix is taken as soon as the ship is steady on a new course. CIC/CDC Navigation team is notified of the new fix time (as applicable). The Commanding Officer is notified when a "no fix" situation arises (the Commanding Officer will verbally acknowledge; i.e., "Very Well"). An immediate attempt to fix the ship's position should be made. Adherence to prudent navigation practices for the existing circumstances will be maintained until the ship's position is accurately determined.**

(7) Fixes are obtained from fixed aids to navigation and charted structures rather than buoys, whenever possible. When buoy positions are verified, bearings to buoys may be used to help clarify the navigation picture when no other objects are available. However, the Navigator must be circumspect in his/her use of such information.

(8) **A fix is not erased (N/A to ECDIS-N systems) because it appears in error; take another fix immediately to determine the ship's position, followed by a second fix after one minute. Make a recommendation to slow down, turn away from danger, or stop the ship until an accurate fix is obtained and ensure all**

26 Feb 02

recommendations are recorded in the Ship's Deck Log.

(9) Positions and fixes are verified by all available means, including visual, soundings, buoys, radar, and GPS.

(10) The Fathometer is energized and recording whenever in restricted waters or in water less than 100 fathoms. Whenever possible, the Fathometer will be set to coincide with the depth scale of the chart being used. Whenever soundings are less than the minimum designated values, notify the Navigator immediately. Compare soundings with charted depths on each fix and report to the OOD. Log all soundings in the Standard Bearing Book and Ship's Position Log.

(11) Accurate records and logs are kept. Complete reconstruction of the ship's track, orders to the helm and lee helm, and recommendations made by the Navigator to the Commanding Officer, Officer of the Deck, and Conning Officer must be possible at any time. Records and logs can be used when evaluating the performance of the Navigation Team, assessing the cause(s) of navigation incidents, and training.

(12) Use of checklists in routine navigation (i.e., Low Visibility, Entering/Leaving port, Swept Channel, etc.). Keep these checklists for six months after completion of the evolution. See appropriated checklists in **Appendix C**.

c. The Navigation Evaluator will ensure every fix determined from the primary navigation plot (Bridge) is compared to both the fix on the electronic plot and the fix obtained at the secondary plot (CIC/CDC). In addition, the phrase "ECDIS-N and/or CIC/CDC concur(s)," "ECDIS-N and/or CIC/CDC do/does not concur," or "ECDIS-N and/or CIC/CDC has/have no fix," with appropriate amplifying information, will be included in every verbal position report made by the Navigation Evaluator to the Navigator, Conning Officer, and Commanding Officer. The Navigation Evaluator will acknowledge the CIC/CDC report. The format for this report will include the following information for each fix:

(1) Fix time.

(2) Fix/EP Quality (excellent, good, poor, etc.) as determined by the Navigation Evaluator based on Commanding Officer's guidance. For GPS fixes, the Commanding Officer may assign fix quality based on Figure Of Merit to Estimated

Position Error (see **Appendix J**, "Figure Of Merit to Estimated Position Error") or request that GPS fixes be identified by Figure Of Merit.

(3) Fix method (visual, radar, ECDIS-N, GPS, running fix, etc.).

(4) Fix position in relation to proposed track.

(5) Nearest hazard to navigation.

(6) Nearest Aid to Navigation.

(7) Corrected Fathometer sounding, and comparison to charted depth.

(8) Distance and time to next turn.

(9) Course on next turn (reported at least once each leg and updated as changes occur).

(10) Any recommendation to regain/maintain proposed track.

(11) Report set and drift (once on each leg when less than 1000 yards and every third fix for legs greater than 1000 yards).

(12) The phrase "ECDIS-N and/or CIC/CDC concur(s)," "ECDIS-N and/or CIC/CDC do/does not concur," or "ECDIS-N and/or CIC/CDC has/have no fix."

(13) The phrase "GPS concurs/GPS does not concur with Visual/Radar fix."

d. The Navigation Evaluator will compare CIC/CDC reported navigation information with Bridge Navigation information at every fix.

e. The Conning Officer shall acknowledge the Navigation Evaluator's report. The Officer of the Deck shall ensure the Conning Officer has acknowledged the Navigation Evaluator's report and has indicated whether he/she intends to comply with the course and speed recommended by the Navigation Evaluator and immediately report non-concurrence to the Commanding Officer.

26 Feb 02

f. The Piloting Officer will report to the Navigator all navigation fix information derived by radar or any other source at each fix. The format for this report should include the following information for each fix:

(1) Fix time.

(2) Fix/EP Quality (excellent, good, poor, etc.) as determined by the Navigation Evaluator based on Commanding Officer's guidance. For GPS fixes, the Commanding Officer may assign fix quality based on Figure Of Merit to Estimated Position Error (see Appendix J) or request that GPS fixes be identified by Figure Of Merit.

(3) Fix method (radar, GPS, running fix, etc.).

(4) Fix position in relation to proposed track.

(5) Nearest hazard to navigation.

(6) Nearest aid to navigation.

(7) Corrected Fathometer sounding and comparison to charted depth.

(8) Distance and time to next turn.

(9) Course on next turn (reported each leg and updated as changes occur).

(10) Any recommendation to regain/maintain proposed track.

(11) Report set and drift (once on each leg when less than 1000 yards and every third fix for legs greater than 1000 yards).

(12) If equipped, the phrase "ECDIS-N concurs/does not concur."

g. The Shipping Officer will report to the Navigation Evaluator and Conning Officer via the Bridge CIC/CDC Phone Talker all critical shipping information and recommended course of action to maneuver the ship safely.

7. Navigation Practices While in the Open Ocean. In the open

ocean, use the following guidelines for obtaining an accurate fix by both primary and secondary methods and by supplemental (ECDIS-N) plots:

a. Compare navigation data from multiple sources, such as electronic NAVAIDS, radar, and celestial sources IAW Chapter 3, Section 6.

(1) If comparisons indicate excessive differences, determine the source of excessive differences from resultant best fixes and analyze them to determine the cause.

(2) The Inertial Navigation System (INS) will only be reset at the direction of the Navigator or Commanding Officer. Check the error and magnitude of the reset before the reset is entered. When resetting, record the resets according to the instructions for maintaining the Ship's Position Log.

b. Inform the Navigator prior to re-initializing an electronic navigation system.

c. Fix the ship's position at least half-hourly, assuring that fix data is used from all available sources.

d. Maintain a DR track extending from the fix through the next two fix intervals.

e. Set and drift will be computed/recorded and logged in the Ship's Deck Log each time the ship's position is fixed. A recommended course to compensate for set and drift will be given by the Navigator or the Quartermaster of the Watch.

f. Except when directed by the Commanding Officer, a sounding will be taken with every fix.

(1) Compare soundings to the charted depth.

(2) Log soundings in the Ship's Position Log and/or the Standard Bearing Book.

g. Report and compare the ship's position hourly or after each fix, to navigation information users such as CIC/CDC.

h. If weather permits, take an azimuth/amplitude of the sun or other celestial body at least daily to determine gyro

26 Feb 02

error.

i. Weather permitting, minimum daily celestial activity will conform as closely as possible to **Appendix D**, "Standard Day's Work In Navigation." Times for accomplishing these elements are not defined, due to variations in the times of celestial observations.

j. Minimum accuracy standards for fixing the ship's position and the interval between these fixes are, to some extent, situation dependent. Table 2-A summarizes the order of accuracy standards and recommended fix intervals prescribed.

k. Make Deck Log and Weather Log entries for any significant change in weather.

l. QMOW duties while in the open ocean. The Quartermaster of the Watch is the direct representative of the Navigator. He/she will assist the Navigator and Officer of the Deck in navigating the ship and will immediately inform the Navigator, Officer of the Deck, Assistant Navigator, and Senior Quartermaster when discrepancies arise. This instruction is not to be construed to limit the QMOW in the exercise of his/her best professional judgment in assessing small discrepancies and advising the personnel cited above.

(1) The QMOW represents a continuous navigational watch on the bridge. He/she is the primary assistant to the OOD for navigation and recording all events affecting the ship and its crew.

(2) The QMOW has numerous duties, including the keeping of various records, logs, and weather observations and obtaining fix information. The OOD must recognize this and if fix taking encumbers the QMOW from performing all other duties, the Senior Quartermaster, Assistant Navigator, and Navigator will be informed to provide additional assistance to the QMOW.

(3) This instruction cannot possibly cover all situations that may arise during the QMOW's watch. However, he/she is charged with the following minimum responsibilities:

(a) Assist the OOD, Navigator, and Assistant Navigator in plotting the ship's position at least every 30 minutes. Maintain a DR and Estimated Position plot. Make sure all course and speed changes ordered are logged. Immediately

notify the Navigator of any discrepancies noted during the watch. Compare every fix with ECDIS-N.

(b) At least every 60 minutes, compare CIC/CDC derived positions with the bridge navigation plotted position and determine if errors exist.

(c) Compute and plot set and drift at every fix and record the data in the Ship's Deck Log.

(d) Calculate when an aid to navigation or radar landfall should be sighted and report whether or not it is detected as specified in the Commanding Officer's Standing Orders.

(e) Note when a change in weather or the visibility decreases to less than the distance specified in the Commanding Officer's Standing Orders. Make appropriate log entries as required.

(f) Determine the INS and master/auxiliary gyro compass errors daily and before entering restricted waters; recording any errors in the Bearing Book, Magnetic Compass Record Book, and Deck Log.

(g) Ensure compass comparisons between the bridge gyro repeaters and magnetic compass are made every time a new course is set and at least every 30 minutes and recorded in the Magnetic Compass Record Book.

(h) Note any malfunctions to all electronic navigation systems including speed and heading inputs. Inform the Navigator and Officer of the Deck of any change in the status of such equipment and log in the Ship's Deck Log the time and nature of such.

(i) Obtain soundings using the Fathometer at each fix, or as directed by the Commanding Officer, EMCON conditions permitting.

(j) Perform celestial observations according to Appendix D. Record results in the Navigation Workbook and Ship's Position Record Book. When using STELLA (System To Estimate Latitude and Longitude Astronomically) computer software, documentation of all observations must also be maintained in hard copy for three years.

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

(k) Prepare the ship's 0800, 1200, and 2000 Ship's Position Reports for submission to the Navigator.

(l) Prepare notes for Commanding Officer's Night Orders notebook as directed by the Navigator.

(m) Before special evolutions, ensure time checks are conducted over all LMC circuits and logged in the Ship's Deck Log.

(n) Ensure chronometers are compared (and wound if required) daily.

(o) Monitor the Helmsman/Lee Helmsman for compliance with ordered course and speed.

(p) Conduct a watch turnover using a checklist such as that detailed in Appendix E.

8. Fathometer Readiness. There are two basic types of Fathometer currently in use. The UQN-1, which has no provision for entering a correction factor for keel reference, and the UQN-4, which has the capability of entering a correction factor of up to 10 feet. The UQN-4 with EC-8 installed has the capability of entering a correction factor of up to 99 feet. Technical manuals for both establish the transducer as zero depth reference point. To ensure actual water depth below lowest hull projection, apply the following guidelines:

a. For UQN-1 equipped ships, affix the following label plate to the Fathometer (* depth determined for each class and inscribed on label plate):

TO OBTAIN WATER DEPTH BELOW DEEPEST
PROJECTION, SUBTRACT _____* FEET
FROM ALL FATHOMETER SOUNDINGS.
RESULTING FIGURE IS REPORTED AS
"CORRECTED FATHOMETER SOUNDING."

b. For UQN-4 equipped ships without EC-8 capability, affix the following label plate to the Fathometer and each remote repeater (* depth determined for each class and inscribed on label plate):

TO OBTAIN WATER DEPTH BELOW DEEPEST
PROJECTION, KEEL REFERENCE SWITCH

MUST BE SET TO ZERO (10 FEET) AND
SUBTRACT _____ * _____ FEET. SOUNDING
IS THEN REPORTED AS "CORRECTED
FATHOMETER SOUNDING."

c. For UQN-4 equipped ships with EC-8 capability, affix the following label plate to the Fathometer and each remote repeater (* depth determined for each class and inscribed on label plate):

TO OBTAIN WATER DEPTH BELOW DEEPEST
PROJECTION, KEEL REFERENCE SWITCH
MUST BE SET TO _____ * _____ FEET.
SOUNDING IS THEN REPORTED AS
"CORRECTED FATHOMETER SOUNDING."

d. In ships where the vertical relationship between the Fathometer transducer face and deepest projection varies only slightly throughout the normal range of loading characteristics and trim of the ship, determine a single correction factor to apply to Fathometer soundings. The correction factor will be decided by calculating the vertical difference between the transducer face and lowest projection at that extreme of normal trim, which maximizes the vertical difference. Additionally, a nomogram will be developed to learn the depth of the transducer face given fore and aft draft and transducer position. Adding this depth to the uncorrected Fathometer sounding results in the depth of the water and can be compared with indicated chart depth.

e. In ships where the vertical relationship between the transducer face and deepest projection varies widely because of loading characteristics or vessels trim, a single correction factor is not practical. Therefore, a correction factor must be calculated for the load that exists at the time the Fathometer is in operation. A nomogram incorporating draft forward and aft will be developed to decide the vertical correction. The location of the transducer will be on the nomogram. A label similar to that recommended for UQN-1 ships will be used with a provision for filling in the correction and the time/date the factor was calculated, using a grease pencil. The nomogram will be used to learn the depth of the transducer face given the fore and aft draft. Adding this depth to the uncorrected Fathometer sounding results in the depth of water and can be compared with indicated chart depth.

f. Standard Fathometer sounding reporting procedures require the Fathometer operator to report corrected Fathometer soundings that will be understood by all concerned to be the depth of water below the deepest projection of the ship. **To compare Fathometer reading to charted depth, add ships draft to corrected Fathometer sounding.**

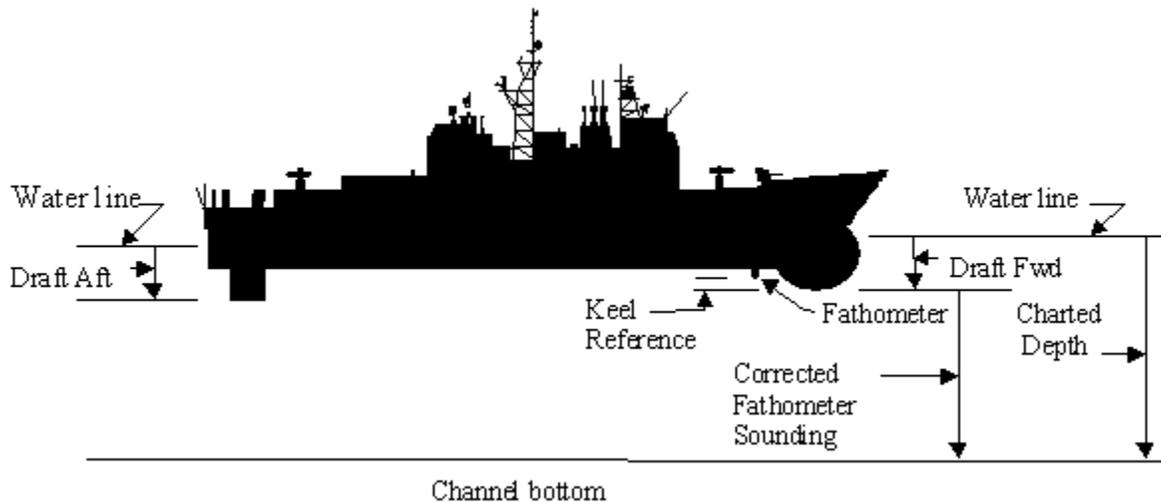


Figure 2-1

9. Depths for Electronic Navigation.

a. Definitions:

(1) Safety Depth - ship's draft plus safety factor. Can be in feet, fathoms, or meters.

(2) Red Soundings - must be greater than or equal to the Safety Depth.

(3) Yellow Soundings - must be greater than or equal to the Safety Depth and greater than or equal to the Red Sounding.

b. ECDIS-N allows Safety Depth and Red and Yellow Soundings to be set to the same value.

c. Set Safety Depth and Red and Yellow Soundings in ECDIS-N in accordance with the Commanding Officer's Standing Orders.

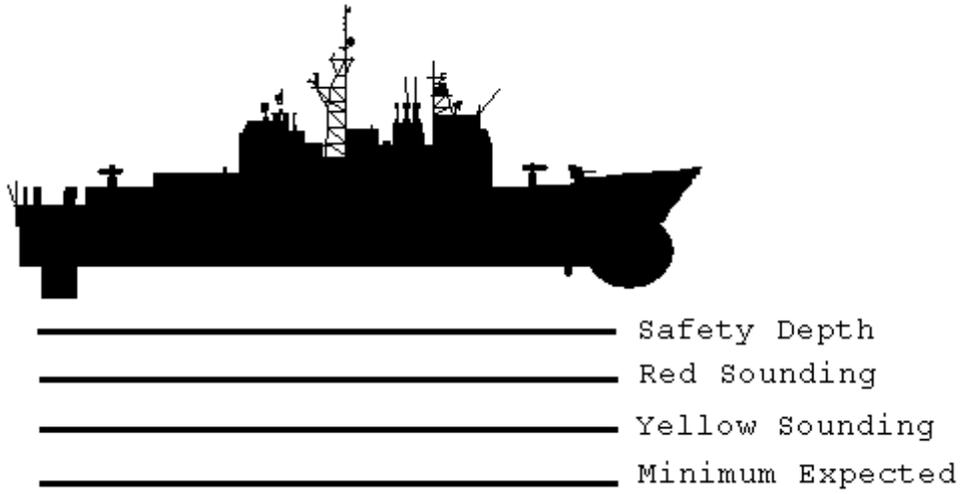


Figure 2-2

Table 2-A

FIX ACCURACY AND FIX INTERVAL GUIDELINES*

| AREA | DISTANCE FROM LAND OR SHOAL WATER | FIX ACCURACY | FIX INTERVAL |
|----------------------------------|-----------------------------------|--------------|--|
| Restricted Waters** | Less than 2 nautical miles | 50 yards | No more than 2 minutes |
| Piloting Waters | 2-10 nautical miles | 100 yards | 3-15 minutes as conditions warrant |
| Coastal Waters | 10-30 nautical miles | 500 yards | 15-30 minutes as conditions warrant |
| En Route Navigation (Open Ocean) | Over 30 nautical miles | 1500 yards | As conditions warrant, but not greater than 30 minutes |

Minimum accuracy standards for fixing the ship's position and the interval between these fixes are, to some extent, situation dependent.

* A good rule of thumb for fix intervals is, "if a hazard to navigation falls within a circle whose radius is that of two DR intervals," then either the fix interval or ship's speed requires adjusting.

**Restricted waters are defined in each ship's *Commanding Officer's Standing Orders* and may be different for each class of ship.

CHAPTER 3

BASIC SKILLS

1. General. This chapter provides guidance on basic skills that serve as the basis for development of each ship's routine.
2. Policy. When at sea, the Officer of the Deck will keep himself/herself informed of the position of the ship and all other particulars which may be used to keep the ship out of danger. He/she will employ all means available for detecting and avoiding danger. The Junior Officer of the Deck, QMOW, and other watch standers responsible to the OOD should never hesitate to request additional watch personnel or recommend stationing the full Navigation Team if a situation warrants. The following procedures constitute the basis for the Navigation Team's performance and will be accomplished continuously while the ship is underway by both the bridge and CIC/CDC navigation plots.
3. Definitions
 - a. Fix. A fix is the intersection of three simultaneous lines of position, either visual or electronic or a combination of the two. Using GPS for a "fix" depends on the FOM in relation to the required fix accuracy (i.e., distance from land or shoal water).
 - b. Estimated Position. An Estimated Position (EP) is defined as two simultaneous lines of position, either visual or electronic. Using GPS for an "EP" depends on the FOM in relation to the required fix accuracy (i.e., distance from land or shoal water).
 - c. Running Fix. The intersection of two or more lines of position, not obtained simultaneously, advanced down DR track to a common time.
 - d. No Fix. No Fix is when you do not have information that meets the criteria for a Fix, an Estimated Position, or a Running Fix.
4. Dead Reckoning (DR) Procedures. The Navigation Team must rely upon DR as the foundation for maintaining an acceptable estimate of the ship's position between fixes.

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

a. The following are general rules used in constructing and maintaining the Navigator's Dead Reckoning plot:

(1) Plot a DR position at least every hour on the hour.

(2) Plot a DR position at every course change.

(3) Plot a DR position at every speed change.

(4) Plot a DR position when obtaining a fix or running fix.

(5) Plot a DR position when obtaining a single line of position.

(6) Plot and label with course, speed, and time a new course line from each fix or running fix as soon as it has been determined and plotted on the chart. This is accomplished whether the ship is on track or not. The DR plot should be for the next two fix intervals.

b. When using a geographic position table (DRT, DDRT, or CADRT), ensure position inputs or updates are provided from an accurate fix.

c. Ensure all speed changes are entered as they are ordered when accepting speed data from dummy log.

5. Estimated Position Procedures

a. Generate an Estimated Position by combining incomplete data from a variety of sources when insufficient data is present to fix the position of the vessel accurately. The Estimated Position may combine the DR position with a single line of bearing, account for set and drift, compensate for tactical data, or represent a combination of these and other factors. Since DR positions are plotted for ordered courses and speed and do not compensate for known values or tactical characteristics of the ship, their relationship to the geodetic position may not always be accurate. To reduce the magnitude of error between the DR position and the geodetic position, the DR plot must be refined during the interval between fixes with a plot of Estimated Positions.

b. To produce an Estimated Position the following guidelines are recommended:

(1) Use the largest scale chart available to enhance plotting accuracy.

(2) Include the last DR position in any calculation leading to an estimate of the ship's position.

(3) Combine all available lines of position of questionable quality with DR position data in the absence of a fix.

(4) Determine set and drift and apply this data to current work on the Navigator's plot.

(5) During high speed maneuvering, compensate for tactical characteristics, interpolating for other than listed speed and rudder angles.

(6) Use bottom contour charts and the Fathometer, when appropriate, to further develop the ship's estimated position.

6. Integrated Navigation. The accuracy of navigation depends on a knowledgeable assessment of all position data. Each source and fix technique is subject to some error. Therefore, the prudent navigator must assess each position determination and evaluate it with respect to all others. When possible, the Navigator will ensure this procedure is accomplished at least once every 4 hours or more often as desired. The QMOW and CIC/CDC watch team will plot all fixes on their respective charts and ECDIS-N displays and will compare fix information.

a. Use of all available resources. Evaluating from all electronic aids, celestial, visual, and DR/EP computations provides the basis for knowledgeable evaluation of the ship's position. Each source of fix is subject to some degree of error and accuracy. The Navigation Team must understand the amount of position error each fix source is subject to and apply that knowledge, combining multiple sources to obtain the best position. This type of application will also be useful in identifying a fix source that has a significant error. By integrating as many sources of fix information as is reasonably possible, mutually supportive fixes will improve position accuracy and raise the confidence in data produced. The integration of all Navigation Systems to derive a most probable position involves:

(1) Understanding those factors influencing the day-to-

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

day or seasonal variation and effectiveness.

(2) Precise data collection, plotting, and analysis at the precise time set for fixing the ship's position.

(3) The Navigator's experience, judgment, and confidence. The decision to select a single source of positioning data or an averaging approach is based on his/her analysis of the factors that influence Navigation Systems accuracy and the time available to gather and analyze the data.

b. Standard Procedures. The Navigator and Quartermaster must:

(1) Properly maintain the ship's DR, including a running EP plot.

(2) Use the DR and all available fixes to establish a composite fix.

(3) Note variation in fix clusters in successive plots, and remain alert to the first indication of accuracy degradation in their data.

(4) Flag all geodetic positioning data provided to the users of navigation information, with an assessment of fix quality (excellent, good, or poor).

(5) Maintain close communication with the TAO/CICWO/CDCWO to:

(a) Ensure the NTDS/ACDS DR position is frequently updated to reflect the fix from the Navigator's plot (for NTDS ships only).

(b) Be alert to the quality of the fix in his/her tactical evaluation to reduce errors in tactical warfare situations.

(c) Ensure system updates and GPS almanac data is provided to Tomahawk Engagement Planning Exercise and Evaluation (TEPEE) console prior to their deployment as prescribed in the Commanding Officer's Battle Orders.

(6) Ensure any position data the TAO receives from the Navigator is compared with the current display. Any data that does not constitute a logical extension of previous fixes and Estimated Positions, in relation to time, are brought to the attention of the Navigator and CIC/CDC watch supervisor to coordinate a resolution of the error. (The Navigator will provide final verification and correction, if required.)

7. Electronic Navigation Modes. ECDIS-N is designed to maintain operational capability when key external sensors are not installed or fail to supply data needed for positioning, radar overlay, etc.

a. Navigation Modes describe manning levels required to optimize ECDIS-N capabilities based on the status of sensor integration occurring within ECDIS-N.

b. The following table describes ECDIS-N Navigation Modes:

Table 3-A

| Navigation Mode | | |
|--|---|------------------------|
| One | Two (May be qualified as "Mode Two Visual, etc.) | Three |
| ECDIS-N operations with fully automatic sensor integration. | ECDIS-N operations with manual sensor integration. | Traditional paper plot |

CHAPTER 4

RECORDS, LOGS, AND FORMS

1. Purpose. The importance of keeping complete, concise, and accurate navigation records, logs, and forms cannot be overemphasized. Besides providing the recorded history of the ship, they become a basis for analysis, evaluation, and correction of material, operational, and personnel deficiencies in warfare. Should it ever become necessary, they comprise the legal records examined by courts of inquiry and official investigations.

2. Corrections. Erasures are strictly forbidden in all navigation logs and records except the Navigation Workbook. Neatly line out and initial an entry to make corrections. Ballpoint pen with non-water soluble black ink will be used throughout, except in the Navigation Workbook in which pencil is authorized for recording and computations.

3. Ship's Deck Log

a. Purpose. The Deck Log will be a complete daily record, by watches, in which will be described every circumstance and occurrence of importance or interest which concerns the crew, the operation, and the safety of the ship or that which may be of historical value. When underway, the Oncoming OOD and QMOW will review the Deck Log from the previous watch before relieving.

b. Instructions for Maintenance. The Deck Log will be kept according to OPNAVINST 3100.7B. A copy of this instruction will be placed in the front of the log, if not provided by preprinted format. The following entries, in addition to those required by OPNAVINST 3100.7B will be included as appropriate:

(1) Draft (forward, aft, mean) and displacement as computed and reported in the ship's daily draft report.

(2) Set and Drift (when determined).

(3) Time Checks.

(4) Commencement and Completion of all Special Evolutions and the completion of any Check Lists.

(5) All recommendations made by the Navigator, QMOW, or CIC/CDC concerning the maneuvering of the ship.

c. Responsibility for Review and Approval. The Navigator will review the Deck Log daily and submit the record to the Commanding Officer at the end of the month for signature.

d. Retention. The original Deck Log will be forwarded to the Naval Historical Center no later than the tenth (10th) day of each month. Duplicate Deck Logs will be kept on board for 1 year.

4. Ship's Position Log (OPNAV Form 3100/3)

a. Purpose. A Ship's Position Log will be a record of positions and soundings from all sources used. In addition, DR positions, set and drift, and manual resets of SINS, NTDS, DRAI, etc., will be recorded. In light of different ship configurations and missions, specific codes to indicate type of fixes will be determined by the Navigator and included in the log.

b. Instructions for Maintenance. Whenever a fix is determined and at least every half-hour, a position from all available sources will be recorded. The position, which is plotted on the chart, shall be recorded and annotated by the letter "T" in the left-hand margin to indicate which position was used if multiple sources were available. The Navigator may limit this to once every 30 minutes if frequent fixes are obtained.

(1) A sounding will be obtained and recorded in the remark column with each fix.

(2) The Ship's Position Log may be secured with the concurrence of the Navigator or Assistant Navigator whenever the Standard Bearing Book is used in piloting waters. When entering restricted waters from the open sea, the initial piloting fix will be recorded in both the Ship's Position Log and Standard Bearing Book. The same is true of the last piloting fix when leaving restricted waters. Upon relief or when secured, the watch or Bearing Recorder will sign his/her name across columns 18-41.

c. Responsibility. The Ship's Position Log will be kept during coastal and open ocean navigation by both bridge and

CIC/CDC watch standers.

d. Retention. This log will be kept for three years after the date of the final entry.

5. Navigation Workbook (OPNAV Form 3530/1)

a. Purpose. The Navigation Workbook is the record of all observations and computations used for navigation of the ship. This will include data relating to celestial lines of position, tides and currents, sunrise/sunset, moonrise/moonset, and gyro error.

b. Instructions for Maintenance. The Navigation Workbook will be kept according to OPNAVINST 3530.3B. The Navigator is responsible for proper maintenance of this log. In view of the large amount of data that may be recorded, ships may organize data into separate notebooks as directed by the Commanding Officer. Locally prepared strip forms will be affixed to or recorded in the workbook. If calculators are used, enough data must be recorded in the workbook to reconstruct the computation. When using computer software (i.e., STELLA), documentation of work must be maintained in a loose-leaf binder.

c. Responsibility for Review and Approval. The Navigator will review and sign the workbook weekly.

d. Retention. This record will be kept three years from the last entry.

6. Standard Bearing Book (OPNAV Form 3520/2)

a. Purpose. The Standard Bearing Book is a record of the data obtained to determine the ship's position by visual bearings, sextant angles, radar bearings, and/or radar ranges.

b. Instructions for Maintenance. The Standard Bearing Book will be kept according to OPNAVINST 3530.3B with the following modifications:

(1) Record the chart number in use at the top of the initial page each day. Each shift of charts will be noted in the first available blank line of the log.

(2) The time zone and date will be indicated.

(3) Label radar ranges YD (yards) or NM (Nautical Miles). Label stadimeter ranges "STAD."

(4) Soundings will be in column 7 at the time each fix is obtained and labeled FT (feet) or FM (fathoms).

(5) All bearings are true, unless otherwise indicated by R (relative) or M (magnetic) for helmsman's heading. When during loss of gyro and shifting to R (relative), the shift will be noted on the first available blank line of the log. An additional column will be utilized to log "Ships Magnetic Head."

(6) All abbreviations must be according to Chart No. 1, "Nautical Chart Symbols and Abbreviations."

(7) Record the current gyro error and gyro repeater errors on all Peloruses and at the top of the initial page each day. Any revised gyro error will be noted in the first available blank line of the log. Enter the radar bearing error and/or heading error(s) at the top of the initial page each day.

(8) A list of NAVAIDS must be permanently maintained in the book and will include the abbreviation, noun name, and latitude/longitude. (Visual NAVAIDS such as tank or tower will have an alphanumeric designation. Other NAVAIDS such as fixed lights, Point Loma, Chesapeake Light need not be alphanumerically designated.)

c. Responsibility. At the end of his/her watch or navigation detail, the Bearing Recorder will sign The Standard Bearing Book after the last entry on the next available line.

d. Retention. The Standard Bearing Book will be kept on board for three years after the date of the last entry.

7. Chart/Publication Correction Files

a. Purpose. These files serve as a record of all corrections for the current allowance of NIMA charts and publications established by the current edition of the Nautical Chart and Publication Allowance.

b. Instructions for maintenance. Chart/Publication Correction Cards (DMAHC 8660/9) will be on board and maintained according to the instructions in NIMA Catalog of Maps, Charts and Related Products - Part 2 Hydrographic products

26 Feb 02

requisitioning procedures.

(1) The Chart Petty Officer will enter corrections to the chart cards. The Publication Petty Officer will enter corrections to the publication cards. However, the QMOW is responsible for making all corrections to charts and publications required for current use. Local area charts and those portfolios designated by the Commanding Officer will be maintained up to date at all times. Corrections to all other charts or publications will be indexed and these changes entered before using charts or publications. Those publications designated by the Commanding Officer will be kept current at all times. Corrections to DNCs will be recorded on a memorandum from the Navigator to the CO via the XO.

c. Responsibility for review and approval. The Senior Quartermaster is responsible for reviewing the ship's charts, publications, and correction files to ensure their proper maintenance. During audits, the Senior QM will ensure applicable allowance lists, NIMA R05 lists, as well as lists of effective corrections are reviewed during the inventory.

d. Retention. Correction cards will be kept up to date for all charts and publications on board. When a chart or publication is superseded, destroy the old card, and replace it with a new card for the new chart or new publication.

8. Notice to Mariners/Summary of Corrections

a. Purpose. Notices to Mariners, Summary of Corrections, and use of the Automated Notice to Mariners (ANMS)(INFONET) and Local Notice to Mariners (LNM) will be used to enter appropriate information on appropriate charts or publications.

b. Instructions for Maintenance. The Chart and Publications Custodian, under the cognizance of the Assistant Navigator and CIC/CDC Officer, will keep separate files as follows:

(1) Notice to Mariners File. Notice to Mariners File will be kept by each work center maintaining navigational charts and related publications. It must be retained on board for the date of the last correction applicable (annotated on the front cover) for the Catalog of Hydrographic Products.

(2) Local Notice to Mariners File. To be handled the

same as Notice to Mariners File and will be held on board for at least one year or longer, as required.

(3) Summary of Corrections. A series of publications that incorporates a historic record of corrections dating from the most recent edition date for NIMA products, back to July 1975.

(4) Classified Notice to Mariners. Provides the same information as the Notice to Mariners and Summary of Corrections except that the information is for classified charts and publications.

c. Responsibility. The Chart and Publications Custodian will maintain the Notice to Mariners File.

d. Retention. Notice to Mariners records will be kept until issued in a summary document.

9. Navigational Safety Warning Messages. Including, but not limited to: HYDROPAC/LANT, NAVAREAS, NAVTEX, NAVINFONET, SAFETYNET, and Coast Guard Local Broadcast Warnings and their web site (<http://www.navcen.uscg.mil/lnm/default.htm>), as applicable.

a. Purpose. To maintain a file of the latest navigational aid discrepancies and hazards to navigation.

b. Instructions for Maintenance and Review. File all Safety Warning Messages chronologically by number and log on a Safety Messages Cover Sheet (See **Appendix F**, "Navigational Safety Messages Cover Sheet"). Attach a review signature sheet with Navigator/Assistant Navigator signature line and "Safety Warning Messages in Effect for the Local OPAREA" status sheet to the front cover. Provide copies to each work center keeping charts.

(1) At sea, route Safety Warning Messages to the OOD, Navigator, and Assistant Navigator/Senior Quartermaster, with a copy to the QMOW and CIC/CDC Watch Officer for the Safety Warning Message file. In port, route Safety Warning Messages to the Duty Quartermaster and Duty Operations. When received, they will be reviewed to determine pertinent information that should be immediately brought to the attention of the OOD (at sea), and to the attention of the Navigator or Senior Quartermaster.

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

(2) The Navigator will brief the Commanding Officer on pertinent information from Safety Warning Messages during navigation briefs and at any other time deemed relevant.

c. Retention. Safety Warning Messages will be kept until they expire.

10. Magnetic Compass Record (NAVSEA 3120/3)

a. Purpose. The Magnetic Compass Record is a complete record of all magnetic compass readings and comparative true headings. It is also a record of gyro errors. Ships with the DFGMC installed are **NOT** exempt from maintaining the Magnetic Compass Record.

b. Instructions for Maintenance. While the ship is underway, compute gyro error and navigational/conning gyro repeater errors daily and record in the remark column of each page. Enter LAT/LONG of current position when practicable.

(1) A separate log for the computation of repeater error may be used which should also record the computed gyro error, but this log does not obviate the requirement to record computed gyro errors in the Magnetic Compass Record.

(2) Compass comparisons between the magnetic compass and the helm repeater in use for steering will be made and recorded every half hour and every time a new ordered course is steered, when practicable.

(3) Compute helm repeater error daily, comparing the master gyro/INS to all repeaters utilized for conning the ship.

(4) Make compass checks and log any time a gyro compass alarm is received.

(5) If the steering repeater and the heading source do not correspond within 1.0 degree at the time of obtaining a compass check, immediately repeat the check for possible error in reading. If there is in fact an error, immediately inform the OOD, Navigator, Assistant Navigator, and leading IC technician. Additionally, if the SINS and gyros do not agree within 1.0 degree, inform the OOD and Navigator immediately.

c. Responsibility for review and approval. The Navigator will review and sign the Magnetic Compass Record daily and

submit the record to the Commanding Officer on the last day of each quarter for his/her signature.

d. Retention. The Magnetic Compass Record will be kept on board for 1 year after the date of the last entry as part of the ship's official records.

11. Ship's Position Reports (NAVSHIP 9240/1)

a. Purpose. To provide a means of reporting the ship's position.

b. Instructions for Maintenance. Ship's Position Report, NAVSHIPS Form 9240/1 or locally prepared forms may be used if containing, as a minimum, that information provided on the NAVSHIPS form (See **Appendix G**, "Ship's Position Report"). Each day at sea, before 0800, 1200, and 2000, the Navigator will prepare, or cause to have prepared, a Ship's Position Report. After the Navigator has signed the Ship's Position Report, deliver the original copy to the Commanding Officer and embarked staff at the appropriate time. A copy will be placed in a file kept in the chart house. CIC/CDC will receive a copy as well. Additionally, the 0800, 1200, and 2000 position will be logged in the Ship's Deck Log. Ensure that correct security classification of the report is indicated. When a senior officer is embarked, provide a copy of each position report to him/her unless otherwise directed.

c. Responsibility for Review and Approval. The Navigator (or Assistant Navigator if authorized by ship's navigation bill) is responsible for reviewing the Ship's Position Reports and will approve them by signature before submission to the Commanding Officer.

d. Retention. The duplicate Ship's Position Report will be kept by the Navigator as may be convenient, but will not normally be kept beyond the end of the month or duration of the voyage, whichever is greater.

12. Captain's Night Order Book

a. Purpose. Captain's Night Order Book contains the orders of the Commanding Officer for the operation and safe navigation of a ship underway during the night.

b. Instructions for Maintenance. The Night Order Book is

26 Feb 02

kept in bound ledger or loose-leaf form. The orders for each night are written on a separate sheet and signed by the Commanding Officer. They include such items as courses and speeds, expected sightings, engineering data, the tactical situation and composition of the formation, and supplementary orders to the Officer of the Deck. This book forms a permanent part of the ship's records and shall be kept in a binder with the Commanding Officer's Standing Orders and other required reading sheets (to be reviewed monthly). Ships may generate a computer copy tailored to their individual characteristics (i.e., Ship's engineering plant/weapons systems).

c. Responsibility. The Navigator is responsible for preparing and submitting the Captain's Night Order Book to the Commanding Officer for approval.

d. Retention. Keep for three years after the last dated entry.

13. Navigation Brief

a. Purpose. To provide a plan for safe and prudent passage, including piloting in restricted waters.

b. Instructions for Maintenance. The Navigator is charged with supervising the preparation and presentation of each Navigation Brief per Appendix B. The Navigator will sign the file copy.

c. Responsibility for Review and Approval. The Executive Officer will review the brief. The Commanding Officer will approve and sign the Navigation Brief file copy before its presentation.

d. Retention. Keep the Navigation Brief on file as required, but not for less than 6 months.

14. Surface Weather Observation Form

a. Purpose. To provide inputs to weather observation message.

b. Instructions for Maintenance. The Navigator is charged with supervising the preparation and presentation of each weather observation message.

c. Responsibility for Review and Approval. The OOD will review weather observation messages prior to release.

d. Retention. Keep each weather observation form on file as required, but not for less than 1 year.

15. Record Keeping for ECDIS-N Systems

a. Purpose. To simplify record keeping for ships certified to use ECDIS-N systems. ECDIS-N systems automate many record/log keeping functions, to include: Chart Summary and Gazetteer, Trackline Summary Sheet, Tide and Current Worksheet, Almanac Data, Electronic Navigation Environment, and Navigation Mode.

b. Instructions for Maintenance. The Navigator is charged with ensuring the daily tape back up and Daily Log requirement are met.

c. Responsibility for Review and Approval. The Navigator will print, review, and sign the Chart Summary and Gazetteer, Trackline Summary Sheet, Tide and Current Worksheet, Almanac Data, Electronic Navigation Environment, Navigation Mode, and Daily Log as required.

d. Retention. Keep daily tape back up and all printed records as required, but not for less than 1 year.

APPENDIX A

ISIC NAVIGATION ASSESSMENT CHECKLIST

(To be conducted once per IDTC)

| ITEM | YES | NO |
|--|-----|----|
| 1. Is there a tailored navigation bill that prescribes responsibilities and procedures for safe navigation of the ship, including navigation in restricted waters during low visibility (Ref OPNAVINST 3120.32C, Arts. 630.13 and 630.13.5)? | | |
| 2. Is the Watch, Quarter, and Station bill current, complete, and readily available to navigation personnel (Ref OPNAVINST 3120.32C, Art. 610)? | | |
| 3. Does the organization provide for and designate personnel to pilot the ship: | | |
| a. During special sea and anchor detail? | | |
| b. During general quarters? | | |
| c. During low visibility? | | |
| d. During special evolutions? | | |
| 4. Are the watch personnel PQS qualified for their assigned positions and appropriate service record entries completed? | | |
| 5. Are qualified senior and experienced personnel on the watch bill as watch supervisors and/or assigned to training teams to ensure the thorough and professional performance of the watch teams? | | |
| 6. Verify the following logs and records are on board, up to date, and properly maintained: | | |
| a. Deck Log (Ref OPNAVINST 3100.7 Series). | | |
| b. Magnetic Compass Record Book (OPNAVINST 3120.32 Series). | | |
| c. Bridge-Bridge R/T log. | | |
| d. Navigation Workbook (Ref OPNAVINST 3530.3B). | | |
| e. Standard Bearing Book (Ref OPNAVINST 3530.3B). | | |
| f. Ship's Position Log (OPNAV 3100/3). | | |
| g. Weather Observation Log (Ref NAVMETOCCOMINST 3144.1 Series). | | |
| h. Surface Radar Contact Log. | | |
| i. CIC Watch Log. | | |
| j. Radar Navigation Fix Log. | | |

26 Feb 02

| ITEM | YES | NO |
|--|-----|----|
| k. Radar and Visual Navigation Points Listing. | | |
| 7. Is the CO's Night Order Book properly maintained and does it contain a copy of the CO's standing orders? | | |
| 8. Have ship control personnel (OOD, JOOD, TAO, CICWO, QMOW, EOOW, and BMOW) reviewed and initialed CO's Night Order Book? | | |
| 9. Have ship control personnel reviewed and initialed CO's standing orders monthly? | | |
| 10. Verify the following instructions and references are on board and up to date: | | |
| a. OPNAVINST 3530.3 (Series) (Bearing and Navigation Workbook). | | |
| b. OPNAVINST 3100.7 (Series) (Deck Log). | | |
| c. CINCPACFLTINST 3140.3 (Series) or CINCLANTFLT 3140.9 (Series) Chart and Pub Requirements and NIMA R05 Listings. | | |
| d. NAVMETOCCOMINST 3140.1 (Series) Meteorological Support. | | |
| e. NAVMETOCCOMINST 3144.1 (Series) Weather Observation Manual. | | |
| f. Atlas of Pilot charts. | | |
| g. Typhoon/Hurricane Havens Handbook. | | |
| h. Tide and Current tables. | | |
| i. Weekly Notice to Mariners. | | |
| j. Local Notice to Mariners. | | |
| k. Summary of Chart/Pub Corrections. | | |
| l. Navigation Safety Messages (with cover sheet for Navigator and Assistant Navigator's review). | | |
| m. Nautical Almanac. | | |
| n. NIMA SRPUB 229 Vol. 1-5, NIMA SRPUB 249 Vol. 1-3 (Sight Reduction Tables). | | |
| o. Catalog of Maps, Charts, and Related Products (with semiannual bulletin). | | |
| p. COMNAVSURFPACINST 3180.2 (Series) or COMNAVSURFLANTINST 9010.1 (Series) Replenishment Guide. | | |
| q. NIMA NAVPUB Pub 9 (Bowditch). | | |
| r. Chart #1 (Chart Symbols). | | |
| s. COMDTINST M16672.2 (Series) Rules of the Road. | | |
| t. Light List, List of Lights. | | |
| u. Coast Pilots. | | |

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

| ITEM | YES | NO |
|--|-----|----|
| v. Fleet Guides. | | |
| x. Sailing Directions. | | |
| y. Port Directory. | | |
| z. NIMA NAVPUB 1310 (Radar NAV Manual). | | |
| aa. NIMA NAVPUB 217 (Maneuvering Board Manual). | | |
| bb. NIMA RAPUB 117 (Radio NAVAIDS). | | |
| cc. NIMA NAVPUB 150 (World Port Index). | | |
| dd. NIMA NAVPUB 151 (Distances Between Ports). | | |
| ee. Updated associated publications (technical and operator) for all installed navigational equipment. | | |
| 11. Has the Commanding Officer specified, in writing, which ready charts and publications are to be kept and corrected up to date (Ref OPNAVINST 3120.32C, Art. 323 and Art. 630.13.4)? | | |
| 12. Verify the following are maintained on board: a. Full allowance of chart portfolios (Ref CINCPACFLTINST 3140.3A or CINCLANTFLTINST 3140.9A). | | |
| b. Chart and pub correction cards for the full chart and pub allowance and checked through the latest Notice to Mariners and Local Notice to Mariners. | | |
| 13. Are appropriate steering casualty procedures available at all steering stations with individual responsibilities covered? | | |
| 14. Are Speed and RPM tables posted at all conning stations? | | |
| 15. Was the gyro error and repeater error determined daily, reported to all navigation users, dated, posted on all gyro repeaters, and logged in the Magnetic Compass Record Book, Bearing Book, and Deck Log? | | |
| 16. Was the radar range and bearing error determined prior to getting underway, dated, posted on all radar repeaters, and logged in the Standard Bearing Book and CIC/CDC Watch Log? | | |
| 17. Are excerpts from the Act to Prevent Pollution from Ships, 1983 and the Clean Water Act of 1977 available to the OOD (OPNAVINST 5090.1 Series)? | | |
| 18. Are ship's tactical data tables available to the OOD and NAV/CIC/CDC plots? | | |

| ITEM | YES | NO |
|--|-----|----|
| 19. Are checklists available for the following navigation evolutions: a. Leaving/Entering Port? | | |
| b. Low Visibility? | | |
| c. Swept Channel piloting? | | |
| d. Special Evolutions (i.e., Replenishment at Sea, Fueling at Sea, Flight Quarters, etc.)? | | |
| 20. Are foreign articles/gear adrift stowed away from all electric and electronic equipment? | | |
| 21. Are operating instructions available for all electronic equipment? | | |
| 22. Is sufficient emergency lighting in operating condition? | | |
| 23. Verify the following Navy Standard Magnetic Compass (NSMC) and/or Digital Flux Gate Magnetic Compass (DFGMC) checks have been properly conducted: a. NSMC: Have all dockside checks been completed for all magnetic compasses tested with results recorded in the Magnetic Compass Record (Ref NIMA PUB 9)? | | |
| b. NSMC: Have all magnetic compasses been adjusted within the past 12 months or since the last overhaul (Ref NSTM 420)? | | |
| c. NSMC: Is the observed deviation within 3 DEG (degaussing off) and 5 DEG (degaussing on) (Ref NSTM 420)? | | |
| d. NSMC: Is a current copy of the deviation table posted at or near each magnetic compass and NAV/CIC/CDC plots? | | |
| e. NSMC: Do the observed deviations in the magnetic compass record tables correspond to the deviation tables? | | |
| f. NSMC: If the NSMC is still on the ship but not in use, is it in lay-up with an "Out of Commission" sticker placed on the compass in plain view of the helmsman? | | |
| g. DFGMC: Does the Navigation Team demonstrate a working knowledge of DFGMC operation to include Continuous and Intentional Auto-Compensation (as it applies to compass deviation), Pre-Set Variation, and compass limitations? | | |

26 Feb 02

| ITEMS | YES | NO |
|---|-----|----|
| h. DFGMC: Is the DISPLAY RESPONSE DAMPING set at "FAST" in restricted waters? | | |
| i. DFGMC: Is AUTO-COMPENSATION mode set continuously? | | |
| j. DFGMC: Has the Commanding Officer set policy guiding the use of PRE-SET VARIATION in the Ship's Navigation Bill? | | |
| k. DFGMC: Has the ALIGNMENT ERROR ADJUSTMENT been completed following system installation, following removal/replacement of the processor unit, or at least annually? | | |
| l. DFGMC: Is INTENTIONAL AUTO-COMPENSATION completed at least 24 hours prior to operating in restricted maneuvering (as the operating environment allows)? | | |
| 24. Is the degaussing folder properly maintained and utilized? | | |
| 25. Verify the following navigation equipment is available and in satisfactory operating condition: | | |
| a. Steering casualty alarm. | | |
| b. Gyro repeaters (error posted and determined daily). | | |
| c. Gyro alarm. | | |
| d. Gyro repeater benchmark alignment. | | |
| e. Bridge/CIC/CDC radar repeaters (error posted and determined daily). | | |
| f. Navigation lights/Telltale Panel. | | |
| g. Ship's whistle. | | |
| h. Bell and gong (with lanyards attached). | | |
| i. Fathometer. | | |
| j. Electronic Navigation Equipment (ECDIS-N system). | | |
| k. EM speed log (calibrated IAW PMS). | | |
| l. Dead Reckoning Analyzer Indicator (DRAI). | | |
| m. Chronometers. | | |
| n. Sextants. | | |
| o. Stadimeter. | | |
| p. Alidades and bearing/azimuth circles. | | |
| q. 3-arm protractor. | | |
| r. Barometer (valid calibration sticker/calibrated semi-annually). | | |
| s. Degaussing system. | | |

26 Feb 02

| ITEMS | YES | NO |
|--|-----|----|
| t. Primary and secondary navigation radar (as applicable). | | |
| u. Fire Control Radar. | | |
| v. DRT/DDRT/CADRT. | | |
| w. STELLA Program. | | |
| 26. Are the optimum scale charts (paper and DNC) available, used at NAV/CIC/CDC plots, and corrected through the latest Notice to Mariners and local Notice to Mariners? | | |
| 27. Verify Bridge and CIC/CDC navigation charts are properly prepared with: | | |
| a. Tracks labeled with true and magnetic courses, speeds, and distances of each leg. | | |
| b. Turn bearing and ranges based on ship's tactical data and labeled with true and relative bearings and distance to the turn. | | |
| c. Advance and transfer data, based on speed and rudder angle labeled for each turn. | | |
| d. Danger bearings and/or ranges where dangers and shoal water are not marked by NAVAIDS. | | |
| e. Chart shift points (Bridge and CIC/CDC shift points will not occur simultaneously). | | |
| f. Shoal water and isolated dangers highlighted IAW ship's navigation standards. | | |
| g. Signature box for "prepared by," "reviewed by," "submitted by," and "approved by." DNC will have a memorandum from the Navigator to the CO via the XO for approval. | | |
| h. Visual and radar navigation points identical for Bridge and CIC/CDC and indexed in the Standard Bearing Book and CIC/CDC Navigation Log. | | |
| i. Slide bar annotated on all turns. | | |
| j. Local speed restrictions annotated. | | |
| k. Range Scales (as appropriate). | | |
| l. Tide and Current stations being used annotated on the chart? | | |
| m. Datum in the GPS receiver adjusted to match datum on chart? | | |
| 28. Was the ship's draft determined and logged in the Deck Log before leaving/entering port? | | |
| 29. Are communications on the navigation circuits checked before leaving/entering port? | | |

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

| ITEMS | YES | NO |
|---|-----|----|
| 30. Was a time check conducted over the LMC circuit before transiting restricted waters and logged in the Deck Log? | | |
| 31. Are tides and currents graphed and posted at all navigation stations for each reference station passed and computations entered in the Navigation Workbook or computer program? | | |
| 32. If used, has the Commanding Officer authorized in writing a computer program for computing tides and currents? | | |
| 33. Was navigation brief held before transiting restricted waters? | | |
| 34. Was the Bridge-To-Bridge R/T operational and tested before leaving/entering port and results documented in the R/T log? | | |
| 35. During piloting, were fixes taken as the situation dictated IAW table 2A of this instruction? | | |
| 36. Were fixes properly labeled and contained at least three LOPs? | | |
| 37. Were DRs laid out from each fix at least two fix intervals, including beyond a turn, and labeled with times (Regardless of whether on track or not)? | | |
| 38. Was set and drift determined once on track legs less than 1000 yards and every third fix on longer legs and logged in the Deck Log? | | |
| 39. Did CIC/CDC take fixes concurrently with the Bridge? | | |
| 40. Was CIC/CDC fix information reported to the Bridge in the format of the Navigation Evaluator's report? | | |
| 41. Is radar repeater error, gyro error, and gyro repeater error applied when plotting fixes? | | |
| 42. Do the Navigation Evaluator's fix reports to the Conn include the following information: | | |
| a. Fix time? | | |
| b. Fix/EP? | | |
| c. Fix method if other than primary means (i.e., Bridge visual, CIC/CDC radar, etc.)? | | |
| d. Fix position in relation to proposed track? | | |
| e. Nearest hazard to navigation? | | |
| f. Nearest aid to navigation? | | |
| g. Corrected Fathometer sounding? | | |
| h. Distance and time to next turn? | | |

26 Feb 02

| ITEM | YES | NO |
|--|-----|----|
| i. Course on next turn (reported each leg and updated as Changes occur)? | | |
| j. Any recommendation to regain/maintain proposed track? | | |
| k. Computed set and drift (once on each leg when less than 1000 yards and every third fix for legs greater than 1000 yards)? | | |
| l. The phrase "ECDIS-N and/or CIC/CDC concur(s)," "ECDIS-N and/or CIC/CDC do/does not concur," or "ECDIS-N and/or CIC/CDC have/has no fix?" | | |
| m. The phrase "GPS concurs," "GPS does not concur," with visual/radar fix, to include the Figure Of Merit? | | |
| 43. Was there effective information flow between the Conn, CIC, and the Navigator regarding the piloting situation, ship's course and speed, and deviations from the proposed track? | | |
| 44. Are set and drift, and advance and transfer applied when making course recommendations? | | |
| 45. Are new courses searched for shipping before turning and a report made to the Conn? | | |
| 46. If two successive fix intervals, from primary plot, result in no fix, is appropriate action taken, such as slowing to bare steerageway or stopping, until a fix is obtained? | | |
| 47. Does the Navigator/Navigation Evaluator inform the Conn when to use International/Inland Navigation Rules? | | |
| 48. Is the low visibility watch bill published before getting underway to facilitate immediate implementation? | | |
| 49. Under conditions of low visibility, did the OOD/JOOD order: | | |
| a. Qualified Fog Lookouts? | | |
| b. Anchor(s) to be manned and ready for letting go when in restricted waters? | | |
| c. Material condition Zebra to be set on the DC deck and below (CO's discretion)? | | |
| d. Navigation lights energized? | | |
| e. Silence on the bridge, all hands on bridge to listen for and report sound signals? | | |
| f. Appropriate fog signal sounded per the Navigation Rules? | | |

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

| ITEM | YES | NO |
|--|-----|----|
| g. A safe speed per the Navigation Rules? | | |
| h. All uncorrelated fog signals identified and a determination made that a risk of collision did not exist before the ship proceeded on? | | |

APPENDIX B

NAVIGATION BRIEF

I. REQUIRED ATTENDANCE:

Commanding Officer
Executive Officer
Operations Officer
Navigator
Engineer Officer
Reactor Officer (when assigned)
First Lieutenant
CIC/CDC Officer
Assistant Navigator (when assigned)
CIC/CDC Surface Watch Officer
Piloting and Shipping Officers
METOC Officer/AG (when assigned)
Helm Safety Officer
Aft Steering Safety Officer
Bridge Sea and Anchor Detail Team (OOD, JOOD, JOOW, Conning Officer)
Helm/Lee Helm
Senior QM and OS
Staff Surface Operations Officer (when assigned)
Other personnel as directed

II. SEQUENCE OF EVENTS:

A. ARRIVAL/DEPARTURE TIME - Navigator

1. Consideration of options

- a. Tides.
- b. Currents.
- c. Operational Requirements.
- d. Speed Restrictions.

2. Operational Requirements

- a. Conditions of readiness.
- b. Tactical situation.

B. WEATHER - Geophysics Officer/AG/Navigator

C. TIDES/CURRENTS - Navigator

1. Tides graphed using the Quarter/Tenth method, for the complete day.

2. Currents graphed using straight-line method.

3. Ebb/Flood velocity and directions at maximum velocity noted on graph. Tides/Currents posted at all ship control stations with copies to CO, XO, NAV, OOD, Conning Officer, etc.

D. ASTRONOMICAL DATA - Navigator: Sunrise, sunset, moonrise, and moonset.

E. CHARTS - Navigator

1. Latest editions with corrections verified (paper and DNC).

2. Corrections/changes since last brief.

3. Type of buoyage system.

4. GPS Datum to be used with each chart.

5. Chart numbers to be used.

F. TRACK - Conning Officer

1. Courses.

2. Turn/danger bearings and ranges.

3. Designated shoal water and danger soundings.

4. Depth of water for channel, turning basin, etc.

5. CIC/CDC and Bridge charts compared.

6. Visual and radar NAV points.

7. Vessel traffic separation scheme.

8. Line of Demarcation.

9. Degaussing area.

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

10. Anticipated traffic.
11. Pier heading.
12. Description of anchorage or mooring.
13. Type of bottom (anchorage).
14. Head/drop bearings.
15. Amount of anchor chain required.
16. Check IN/OUT points along a Narrow Channel or Vessel Traffic Separation Scheme.

G. GROUND TACKLE - First Lieutenant

1. Ready anchor - port/stbd/centerline.
2. Scope of chain.
3. Status of windlass/winches.
4. Special mooring buoy procedures.
5. Mooring plan.
6. Let go or walk out to certain scope.

H. SIGNIFICANT TRAFFIC - Operations Officer

1. Entering/departing movements.
2. Harbor special events.
3. Media coverage.

I. TUGS AND PILOTS - Navigator

1. Tug/Pilot pick up/drop off point/time.
2. Communications.

J. STATUS OF NAV EQUIPMENT - Navigator

1. Compass/repeater errors.

2. Down equipment, impact, and ETR.
3. Backup systems.
4. ECDIS-N navigational systems.

K. STATUS OF ENGINEERING PLANT - Engineer Officer (or
Reactor Officer)

1. Plant status/configuration.
2. Limiting casualties.
3. Degaussing monitors.

L. SPECIAL CONSIDERATIONS/EVENTS - Navigator

1. Honors.
2. Flag Officer movements.
3. Visitors.
4. Helo ops (FOD/VERTREP/PAX Transfer).
5. Boats in the water.
6. Harbor exercises.
7. Accommodation ladder up/down.
8. Debrief schedule.
9. Hot areas.
10. Uniform.
11. Watch Bill.

M. EMERGENCIES - OOD

1. Steering/engineering casualties.
2. Man overboard.
3. Loss of gyros/RADAR/communications.

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

4. Reduced visibility.
5. Emergency anchorage locations.

N. RISK ASSESSMENT-NAVIGATOR

1. Collision.
2. Grounding.
3. Navigation equipment malfunction.
4. Communications failure.
5. Man overboard.
6. Breakdown in Bridge resource management.
7. Steering/propulsion casualty.

III. REVIEW/RETENTION

- A. Navigator will sign and forward for review and approval.
- B. Forward to the Executive Officer for review and signature, and forward to Commanding Officer for approval.
- C. Commanding Officer will approve and sign.
- D. Navigator will maintain file copy as required, but not for less than 6 months.

APPENDIX C

CHECKLISTS

1. Checklist For Getting Underway. Consideration shall be given to the following sample, at a minimum, when developing an underway checklist. The chronological sequence and timeline of events shall be determined by the individual command.

SAMPLE CHECKLIST FOR GETTING UNDERWAY

Date: _____ From: _____
 To: _____

24 Hours Prior to Getting Underway

| <u>Event</u> | <u>Responsibility</u> |
|--|-----------------------|
| 1. Conduct navigation brief. | NAV _____ |
| 2. Assume radio guard. | OPS _____ |
| 3. Arrange for tugs / line handlers. | OPS _____ |
| 4. Verify schedule for lighting off the plant. | ENG/REAC_____ |
| 5. Notify ships in nest. | OPS _____ |
| 6. Check OPORD for required reports. | OPS _____ |

6 Hours Prior to Getting Underway

1. Energize master gyro. _____ ENG/duty IC _____

2 Hours Prior to Getting Underway

1. Ascertain from the XO:
- _____ a. If any variation in the standard time for stationing the Special Sea and Anchor detail. _____ OOD _____
 - _____ b. Disposition of boats.
 - _____ c. Instructions concerning U.S. and guard mail.

- _____ d. Number of passengers and time of arrival.
- _____ e. Uniform for getting underway.
2. Start hoisting boats when OOD no longer OOD _____
requires their use, after obtaining permission
of the XO.
3. Rig in booms and accommodation ladders OOD _____
and secure them for sea, after obtaining
permission of the XO.
4. Have the word passed giving time for OOD _____
getting underway.
5. Energize and check all CIC equipment. CICO _____
6. Conduct radio checks. COMMO _____
7. Shift from shore power to ship's power. ENG/REAC_____
8. Adjust bridge radar repeaters. OOD/CICO _____
- 1 Hour Prior to Getting Underway
1. Set material condition YOKE. DCA/DCPOs _____
2. Clear ship of visitors and inspect CMAA _____
for stowaways.
3. Postal Clerk makes last mail run. PC _____
4. Ascertain time for heaving CDO/OPS _____
around on anchor chain.
5. Check power source, switch operation, ELECO _____
oil level, and manual/electric brakes on Anchor Windlass.
6. Pass word, "All hands shift into the OOD _____
uniform for getting underway."
7. Muster the crew on station. DIVO _____

30 to 60 Minutes Prior to Getting Underway

1. Pass word, "Go to your stations OD(inpt)_____ all special sea and anchor detail" (twice).
When relieved by the OOD underway pass the word, "The Officer of the Deck has shifted his watch from the Quarterdeck to the Pilot House."

2. Man after steering and the OOD/ENG/Helm _____ pilot house. Safety test steering gear, communications, and emergency alarms.

3. Test engine order telegraph OOD/ENG/HSO _____ and revolution indicator.

4. Test underway lights. OOD _____

5. Manned and ready reports from the OOD _____ following stations:

- _____ Forecastle
- _____ Fantail
- _____ Amidships
- _____ Signal Bridge
- _____ Pilot House
- _____ Main Control
- _____ CIC
- _____ After Steering
- _____ Fire Control
- _____ Sonar

6. Test Fathometer. NAV/ASWO _____

7. Test sound powered phone circuits. OOD _____

8. Receive departmental reports of OOD _____ readiness for sea:

- _____ OPS
- _____ WEPS
- _____ SUPPLY
- _____ ENG/REAC
- _____ NAV/ADMIN

- 9. Check all gyro repeaters against master gyro and report error to the OOD. NAV _____
- 10. Record ship's draft both fore and aft. DCA _____
- 11. Direct main control to report when main engines are ready to be tested. Upon receipt of this report, obtain permission from the Commanding Officer to test the main engines and direct main control accordingly. A qualified OOD underway must be on the bridge when testing the main engines. In particular, he shall ensure the stern area is clear, all mooring lines are double and properly secured, and the brow is in such a position that if the ship moves the brow will not be damaged. OOD _____
- 12. Disconnect utility lines from the pier with the exception of phone line. ENG _____
- 13. Complete all pre-underway steering gear PMS checks. AUXO _____
- 14. Complete all SSDG pre-underway PMS checks. AUXO _____

15 to 30 Minutes Prior to Getting Underway

- 1. Rig in booms and davits as boats are hoisted or cleared away. 1st LT _____
- 2. Request permission to get underway from SOPA. OOD _____
- 3. Test ship's whistle. OOD _____
- 4. Alarms set to "at sea" position. ELECO _____
- 5. Test gyro (failure) alarm. ELECO _____
- 6. Test hand-held radios (bridge/fantail/forcastle). COMMO _____

COMNAVAIRFORINST 3530.4/
COMNAVSURFORINST 3530.4
26 Feb 02

Within 15 Minutes Prior to Getting Underway

1. Disconnect phone lines. Duty IC _____
2. Rig in brow. OOD _____
3. If moored to a buoy, take in chain OOD _____
or wire and ride to manila lines when directed.
4. Report, "Ready to answer all bells." ENG _____
5. Pass word, "All hands topside fall OOD _____
into port/starboard for getting underway."
6. Report ready to get underway to the XO, OOD _____
who will report to the CO.

Immediately prior to getting underway

1. Set Restricted Maneuvering in Main OOD _____
Control.
2. Inform Main Control to, "Stand by to OOD _____
answer all bells."
3. Make SECURITE call. JOOD _____
4. Log completion of checklist in the NAV _____
ship's Deck Log.

LOW VISIBILITY CHECKLIST

- _____ 1. Station the low visibility detail.
- _____ 2. Order, "SET MATERIAL CONDITION ZEBRA MAIN DECK AND BELOW" (CO's discretion).
- _____ 3. Energize navigation lights.
- _____ 4. Order, "SILENCE ON THE BRIDGE."
- _____ 5. Sound fog signals according to inland/international rules of the road.
- _____ 6. Shift radio circuits to CIC/CDC.
- _____ 7. Check settings on bridge-to-bridge radio.
- _____ 8. The Commanding Officer will determine which plot is to be designated as primary, but the bridge will plot by GPS; CIC/CDC will retain a radar plot with GPS back up (if available).
- _____ 9. Slow to a safe speed and ensure primary plot has established the ship's position.
- _____ 10. Open bridge wing doors.
- _____ 11. If at trail shaft, order split plant (if applicable).
- _____ 12. Log completion of checklist in the ship's Deck Log.

MINE COUNTERMEASURES/SWEPT CHANNEL CHECKLIST

| <u>Event</u> | <u>24 HOURS PRIOR</u> | <u>Responsibility</u> |
|---|-----------------------|-----------------------|
| 1. Consolidate mine threat intelligence (floating/bottom/influence/magnetic/acoustic). | | ISC_____ |
| 2. Determine transit route and time (consider tides, currents, and depths). | | NAV/CICO_____ |
| 3. Conduct brief (concurrent with NAV brief). | | NAV_____ |
| 4. Review/verify Quiet Ship Bill. | | ENG/ASWO_____ |
| 5. Verify degaussing is operational. | | ELECO_____ |
| 6. Secure cathodic protection. | | EMO_____ |
| 7. Verify lifeboat list is current. | | 1ST LT_____ |
| | <u>1 HOUR PRIOR</u> | |
| 1. Conduct noise survey IAW EOSS MLOC. | | ENG_____ |
| 2. Ensure all personnel possess inflatable life preservers. | | 1ST LT_____ |
| 3. Set Quiet Ship Condition Q1 or Q2 (at CO's discretion). | | OOD_____ |
| 4. Every 15 minutes, pass word: "The ship will enter a mine danger area in ___ minutes." | | OOD_____ |
| 5. Pass word: "Secure all missile hazards throughout the ship." | | OOD_____ |
| 6. Brief mine watch personnel. | | CICWO_____ |
| 7. Set modified material condition ZEBRA main deck and below. | | CICWO_____ |

30 MINUTES PRIOR

1. Prepare mine reports. CICWO_____
2. Ensure prairie/masker air is energized (If ship speed is greater than 5 knots). EOOW_____
3. Display lights/day shapes for ship restricted in ability to maneuver. OOD_____
4. Man repair lockers. DCA_____
5. All topside personnel don life preservers and helmets. OOD_____
6. Station mine watch detail with binoculars. OOD_____
7. Station anchor detail (if applicable). OOD_____
8. Station leadsman (if applicable). OOD_____

10 MINUTES PRIOR

1. Secure Fathometer. OOD/ASWO_____
2. Pass word:
"The ship will enter a mine danger area in ten minutes. All personnel not on watch remain inside the skin of the ship. All non-essential personnel lay to the second deck or above." OOD_____
3. Make the anchor ready for letting go (if applicable). 1ST LT_____
4. Shift DRT trace to 1000 yard scale. CICWO_____

UPON ENTERING MDA

1. Transit at slowest possible speed (7 kts or less if not swept). OOD_____
2. Pass word:
"The ship has entered a mine danger area. All personnel not on watch remain inside the OOD_____

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

skin of the ship. All non-essential
personnel lay to the second deck or above."

3. Log completion of checklist in the ship's OOD_____

Deck Log.

DISPLAY INFORMATION FOR ELECTRONIC NAVIGATION CHECKLIST

1. Completion of the following actions are recommended. The shaded areas represent watches which are manned during open ocean and coastal navigation. During piloting of restricted waters all stations on the checklist will be used.

| Step | Action | Nav. Eval | Vis. Plot | Radar Plot | QMO W | OOD |
|------|--|-----------|-----------|------------|-------|-----|
| 1. | Display command specified charts at all workstations | X | X | X | X | X |
| 2. | Set Time Zone | X | | | X | |
| 3. | Set DR Interval in accordance with the Navigation Plan or in accordance with the Unit Navigation Standards | X | | | X | |
| 4. | Set ORDERED COURSE and SPEED | X | | | X | |
| 5. | Select Velocity Vector | X | | | X | |
| 6. | Select GYRO | X | | | X | |
| 7. | Reset Voyage Log (if start of voyage) | X | | | X | |
| 8. | Start RADAR Overlay | X | | Mode 1 | X | X |
| 9. | Set Collision Avoidance Parameters in accordance with the Navigation Brief or Unit Navigation Standards. | X | | | | X |
| 10. | Activate trackline as specified in the Navigation Brief. | X | | | X | |
| 11. | Set Tide and Current Dynamic Plot as specified in the Navigation Brief. | X | | | X | X |
| 12. | View Navigation Objects | X | X | X | X | X |
| 13. | Check Gyro Heading against displayed gyro heading | X | | | | |
| 14. | Check settings on Doppler Speed Log (Sounding units same as chart, bottom tracking mode) | X | | | X | |
| 15. | Start/Electronic Charting System Checklist | X | | | X | |
| 16. | Print Daily Log | | | | X | |

APPENDIX D

STANDARD DAY'S WORK IN NAVIGATION

OPEN OCEAN NAVIGATION. Weather permitting, minimum daily celestial activity will include the following:

Morning Twilight: Usually 45 minutes before sunrise, shoot available celestial bodies, to include selected stars, planet(s), the moon, and Polaris. Reduce sightings to LOPs, plot on plotting sheet, and determine ship's position. Advance celestial fix to 0800 for 0800 Ship's Position Report. Transfer fix to track chart. Inform CIC/CDC of position.

Early Morning: Determine gyro error by azimuth/amplitude of sun or other celestial body. Include any gyro error noted in 0800 and 1200 Ship's Position Report. Verify Figure Of Merit (FOM) on the WRN-6/GPS and include on position reports.

0800: Submit 0800 Ship's Position Report to Commanding Officer, after being reviewed and signed by the Navigator.

8-12: QMOW compute watch time of LAN (Local Apparent Noon).

Morning: Shoot sun to determine LOP. Plot on plotting sheet.

Mid-morning: Shoot sun to determine LOP. Plot on plotting sheet.

Noon: Observe LAN. Recommend observations be started at 10 minutes before computed time of LAN, and for a couple of minutes after. Reduce sighting and determine ship's latitude. Advance mid-morning sun LOP to LAN LOP on plotting sheet to obtain running fix. Plot running fix on track chart and pass fix information to CIC/CDC. Advance sun LOPs to 1200, for 1200 Ship's Position Report.

1200: Submit 1200 Ship's Position Report to Commanding Officer, after being reviewed and signed by the Navigator.

Afternoon: Shoot sun to determine LOP. Plot LOP on plotting sheet. Advance LAN LOP to afternoon LOP on plotting sheet to obtain running fix (minimum three Sun Lines for R-Fix). Plot running fix on track chart and pass fix information to CIC/CDC.

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

Mid-Afternoon: Shoot sun to determine LOP. Plot LOP on plotting sheet. Advance afternoon LOPs to establish an R-Fix. Plot on track chart and pass information to CIC/CDC.

12-16: QMOW determine time of sunset and star time. Compute celestial bodies available, including planets.

Late Afternoon: Include any gyro error computed in 1200 Ship's Position Report.

Evening Twilight: Usually 30 minutes after sunset, shoot celestial bodies, to include selected stars, planet(s), moon, and Polaris. Reduce sightings to LOPs, plot on plotting sheet, and determine ship's position. Advance celestial fix to 2000 for 2000 Ship's Position Report. Transfer fix to track chart. Inform CIC/CDC of position.

1600-2000: QMOW determine time of sunrise and moonrise/set for Commanding Officer's Night Orders. Also compute star time for morning star shoot. Determine celestial bodies available, including planet(s).

2000: Submit 2000 Ship's Position Report to Commanding Officer, after being reviewed and signed by the Navigator.

0000-0400: Compute Latitude by Polaris, lines of position of the moon and planet(s), as available, and gyro error by Polaris.

All celestial work must be documented in the ship's Navigation Workbook with the Navigator's signature at the end of each celestial day. When using computer software (i.e., STELLA), documentation of all observations must be maintained in a loose-leaf binder.

APPENDIX E

QMOW TURNOVER CHECKLIST

SAMPLE

INVENTORY

___ CHRONOMETER COMPARISON/Report
submitted
___ NIGHT ORDERS
___ NAVIGATION BILL
___ QMOW PASS DOWN LOG
___ BEARING BOOK
___ POSITION LOG
___ NAUTICAL ALMANAC
___ MAGNETIC COMPASS BOOK
___ STAR LOG
___ NAVIGATION WORKBOOK
___ NAVIGATION RULES
___ CHART 1
___ VOYAGE PLANNING WORKSHEET
___ DECK LOG/EXTRA SHEETS
___ POSITION REPORT/EXTRA SHEETS
___ WEATHER OBSERVATION LOG/EXTRA
SHEETS
___ 8/12/20 O'CLOCK REPORTS

CELESTIAL

SUNRISE/SUNSET _____/_____
MOONRISE/MOONSET _____/_____
AZIMUTH/AMPLITUDE _____
SUN LINES/LAN _____
STARS/PLANETS PREPARED _____

WEATHER

BAROMETER _____
WIND _____
AIR/SEA TEMPERATURE _____/_____
HEAVY WEATHER MESSAGES PLOTTED _____
LAST FAX/NEXT FAX _____

EQUIPMENT STATUS

GPS ___ RADAR ___
LORAN-C ___ SINS ___
FATHOMETER ___
MAIN/AUX GYRO ___/___
WSN ___ EM LOG ___
HELM REPEATER ___
AFTER STEERING REPEATER ___
MAGNETIC COMPASS ___
BRIDGE WING REPEATERS ___
ECDIS-N SYSTEM ___

INTENTIONS

DR COURSE/SPEED _____/_____
FIX INTERVAL _____
PIM TRACK COURSE _____
PIM TRACK SPEED _____
TRACK LEFT/RIGHT _____
TRACK AHEAD/BEHIND _____
NEXT TURN POINT/TIME _____/_____
SET _____
DRIFT _____
CIC/CDC FIX COMPARISON _____
EXPECTED AIDS/LANDFALL _____
SHIPS IN COMPANY _____
STEAMING FORMATION _____
FORMATION GUIDE _____

SENIOR QM

REMARKS:

NAVIGATOR

REMARKS:

APPENDIX G

SHIP'S POSITION REPORT (NAVSHIP 9240/1)

1. Purpose. To provide a means of reporting the ship's position.
2. Format. Required information:
 - a. At (time of day) - 0800, 1200, or 2000.
 - b. Date - current date.
 - c. Latitude/Longitude - the DR LAT/LONG at 0800, 1200, or 2000.
 - d. Determined at - the time of the fix from which the position was obtained.
 - e. By (indicate by check box.).
 - f. Set/Drift.
 - g. Distance made good since (Time) (Miles) - the distance traveled since the last report, always computed from position report to position report.
 - h. Distance to - always to the ultimate destination.
 - i. ETA - the estimated time of arrival at the ultimate destination, expressed as a date/time group.
 - j. True heading - the heading of the ship corrected from gyro error.
 - k. Error - the gyro error previously computed.
 - l. Variation - the angular difference between the true North Pole and the magnetic north pole, as determined from the chart compass rose.
 - m. Magnetic Compass Heading - (Check one) the magnetic compass check.
 - n. Deviation.

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

o. Table deviation - the deviation from Form 1104 that was predetermined for the magnetic compass.

p. Degaussing (DG) (Indicate by check in box) - status of degaussing, on or off.

q. Remarks - GPS Figure Of Merit (FOM) values and additional information from the Navigator to the Commanding Officer.

r. Respectfully submitted by (Navigator) - the Navigator's signature. CC - Carbon Copy to embarked staff, CIC/CDC, and (1) to file.

3. The QMOW/PLOT watch will fill out and submit the position report to the Assistant Navigator/Senior Quartermaster.

4. Responsibility for review and approval. The Navigator is responsible for position reports. The Navigator will approve them by signature before submission to the Commanding Officer, embarked staff, and CIC/CDC.

5. Disposition. The duplicate ship's position report will be kept as may be convenient.

6. Responsibility for maintenance. The Assistant Navigator is responsible for maintaining the file of duplicate position reports.

APPENDIX H

ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEMS-NAVY (ECDIS-N)

- Ref: (a) OPNAVINST 9420.2 IMPLEMENTATION OF THE ELECTRONIC
CHART DISPLAY AND INFORMATION SYSTEM-NAVY (ECDIS-N)
CERTIFICATION PROCESS
(b) NAVSEAINST 9420.4 CERTIFICATION OF NAVIGATION SYSTEMS
(NAVCERT)

1. Only Department of Defense (DoD) approved position/navigation systems and software are authorized for navigation purposes. Advances in electronic databases, operating systems and computer technology have facilitated the widespread deployment of digital display systems to the fleet and the use of electronic charts and display and information systems at sea. In addition, the advent of continuous and automated positioning systems, such as the Global Positioning System (GPS) and Inertial Navigation System (INS), have made it possible to take maximum advantage of electronic charting, eliminating many constraining aspects of navigation by paper chart while significantly advancing safety of navigation. **While the interim use of electronic systems for enhanced situational awareness is acceptable, U.S. Navy vessels may not use these systems in lieu of paper charts. ECDIS-N standards must be approved; systems fielded, tested, and certified; and NIMA must provide updated and continuously maintained electronic chart products to the fleet before U.S. Navy vessels may go paperless.**

2. The Navy must ensure interoperability among various ECDIS-N systems and between ECDIS-N systems and other systems. The Navy will achieve interoperability by mandating standards and functional requirements for ECDIS-N and associated electronic charts in accordance with the following Defense Information and Infrastructure Common Operating Environment (DII COE) requirements:

a. Navy standard automated and continuous positioning systems and approved navigation and piloting procedures will be used for position reference. In addition to accepting continuous position systems data for navigation and piloting, ECDIS-N will accept radar and visual navigation fix information.

b. Department of Defense (DoD) standard products and datum will be employed as follows:

26 Feb 02

(1) Standard products and services are defined as those which are produced by NIMA. NIMA produces all electronic charts on WGS-84, maintains these products, and provides them directly to the fleet.

(2) World Geodetic System-84 (WGS-84) is the standard datum.

(3) Vector Product Format (VPF) is the standard digital data format that will support ECDIS-N on board all U.S. Navy vessels.

(4) The standard products that support navigation on board U.S. Navy vessels are defined as follows:

| Digital Product | Paper Equivalent | Classification |
|------------------------------|---|--------------------|
| Digital Nautical Chart (DNC) | General, Coastal Harbor, and Approach | Unclassified |
| Tactical Ocean Data (TOD) 0 | OPAREA, Range markings Limited Distribution | |
| Tactical Ocean Data (TOD) 1 | Bottom Contour | Confidential |
| Tactical Ocean Data (TOD) 2 | Bathymetric Navigation Planning | Secret |
| Tactical Ocean Data (TOD) 3 | TBD | As required |
| Littoral Warfare Data (LWD) | Combat Chart | Confidential |
| Vector Database Update (VDU) | Notice to Mariners | Depends on Product |

3. ECDIS-N must incorporate safe navigation and piloting functionality at a minimum. ECDIS-N functionality is based on IMO Resolution A.817 (19) adopted on 23 November 1995, which is the International Maritime Organization (IMO) performance standards for Electronic Chart Display and Information Systems (ECDIS) as established for civil shipping. U.S. Navy vessels are not required to comply with IMO resolutions. In setting standards in keeping with safe maritime operations, however, the Navy will follow DoD mandates to use commercial standards wherever possible. Therefore, deviations from civil guidance will be limited to those required for unique military applications and approved naval navigation and piloting procedures. All electronic charting data used for navigation

26 Feb 02

must be maintained using the most current NIMA databases and updates available.

4. ECDIS-N capability began limited fleet introduction in FY98 to enhance situational awareness and initiate the transition to a certified ECDIS-N system. The goal is full fleet implementation by FY04. The Navy requirement for paper charts from NIMA as the primary source of navigation information will continue until all U.S. Navy vessels implement ECDIS-N. Information on the status of ECDIS-N initiatives is promulgated through periodic notices and navigation bulletins and can be obtained from various online sources, including the Navy's navigation web site at the following URL:
<http://www.navigator.navy.mil>

5. Ships with ECDIS-N systems must meet the following requirements to receive ISIC certification for electronic navigation:

- a. Have a DOD approved ECDIS-N system installed.
- b. Verify ECDIS-N System Certification via SPAWAR NAVCERT process.
- c. ISIC conducted Navigation Assessment, meeting ECDIS-N Certification Requirements stated below. ISICs are directed to use appropriately trained personnel to conduct navigation team examinations prior to issuing approvals for paperless navigation.
- d. ISICs shall report to TYCOMs, via message, ship approval to navigate electronically. See sample message on **H-12**.

ECDIS-N Certification Requirements

(To be conducted once per IDTC)

| STANDARD | Yes | No |
|--|-----|----|
| TRAINING | | |
| Has Navigator completed ECDIS-N Navigation Operator Course (A-061-0030)? | | |
| Has Senior QM completed ECDIS-N Navigation Operator Course (A-061-0030)? | | |
| Has Bridge Display Operator completed ECDIS-N Navigation Operator Course (A-061-0030)? | | |

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

| | | |
|---|------------|-----------|
| Has Piloting Officer completed ECDIS-N Navigation Operator Course (A-061-0030)? | | |
| Has CIC/CDC Display Operator completed ECDIS-N Navigation Operator Course (A-061-0030)? | | |
| Have Maintenance Technicians attended Information Systems Maintenance Technician COI (A-150-2300)? | | |
| Does the ship have two graduates of the Information Systems Maintenance Technician COI (A-150-2300)? | | |
| DISPLAY | Yes | No |
| Do DNCs display correctly? | | |
| Can operator present a standard display at any time by a single operator action? | | |
| Display base? | | |
| All other Info? | | |
| Can the operator add or remove information from the display? | | |
| Can the operator select a safety contour from the depth curves provided? | | |
| Does the system emphasize soundings equal to or less than the safety depth whenever soundings are selected for display? | | |
| Are DNC updates displayed without any degradation of their information content? | | |
| Are DNCs and all updates correctly loaded into the SDNC? | | |
| SYSTEM SET UP | Yes | No |
| Can operator set up primary sensors? | | |
| Heading source? | | |
| Ground speed source? | | |
| Water speed source? | | |
| Position Source? | | |
| Can operator set up secondary sensors? | | |
| Set and Drift Sensor/Change Data? | | |
| Depth Sensor/Change Data? | | |
| Draft Sensor/Change Data? | | |
| Wind Sensor/Change Data? | | |
| Units of Measure? | | |
| Safety Configurati?ion | | |
| SPECIAL EVENTS | Yes | No |
| Can operator enter an Event Marker? | | |
| Man Overboard? | | |
| Anchoring? | | |

| PROVISION AND UPDATING OF CHART INFORMATION | Yes | No |
|---|------------|-----------|
| Is the latest edition of the DNC originating from NIMA being used? | | |
| Can the operator request and provide access to the date/edition of each DNC library? | | |
| Can the operator use the latest edition IHO S-57 format ENC: When DNC data are not available for a specific geographic area? | | |
| DNC data for the area are more than 90 days out of date? | | |
| Required by joint operations governed by WECDIS? | | |
| Are the contents of the SDNC adequate and up-to-date for the intended voyage? | | |
| Are updates stored separately from the DNC? | | |
| Can operator update the DNC via VDU? | | |
| Are updates automatically applied to the SDNC? | | |
| Can operator display updates for review and ascertain they have been included in the SDNC? | | |
| SCALE | Yes | No |
| Does the operator receive an indication whenever the information is displayed at a larger scale than that contained in the DNC? | | |
| When own ship's position is covered by a DNC at a larger scale than that provided by the display? | | |
| DISPLAY OF OTHER NAVIGATIONAL INFORMATION | Yes | No |
| Can operator add radar information to the ECDIS-N display? | | |
| Can radar vectors be added in relative? | | |
| True? | | |
| Can operator remove the radar information by single operator action? | | |
| Can operator enter bearing and distance LOPs from own ship to charted aids to navigation and conspicuous objects? | | |
| Can operator enter bearings as true? | | |
| Relative? | | |
| Can operator generate and display minimum number of LOPs to resolve into a "fix" or an "estimated position?" | | |
| Can operator enter gyrocompass error into the system? | | |

26 Feb 02

| | | |
|---|------------|-----------|
| Can operator display concurrently both the assumed ship's position and the LOPs drawn from objects shot? | | |
| Can operator visually compare the following: a) ship's position derived from a continuous positioning system (e.g., GPS, INS), and b) an estimated position (EP) which has been continuously updated by applying set and drift values to a dead reckoned position which was projected from a LOP fix? | | |
| Can operator specify (minimum of 2) number of dead reckoning intervals? | | |
| DISPLAY MODE AND GENERATION OF THE NEIGHBORING AREA | Yes | No |
| Can operator display the SDNC in a "north-up" orientation? | | |
| True-Motion mode? | | |
| Can operator manually change the chart area and the position of own ship relative to the edge of the display? | | |
| COLORS AND SYMBOLS | Yes | No |
| Can operator select whether own ship is displayed in true scale or as a symbol? | | |
| DISPLAY REQUIREMENTS | Yes | No |
| Can operator display route planning and supplementary navigation tasks? | | |
| Route monitoring? | | |
| ROUTE PLANNING MONITORING AND VOYAGE RECORDING | Yes | No |
| Has the Commanding Officer approved the ship's navigation route plan? | | |
| Has the operator been presented an indication that the route plan has been approved by the Commanding Officer (If a previously approved route plan is modified, it must be re-approved by the Commanding Officer)? | | |
| Can operator carry out route planning, including both straight and curved segments? | | |
| Can operator adjust a planned route by: Adding waypoints to a route? | | |
| Deleting waypoints from a route? | | |
| Changing the position of a waypoint? | | |
| Changing the order of the waypoints in the route? | | |

26 Feb 02

| | | |
|--|------------|-----------|
| Can operator plan an alternative route in addition to the selected route? | | |
| Is selected route clearly distinguishable from the other routes? | | |
| Can operator show distance from nearest land? | | |
| ROUTE MONITORING | Yes | No |
| Can operator return to the route monitoring display covering own ship's position immediately by a single operator action? | | |
| Has an alarm been set to sound if the ship, within a specified time set by the operator, is going to cross the safety contour? | | |
| Is an alarm or indication available, as selected by the operator, if the ship, within a specified time set by the operator, is going to cross the boundary of a prohibited area or of a geographical area for which special conditions exist? | | |
| Is an alarm indicated when the limit for deviation from the planned route specified is exceeded? | | |
| The ship's position shall be derived from a continuous system with accuracy consistent with the requirements of safe navigation. A second independent positioning method of a different type shall be provided. Can operator select the source he/she wants to use and identify which source is being used? | | |
| Is operator provided an alarm when the input from the position-fixing system is lost? | | |
| Can operator define critical points and the time or distance at which an alarm shall be given? | | |
| Does the positioning system and the SDNC reference WGS-84? | | |
| Can operator display time-labels along ship's track? | | |
| Can operator display adequate number of points, free movable electronic bearing lines (EBL), variable and fixed-range markers, and other symbols required for navigation purposes? | | |
| Can operator enter the geographical coordinates of any position and then display that position on demand? | | |

26 Feb 02

| VOYAGE RECORDING | Yes | No |
|--|------------|-----------|
| Can operator reproduce minimum elements required to reconstruct the navigation and verify the official database used during the previous 12 hours? | | |
| Was the following data recorded: Time, position, heading, and speed (one-minute intervals)? | | |
| DNC and TOD source, edition, date, library and update history (initially and for each change)? | | |
| PERFORMANCE TESTS, MALFUNCTION ALARMS, AND INDICATIONS | Yes | No |
| Can the technician carry out shipboard diagnostic tests of major functions either automatically or manually? | | |
| Can the Operator detect suitable alarms or indications of system malfunction? | | |
| BACKUP ARRANGEMENTS | Yes | No |
| Can the operator transfer to the backup system within 3 minutes of a critical navigation situation? | | |
| POWER SUPPLY | Yes | No |
| Can equipment necessary for normal functioning operate when supplied by an emergency source of electrical power? | | |
| Can equipment maintain full operation at one console upon loss of ship's electrical power for a minimum period of 30 minutes? | | |
| Is ECDIS-N backup power supply separate from the ECDIS-N primary power supply? | | |
| OPERATIONAL ISSUES | Yes | No |
| Can operator display the platform's present course over ground (COG) and speed over ground (SOG)? | | |
| In the event of a failure to the automatic data entry mechanism(s), can operator enter manual input of position and heading data? | | |
| Can operator enter (either automatically or manually) and display data inputs of: Visual position information? | | |
| Radar position information? | | |
| Depth of water beneath the keel? | | |
| Relative wind speed and direction? | | |

26 Feb 02

| | | |
|---|------------|-----------|
| Can operator configure system for "magnetic heading mode of operation?" | | |
| Corrections for magnetic deviation shall use a lookup table specific to the source from which the reading was taken. Is lookup table available? | | |
| Is operator capable of displaying, processing and storing classified data commensurate with the mission security requirements of own ship? | | |
| REQUIRED SUPPORT | Yes | No |
| Are the following support items available: Operator and maintenance technical manuals? | | |
| Planned maintenance system documentation and maintenance requirement cards? | | |
| Allowance parts lists and a detailed drawing package? | | |
| DISPLAY OF CHART INFORMATION | Yes | No |
| Can operator use intermediate display scales, or zoom in between scales? | | |
| SUPPLEMENTARY DISPLAY FUNCTIONS | Yes | No |
| Can operator add the following symbols, lines and areas to the SDNC and revise or delete them: The caution (!) or information (i) symbol used to call up a note on the text display by cursor picking? | | |
| Simple lines and areas with or without color fill, set up for cursor picking to give explanatory note in the text display? | | |
| Any of the symbols in GeoSym? | | |
| Text notes? | | |
| UPDATE OF CHART INFORMATION | Yes | No |
| Is operator using newest edition of DNC ® or TOD data received from NIMA? | | |
| Can operator update chart information using VDU (Via CD-ROM or through an electronic network)? | | |
| Can operator verify update was applied correctly (Update flagged invalid in the record of updates and/or reject corrupted files)? | | |
| Can operator apply manual entry of unofficial updates (To point objects and simple line and area objects such as traffic routing schemes, restricted areas, and shoreline constructions)? | | |

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

| | | |
|--|--|--|
| Can operator remove from the display any manual update(s)? | | |
| Is a record of updates through a log file available? | | |
| Does the log file indicate if each update has been applied to or rejected from the SDNC? | | |

26 Feb 02

Example ISIC Navigation Assessment Qualification ReportADMINISTRATIVE MESSAGE

ROUTINE

R XXXXXXXZ FEB 02

FM COMPHIBGRU TWO

TO COMNAVSURFLANT NORFOLK VA//N3/N6/N7/N8//

USS SHIP

INFO CNO WASHINGTON DC//N096/N63/N633//

CINCLANTFLT NORFOLK VA//N3/N37/N435/N66/N72//

COMSECONDFLT

COMAFLOATRAGRULANT NORFOLK VA//00/01//

COMAFLOATRAGRU NORFOLK VA//N3//

BT

UNCLAS //N03530//

MSGID/GENADMIN/COMPHIBGRU TWO/-/FEB//

SUBJ/USS SHIP (HULL NUMBER) NAVIGATION ASSESSMENT QUALIFICATION
REPORT//

REF/A/DOC/OPNAV/15FEB01//

REF/B/GENADMIN/SPAWAR/XXXXXXZMMMY//

REF/C/DOC/CNSL-CNSP/17DEC99//

REF/D/DOC/CNAF-CNSF/DDMMYY//

REF/E/DOC/CINCLANTFLT-CINCPACFLT/DDMMYY//

AMPN/REF A IS OPNAVINST 9420.2 (ECDIS-N CERTIFICATION INST).

REF B IS NAVCERT MSG. REF C IS CNSL-CNSPINST 3502.2E

(SURFTRAMAN). REF D IS CNAF-CNSFINST 3530.4B (NAVDORM). REF E
IS CINCLANTFLT-CINCPACFLT INST 3530.1 (SURFACE SHIP AND
SUBMARINE SEAMANSHIP AND NAVIGATION INST).//RMKS/1. IAW REF A, USS SHIP NAVIGATION EQUIPMENT CERTIFICATION
WAS COMPLETED ON DD MMM YY AND IS DOCUMENTED AS REF B.2. IAW REFS C AND D, A CREW PROFICIENCY NAVIGATION ASSESSMENT
WAS COMPLETED ON DD MMM YY. DETAILS OF THE ASSESSMENT WERE
DISCUSSED WITH THE COMMANDING OFFICER.3. IAW REF E, USS SHIP IS AUTHORIZED FOR UNRESTRICTED
NAVIGATION OPERATIONS INCLUDING USE OF ECDIS-N.//

BT

NNNN

NOTE: Pacific Fleet units use appropriate "PAC" addresses.

APPENDIX I

Digital Flux Gate Magnetic Compass

1. The Digital Flux Gate Magnetic Compass (DFGMC) is a replacement for the Navy standard magnetic compass, designed to improve accuracy by removing deviation from the compass equation. Ship design engineers have long battled the effect of steel hulls, degaussing, and various electrical systems each producing compass deviation. Annual swing-ship is designed to ensure compass compensating systems are properly set to minimize the effects of the shipboard environment and measure resulting deviation. This procedure is often tedious and on many ship classes still produces poor results. The DFGMC provides a solution by positioning the flux gate sensor atop the mast away from ship's magnetic fields and incorporating an internal auto-compensating algorithm. DFGMC auto-compensation corrects for changes in ship's magnetic field each time a 360° turn is completed, setting the resulting compass deviation to zero. This feature allows the compass to correct for minute changes in magnetic signature and the local operating environment.

2. In order to utilize the DFGMC, compass operation, adjustment procedures, and limitations must be thoroughly understood. These procedures can also be found in the DFGMC tech manual.

a. Operation. The DFGMC offers several functions not found on conventional compasses. It is imperative that key members of the Navigation Team understand these functions and are aware of the compass' current operating mode. A summary and guidance of key features is offered below:

(1) SET COURSE MODE. A reference heading may be set in memory by pressing the "SET CRS" pushbutton in accordance with the technical manual. In this mode compass heading is displayed along with bar segments indicating deviation of current course from the reference heading in 5° increments. This mode does not detract from normal compass operation and may be implemented as the CO or OOD directs.

(2) DISPLAY RESPONSE DAMPING. This toggle switch selects one of three fixed values of display damping. In the "FAST" position, the display is updated every three seconds, in "MED" every nine seconds, and in "SLOW" every 17 seconds. This switch should be set on "FAST" when operating in restricted

26 Feb 02

waters. When operating in rough seas or at high speeds "MED" or "SLOW" may be selected to slow display updates.

(3) CONTINUOUS AUTO-COMPENSATION. In this mode, the DFGMC checks the stored calibration against present accuracy each time the ship completes a 360° turn over a two minute period. WHILE OPERATING IN RESTRICTED WATERS, THIS MODE WILL ALWAYS BE DISABLED. While at sea, this mode will always be enabled, except on small craft whose magnetic condition does not appreciably change. Continuous Auto-Compensation will help compensate for compass error caused by the ship's degaussing system. To alert the operator that Continuous Auto-Compensation is enabled, the display will flash "CAL" and "ON" every minute and return to the heading display.

(4) PRE-SET VARIATION. The DFGMC determines and displays MAGNETIC HEADING (COMPASS HEADING auto-compensated for DEVIATION). Local VARIATION may be pre-set in the compass to convert magnetic heading to true heading automatically. The default setting is 0°, which equates to magnetic head. Variation depends greatly on one's position on the earth's surface. The Commanding Officer must set policy guiding the use of this function in the Ship's Navigation Bill for open ocean transits (**For restricted water transits the heading display will ONLY be MAGNETIC COMPASS HEADINGS**). If used, the Navigation Team must be aware that compass heading equates to true heading, and no correction for variation is required. Procedures must also be in place to ensure the setting is adjusted for local variation as listed on the current chart in use. The following guidance is promulgated:

(a) The compass will be set in accordance with ship's doctrine and verified or updated each day underway in conjunction with checking gyro error. This may be completed in conjunction with (b) below.

(b) If pre-set variation is used, in addition to daily checks required in (a), it will also be checked against local variation every time charts are shifted.

(c) Loss of Gyro procedures will include checking variation to ensure it is correctly set in accordance with ship's doctrine.

b. Adjustments

(1) ALIGNMENT ERROR ADJUSTMENT. This procedure is normally required only to correct for minor misalignments between the Processor Unit (containing the flux gate magnetic sensor) and the ship's centerline. Completion of this procedure is referenced in MIP 4211/017, MRCs R-1 or R-2 depending on which DFGMC model is installed. Alignment Error Adjustment must be conducted in conjunction with the appropriate MRC:

- Following system installation.
- Following removal/replacement of the Processor Unit.
- At least annually.

Degaussing may be energized or de-energized during the adjustment, as long as it is not changed. At least two auto-compensation procedures must be completed after degaussing is set, just prior to the adjustment procedure. The following steps provide specific guidance for the completion of Alignment Error Adjustment.

(a) Hold course in each of the four cardinal headings (000°, 090°, 180°, and 270°). As the ship steadies up on each course, record the difference between compass heading and ship's gyro heading (TRUE). Errors resulting from readings left of actual heading (WEST) are negative (-), and errors right of actual heading (EAST) are positive (+). The observed error between COMPASS HEADING and TRUE HEADING is compass DEVIATION + magnetic VARIATION.

(b) Apply local magnetic VARIATION to compass error on each cardinal heading to determine compass DEVIATION. If the resulting deviations are approximately the same and not zero, a sensor alignment correction is required.

(c) To determine the sensor alignment correction factor, average the four cardinal heading deviations. If the resulting error is negative (WEST), the sensor correction factor is positive, and vice versa.

(d) Enter the sensor correction factor in the DFGMC according to instructions in the tech manual. Remember negative errors (errors WEST, or left of actual heading) require a positive correction factor and positive errors require a negative correction factor.

(e) After entering the correction, ensure the DFGMC is not turned off for at least 10 seconds in order for the new

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

correction factor to be permanently stored in non-volatile memory.

(f) Record the sensor correction factor on the compass card and in the Deck Log. On the compass card, deviations observed on each of the four cardinal headings should be recorded in the appropriate column (DG ON or OFF) and the rest of the deviation entries left blank. The Compass Correction Factor should be recorded as a + or - value under "TYPE CC COILS" at the top of the card. "TYPE CC COILS" should be crossed out in ink and "CORRECTION FACTOR" entered in the space just above. All entries for magnet/sphere adjustments should be labeled as N/A. RECORDED DEVIATIONS ARE FOR DFGMC ADJUSTMENT ONLY, NOT FOR USE DURING NAVIGATION. Actual DFGMC deviation is zero if the correction factor is entered in the DFGMC and auto-compensation is current.

(1) INTENTIONAL AUTO-COMPENSATION. This procedure is required whenever compass heading is suspect. It should be the first course of action whenever changes in the magnetic environment may have affected compass accuracy, for example when degaussing is energized or de-energized and when practical, prior to operating in restricted maneuvering. Procedural steps are outlined in MIP 4211/017, MRCs R-1 or R-2, depending on the DFGMC model installed, and are summarized below:

(a) Enter the DFGMC calibration mode as described in the operational/technical manual.

(b) Maintaining speed and rudder angle, complete two full 360° circles. Ensure turn rate does not exceed approximately 3° per second so that each turn takes more than two minutes to complete.

(c) Note the three digit calibration score as listed in the technical manual. The first digit indicates the quality of the compensation and should be as close to "9" as possible. The second digit indicates the quality of the magnetic location of the sensor (1-9). On steel superstructure ships it should read at least "2;" on aluminum superstructures at least "7." The final digit is a roll over counter indicating each time a new compensation has been accepted.

c. Limitations. Once the operation and adjustment procedures are completed, there are certain limitations that must be understood. Due to the nature of DFGMC auto-compensation, it is not always possible to complete the

26 Feb 02

procedure when the magnetic environment changes. For example, after degaussing is energized the ship may not be able to immediately complete two 360° turns. A case to consider occurs when the ship leaves port. Degaussing may have been cycled through several states prior to a degaussing range run. Also, the DFGMC does not have compensation coils used with the Navy Standard Magnetic Compass (wet compass) and therefore, does not automatically compensate for changes in the ship's degaussing system. The following guidelines apply:

(1) Gyro Casualty. With a DFGMC, it is even more imperative to use magnetic checking courses to determine course to steer in the case of a gyro casualty. A loss of gyro can cause unpredictable fluctuations in ship's degaussing which in turn can affect the DFGMC. Intentional auto-compensation must be completed as soon as possible after degaussing is set in manual and stabilized. It is not always possible to complete auto-compensation procedures, and unlike a conventional magnetic compass, compass deviation cannot be measured for later use in course calculations. The DFGMC heading must be considered suspect until verified, or until auto-compensation is completed.

(2) Auto-compensation should normally be completed within 24 hours prior to operating in a restricted maneuvering environment. Degaussing should be set in its intended mode of operation and not energized or de-energized following the check. As a rule, the procedure should be completed whenever steering checks are required (i.e., as a part of the "Entering Port" or "Underway Replenishment" checklist). This will ensure the compass has been set with minimal deviation.

(3) If auto-compensation cannot be completed, the ship will always attempt to keep degaussing set in the same position as during the last auto-compensation prior to entering restricted maneuvering. This will help minimize magnetic field changes that may affect the compass.

(4) If possible, the Navigator should study the effects of energizing and de-energizing degaussing on the DFGMC. This may help the Navigation Team predict the effects of degaussing.

3. The DFGMC is an authorized replacement for the conventional magnetic compass. As long as the operational and adjustment procedures are practiced and compass limitations are well understood, the DFGMC offers excellent accuracy with reduced maintenance. At the Commanding Officer's discretion, ships with

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

both a conventional compass and DFGMC may place the conventional compass in lay-up in order to reduce maintenance requirements. In accordance with the ship's gauge calibration instruction, an "Out Of Commission" sticker will be placed on the compass in plain view of the helmsman. This may be on the compass face itself in order to obstruct compass reading.

COMNAVAIRFORINST 3530.4/
COMNAVSURFORINST 3530.4
26 Feb 02

APPENDIX J

FIGURE OF MERIT (FOM) TO ESTIMATED POSITION ERROR

| Figure Of Merit | ESTIMATED POSITION ERROR | | |
|-----------------------|--------------------------|-----------------|------------------|
| | Meters | Feet | Yards |
| 1 | Less than 25 | Less than 82 | Less than 27.3 |
| 2 | Less than 50 | Less than 164 | Less than 54.7 |
| 3 | Less than 75 | Less than 246 | Less than 82 |
| 4 | Less than 100 | Less than 328 | Less than 127.3 |
| 5 | Less than 200 | Less than 656 | Less than 218.6 |
| 6 | Less than 500 | Less than 1640 | Less than 546.6 |
| 7 | Less than 1000 | Less than 3280 | Less than 1093.3 |
| 8 | Less than 5000 | Less than 16400 | Less than 5466.6 |
| 9 | Unknown | Unknown | Unknown |

APPENDIX K

Navigation Training Resources

1. Safe and efficient navigation in practice is highly dependent upon an effective program of training for all navigation and ship control personnel. Analysis of navigation incidents has repeatedly cited lack of professional knowledge as a significant contributor and in some cases has been among the primary causes of these incidents. Ships are encouraged to develop and implement an aggressive training plan for navigation and to make optimum use of every opportunity to conduct navigation training, including incorporation of training into the Navigation Brief, during allotted Marine Safety International (MSI) simulator sessions, and while debriefing navigation evolutions.

2. Immediate Superiors in Command (ISICs) are encouraged not only to assess Navigation Team performance on their ships but also to test requisite knowledge of all Navigation Team and shiphandling personnel during every phase of the ship's life cycle. Topics include but are not limited to Rules of the Road, Piloting Procedures, GPS Capabilities and Limitations, Basic Hydrography and Charting, Operational Risk Management, and Case Study Analysis.

3. The following resources are available to assist Navigators and Training Officers in developing their training curriculum:

NAVY-WIDE RESOURCES

Navigator of the Navy Training Resources for the Navigator

URL: <http://www.navigator.navy.mil/navigator/training.html>

Point of contact: DSN 762-0265, Commercial: (202) 762-0265

Resources Available:

Geospatial Information and Services Handbook

Prepared Lessons (PowerPoint Format):

Datums

Coordinates

Coordinates and Datum Transformations

Product Accuracy

COMNAVAIRFORINST 3530.4/

COMNAVSURFORINST 3530.4

26 Feb 02

GPS Fundamentals

Electronic Charts: Raster and Vector Formats

NIMA Product Distribution

Electronic Chart Display and Information System Navy
(ECDIS-N) I

Electronic Chart Display and Information System Navy
(ECDIS-N) II

What is an Electronic Nautical Chart (ENC)?

Digital Nautical Chart (DNC)

Naval Safety Center

URL: <http://safetycenter.navy.mil/>

Point of Contact: afloat@safetycenter.navy.mil

Resources available:

Interactive Case Study Analysis

Operational Risk Management Training

Sanitized Afloat Mishap Reports

Best Business Practices (Lessons Learned)

LANTFLT RESOURCES

Afloat Training Group Atlantic

Afloat Training Group Norfolk

Afloat Training Group Mayport

Afloat Training Group Ingleside

PACFLT RESOURCES

Afloat Training Group Pacific

Afloat Training Group PACNORWEST DET

Afloat Training Group Hawaii

Afloat Training Group Yokosuka

COMNAVAIRFORINST 3530.4/
COMNAVSURFORINST 3530.4
26 Feb 02

Fleet Training Center San Diego

OUTSIDE AGENCY RESOURCES

USCG Navigation Training

Marine Safety International (MSI)

DOD GPS Support Center