

航海概论

Introduction to Marine Navigation

(英文版)

主编 何庆华 吕红光

主审 张吉平



大连海事大学出版社

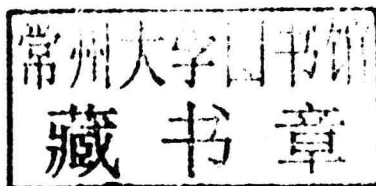
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Abstract

This book consists of 13 chapters, of which the contents include the major courses of navigation skills. Chapter 1 introduces shipboard organization and seafarers' responsibilities. Chapter 2 introduces the types of ships, the shapes of ships, ship's dimensions, volumes and weights, and ship's marks. Chapter 3 discusses ship's equipment covering marine power plants, manoeuvring equipment, cargo handling equipment and safety equipment. Chapter 4 introduces ship's navigation performances including buoyancy, stability, insubmersibility, swiftness, seakindliness and manoeuvrability. Chapter 5 is about the basic knowledge of navigation. Chapter 6 discusses how to fix ship's position by dead reckoning, landmarks, electronic equipment and celestial methods. Chapter 7 introduces the key points of meteorology and oceanography which are closely related to navigation. Chapter 8 discusses navigation and watchkeeping and you can learn how to make passage plan, how to make watchkeeping and what an Officer on watch should do when the ship is navigating in hazardous condition. Chapter 9 introduces communication covering flag signaling, flashing light signaling, sound signaling and radio communication. Chapter 10 discusses how to handle a ship. Chapter 11 introduces collision avoidance. Chapter 12 briefly introduces shipping methods and cargo documents. Chapter 13 discusses how to handle cargo.

This book is to be used as a textbook for the course of *Introduction to Marine Navigation* for non-navigation technology students. It may also be used by mariners as general reference, in order to obtain some knowledge of navigation.

Preface

In trying to teach *Introduction to Navigation* in English at Dalian Maritime University, it has become necessary to have an English version textbook to present this course.

This textbook was jointly written by Capt. He Qinghua, Associate Professor of Dalian Maritime University, Mr. Lv Hongguang, Mr. Bai Chunjiang, Ms. Yu Shihui, Mr. Wang Wenxin, and Mr. Zhao Jian, Lecturers of Dalian Maritime University. Chapters 1, 2, 3, 4, 9, 10, 11, Section 8.2 were written by Capt. He Qinghua; Chapter 5, Sections 6.3, 6.4, 8.1 and 8.3 were written by Mr. Lv Hongguang; Chapter 7 was written by Mr. Bai Chunjiang; Chapter 12 was written by Ms. Yu Shihui; Chapter 13 was written by Mr. Wang Wenxin; Sections 6.1 and 6.2 were written by Mr. Zhao Jian. The whole textbook was modified and finalized by Capt. He Qinghua, and has been proofread and approved by Professor Zhang Jiping.

The book was carefully checked and rectified by Ms. Xv Jin, the Associate Professor from Foreign Language College of Dalian Maritime University. Her hard work was appreciated. In addition, many suggestions of my classmate Mr. Bu Renxiang, Associate Professor, and other colleagues are helpful. Thanks to you all.

He Qinghua
Dec. 2013

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Chapter 1

Seafarer

Seafarer is someone who works on a boat or ship at sea. The synonyms of seafarer include crew, sailor, seaman, mariner, navigator, shipman, etc. All vessels have one thing in common: they must be manned by qualified crews.

1.1 Shipboard Organization

1.1.1 Manning

A ship should be manned sufficiently and efficiently when it proceeds to sea under the relevant provision of the regulations governing minimum safe manning of ships of the registered nation and the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended.

Every ship shall be provided with an appropriate minimum safe manning document or equivalent issued by the Administration as evidence of the minimum safe manning considered necessary to comply with the provisions of SOLAS. In general, this document is valid for 5 years.

1.1.2 Shipboard Organization

The crew is the staff who sails on board a ship and responsible for its operation, primarily while the ship is at sea; they also have certain responsibilities while the ship is in port.

The Captain or Master is the head of shipboard organization, who is responsible for supervising the efforts of the following three departments, and coordinating their work so as to achieve the best results.

Each shipboard department has a designated head who reports to the Master.

The **Deck Department** is headed by a Chief Officer (C/O), or Chief Mate. He is assisted by two or more senior licensed deck officers or mates who stand the watches. Routine

work on board ships is divided into daily watches. The usual schedule is two watches of four hours each within a twenty-four-hour workday. Apart from the officers, the deck department crew also consists of ratings, like the Boatswain (or Bosun), Able-Body seaman (AB), and Ordinary seaman (OS).

The **Engine Department** is headed by a Chief Engineer (C/E). He has other licensed engineers including First Engineer (1/E), Second Engineer (2/E), Third Engineer (3/E) and Electrician Engineer (E/E) to assist him with watchstanding and the performance of maintenance and repair chores in the engine room. Apart from the Engineers, the Engineer Department crew also consists of ratings, like the Oilers, Wipers, etc.

The Purser is the head of the **Catering Department**. He assists the Captain in dealing with entering and leaving formalities and other administrative work if necessary. In port, he will take care of ordering and supervising the delivery of provisions. He also prepares daily menus, looks after the supply and distribution of galley goods and is in charge of crew wages and the entertainment fund. The Purser is assisted by a Chief Cook (C/Cook) and his assistant cooks, messmen and assistant stewards.

Now with the development of shipping, the Catering Department is merged in the Deck Department on most ships. So there are only two departments on board.

Ships may have other ratings in their crews, but the basic shipboard organization of a ship in the merchant marine remains standard and is easily recognizable on any ship.

Figure 1-1 indicates the shipboard organization of most merchant ships.

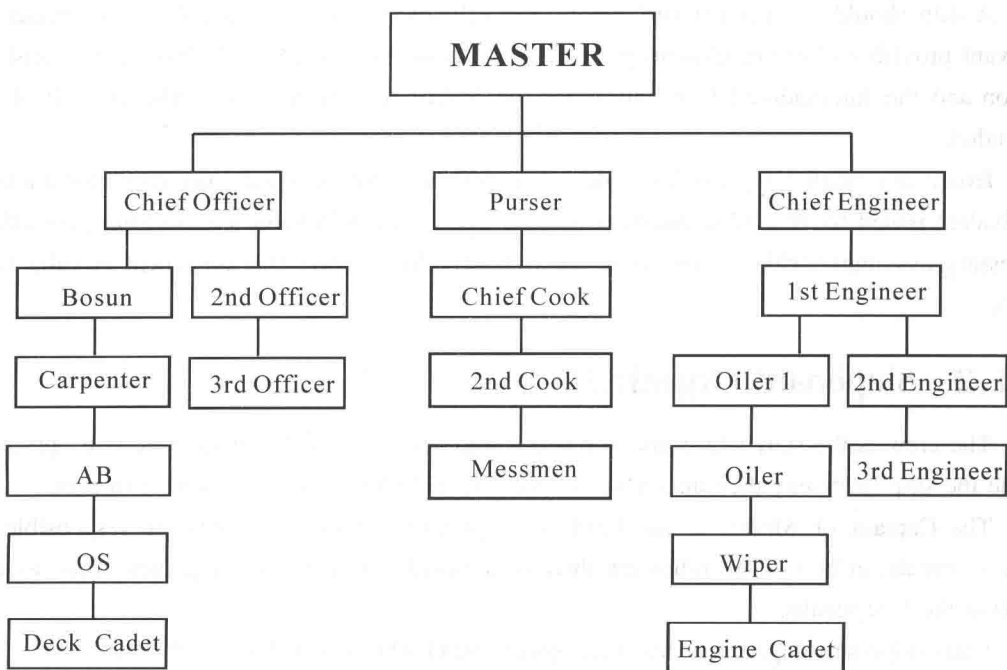


Figure 1-1 Shipboard organization chart

1.2 Responsibilities of Seafarers

Seafarers hold a variety of professions and ranks, and each of these roles carries unique responsibilities which are integral to the successful operation of a seafaring vessel.

For the different types of the ship from different countries, the crew establishments and the crew's rank are different. Even if the ships belong to the same country, but not belong to the same company, their crew establishments and the crew's duties are not the same.

All crewmembers should ensure understanding of relevant procedures and instructions contained within the company Safety Management System (SMS) including safety of personnel, the ship, her cargo and environmental protection. All crewmembers should be fully conversant with ship's emergency organization and relevant contingency plans and ensure in his proficiency to fulfill assigned emergency response role.

1.2.1 Master

Master is the leader of a ship, and he is the representative of the shipowner.

(1) Command and control

① To exercise effective control and efficient operation of the vessel, bearing in mind that safety and security of the ship, crew, cargo and protection of the environment are paramount.

② To ensure that vessel is at all times seaworthy and maintained/operated in accordance with prescribed company guidelines; at all times observing international statutory regulations.

③ At all times, to be aware of his traditional responsibilities for the safe navigation of the vessel.

④ Notwithstanding anything contained in Ship Management Manual, to exercise his authority and discretion to take whatever action required for safety of crew, ship and protection of the environment. Under no circumstances shall commercial considerations prevail over ship and personnel safety, security and pollution prevention.

⑤ To ensure that ship navigational outfit is fully corrected and updated. Ensure that ship's navigational systems are maintained in full working order, and that testing and calibration is carried out in accordance with Company Guidelines, and SOLAS Conventions.

⑥ To exercise overall control with the C/O in maintaining the water tight integrity of the ship, in the handling and transportation of cargo.

⑦ To maintain validity and security of all ship's statutory certificates, and ensure timely renewal of them.

⑧ To ensure compliance with company policies, local and international laws relating to operation of vessels and strict compliance with current pollution regulations.

⑨ To keep himself updated with all latest developments in maritime technology, environmental protection.

(2) Safety, security and training

- ① To take full command in all emergency situations and environmental protection response plans.
- ② To ensure effective maintenance of safety equipment and systems.
- ③ To conduct and record safety training and emergency drills, and security training and drills; to ensure that all training meets requirements of SOLAS regulations, all other international statutory and environmental protection regulations.
- ④ To act as the leader of ship's Spill Control Team.
- ⑤ To develop a training program to ensure that all crew consistently and appropriately meet the company's requirements with regards to onboard STCW training.

(3) Administration

- ① To assume overall budgetary responsibility for his ship, monitor and control the use and disposition of materials, authorize all requisitions and expenditures.
- ② To ensure a high standard of communications within the ship and between ship and shore.
- ③ To regulate cash advances to avoid deficits, ensure correct administration of shipboard accounts.
- ④ To ensure security and control of bonded stores for all purposes.
- ⑤ To take responsibility for administering company's drug and alcohol policy.
- ⑥ To ensure that all company and statutory publications (controlled documents) are fully updated and available to ship's personnel.
- ⑦ To maintain all documentation, certification and other paperwork for which he is responsible in the company filing system.

(4) Organization and leadership

- ① To act as leader of Shipboard Management Team and to ensure that company's organizational objectives are met.
- ② To organize and direct on board training for career development of subordinates and trainees assigned to vessel.
- ③ To familiarize himself with all aspects of the vessel and her equipment.
- ④ To assume responsibility for observing all safe working practices during any maintenance on communication or navigation equipment by ship/shore personnel.

(5) Welfare

- ① To maintain discipline on board, ensure compliance with company and regulatory disciplinary procedures.
- ② To foster a stable and congenial working and social atmosphere within a multi-cultural

environment.

- ③ To appropriately utilize standard crewmember's performance evaluation system.
- ④ To assume overall responsibility for medical services to ship's company.
- ⑤ To achieve and maintain highest hygiene and living spaces standards onboard the ship.

1.2.2 Chief Officer

As the head of the Deck Department, Chief Officer (C/O) is the main assistant of the Captain.

(1) Cargo operation

- ① To plan and conduct all cargo operations in a safe and efficient manner in accordance with relevant statutory regulations and the requirements of the ship's operator.
- ② To ensure a vessel's readiness to receive and discharge cargoes as per standards and conditions required by Charterer and as directed by the ship's operator.
- ③ To be responsible for training for 2/O and 3/O regarding of cargo operation, and improving their working skills.
- ④ To ensure onboard implementation of all procedures for suitable cargo custody.
- ⑤ To keep the Master continuously informed of all operational matters and to consult him whenever necessary.

(2) Navigation

- ① To take a charge of appropriate navigational watch and GMDSS watch as required by the Master.
- ② To assist the Master in keeping double bridge watches during prolonged periods of reduced visibility, in restricted waters (dense traffic or confined water transits) and all other critical situation under the Master's discretion.

(3) Administration

- ① To ensure accurate completion and appropriate filling of all cargo and operational documentation by following current company procedures and requirements of relevant statutory regulations.
- ② To control requisition and deliveries of all deck stores, consumables and spare parts.
- ③ To ensure appropriate Deck Department stock control.
- ④ To be fully familiar with security and correction of all company and statutory publications assigned to him.
- ⑤ To actively participate in effective maintenance planning.
- ⑥ To fully participate in proper operation of the vessel's SMS and safety and environmental protection program implemented by the company.
- ⑦ To be fully familiar with contents of all company procedures/instructions and relevant

industry publications which are related to his particular responsibilities and duties.

⑧ To be responsible for accurate record keeping in garbage record book, ballast water reporting form, etc.

⑨ To act as a ship's Sanitary Officer as per company and statutory requirements.

(4) Maintenance

① To assume responsibility for vessel's fabric/cosmetic maintenance with exceptions of the engine room.

② To establish optimal interrelation with Engine Department and to work closely with C/E and I/E in maintenance of cargo operation and monitoring systems, environmental protection equipment and devices and safety equipment.

③ To ensure in high standard of inspection and maintenance of all cargo and ballast tanks and void spaces including inspection of ship's structural components.

④ To ensure that the deck maintenance is carried out in accordance with Company instructions.

⑤ In accordance with good seamanship practice, to continuously maintain the ship's watertight integrity (seaworthiness) with highest priority given to safety of the crew, vessel, her cargo and the environment.

⑥ To make a detailed repairing list in relation to Deck Department before docking.

(5) Safety and training

① To be fully familiar with ship's emergency organization and contingency plan and to ensure his own readiness to assume specific role as assigned to him within these plans.

② To act as a leader of Emergency Response Team onboard except in case of engine room emergencies.

③ To assume responsibilities of ship's Safety Officer and Security Officer.

④ To fulfill his important role within Shipboard Pollution Response Team.

⑤ To assist the Master in conducting onboard training programs in accordance with company procedures/instructions.

⑥ To ensure that all safety and security equipment is maintained and tested in accordance with company procedures, instructions and statutory regulations by observing particular maker's recommendations.

⑦ To execute particular training programs onboard and to assist the Master in training and evaluation of subordinates.

⑧ To be fully familiar with Master's duties within ship's emergency organization in order to act accordingly in case of absence or incapacity of Master.

⑨ To carry out continual program of self-development and training in order to meet professional knowledge and management skills for taking command onboard company managed vessel.

(6) Organization and Leadership

① To lead by example and authority based on knowledge and experience and to possess appropriate people management skills.

② To command the confidence of his subordinates by presenting himself in an exemplary personal and professional manner.

③ To participate as a full member of Shipboard Management Team with special responsibility for cargo operations, safety, security, environmental protection and shipboard training.

(7) Welfare

① To assist the Master in maintaining shipboard discipline and ensure full onboard compliance with relevant company and regulatory disciplinary procedures.

② To assist the Master in maintenance of company evaluation and appraisal system.

③ To establish and maintain stable working and social atmosphere within shipboard multi-cultural environment and to promote optimal departmental interrelation.

④ To assist the Master in administering medical assistance given to ship's personnel and to support 2/O in performing his duties of ship's Medical Officer.

⑤ To achieve and maintain highest health and hygiene standards onboard.

1.2.3 Second Officer

The Second Officer (2/O) belongs to Deck Department and should assist the Captain and C/O to handle the work under their instruction. The 2/O should be fully familiar with company procedures and instructions related to his position and typical duties and responsibilities required to be exercised onboard.

(1) To be in charge of a routine navigational and GMDSS watch in accordance with company procedures and Master's standing orders.

(2) To monitor and complete the operation, test and maintenance of radio equipment and navigational aids.

(3) To take a charge of appropriate cargo/deck watch in port and, whenever required, to assist the C/O with all cargo operations.

(4) To maintain the ship's nautical charts and statutory publications fully corrected and updated.

(5) To make the voyage plan, and report to the Captain for approval prior to commencing of new voyage.

(6) To take charge of mooring, unmooring and anchoring operations as per Master's orders.

(7) When any radio equipment or navigational aids need repair and inspection, the 2/O should inspect the current condition and submit to repair.

(8) To determine the position of the vessel at noon, various navigation parameters should be recorded in the logbook and reported to the Captain of related contents.

(9) To be fully familiar with any position reporting systems in use or enforced.

(10) To carry out appropriate stock control and check and confirm the receipt of deliveries of correct nautical charts, office stationery, etc.

(11) To act as a ship's Medical Officer, to assist the Master in administering and recording medical attention to ship's personnel and to ensure in proper maintenance of the shipboard medicines stock and hospital equipment.

(12) To be fully conversant with assigned duties in ship's emergency organization.

(13) To assist safety and general training as directed by the Master and C/O.

(14) To deputize C/O during periods of enforced absence and/or incapacity directed by the Master.

1.2.4 Third Officer

The Third Officer (3/O) belongs to Deck Department and should assist the Captain and C/O to handle the work under their instruction. The 3/O should be fully familiar with company procedures and instructions related to his position and typical duties and responsibilities required to be exercised onboard.

(1) To be in charge of a routine navigational and GMDSS watch in accordance with company procedures and Master's standing orders.

(2) To take a charge of appropriate cargo/deck watch in port and, whenever required, to assist the C/O with all cargo operations.

(3) To perform maintenance and inspection of all life saving, fire fighting, personal protection and pollution control systems, equipment and materials as required by SOLAS and IMO regulations and to report condition to the C/O.

(4) To take charge of mooring, unmooring and anchoring operations as per Master's orders.

(5) To maintain and update *SOLAS training manual* and *fire training manual*.

(6) To maintain a shipboard training record book and to record drills/training into deck log book.

(7) To make an inspection and inventory of all signaling equipment including flags, pennants and day shapes and to test internal telephones and shipboard public address system, ship's chronometer and to perform clock adjustments as necessary.

(8) To maintain regular updates of ship's muster list and fire/safety control plans.

(9) To deputize 2/O during periods of enforced absence and/or incapacity as directed by the Master.

1.2.5 Bosun

The Bosun belongs to Deck Department and should assist the C/O to handle the work under their instruction.

- (1) To complete the task ordered by the C/O, to guide and monitor subordinates' job.
- (2) To assist the Duty Officer in anchoring and mooring operations at forward mooring station.
- (3) To assist the C/O with all cargo operations under the instruction of the C/O.
- (4) To coordinate and carry out all deck fabric and equipment maintenance as directed by the C/O by observing safe working practices and relevant systems/equipment instruction manuals.
- (5) To supervise and assist as required with repairs to cargo holds, ballast tanks and void spaces coatings as directed by the C/O.
- (6) To maintain all portable hand and power tools, scaling, painting and spraying equipment used for deck maintenance and to advise the C/O of any tools and equipment damaged or missing.
- (7) To maintain and conduct necessary repairs of ship's mooring ropes, pilot ladders, gangways, lifeboat boarding ladders and different rigging equipment as necessary.
- (8) In accordance with instructions, to measure freshwater tank, ballast tank and sewage tank everyday.
- (9) To clean and make statistics about deck spares supply and consumption.
- (10) When repairing at dock, to complete all tasks regulated by C/O and take tour of inspection and report to the C/O.
- (11) As a ship's Petty Officer, the Bosun should command confidence of his colleagues and subordinates by presenting himself in an exemplary professional manner at all times.

1.2.6 Able-Body Seaman

As deck rating, the Able-Body (AB) should conduct the work under the order of C/O, Officers or Bosun.

- (1) To perform bridge watchkeeping duties as lookout and/or helmsman in accordance with relevant watch schedule.
- (2) To perform deck/cargo watchkeeping duties in accordance with relevant watch schedule, as directed by the Duty Officer and by following relevant safe working practices and environmental protection requirements given in relevant sections of company SMS.
- (3) To assist the Duty Officer in anchoring and mooring operations as directed by the C/O.
- (4) To perform deck maintenance and cleaning duties as directed by the Bosun and/or the C/O.

1.3 Registration and Qualifications of Seafarers

For the purpose of strengthening the administration of seafarers, improving their qualities, safeguarding their legal rights and interests, ensuring waterborne traffic safety and protecting the water environment, *Regulations of the People's Republic of China on Seafarers* were formulated. These Regulations have entered into force since September 1, 2007.

These Regulations cover, within the territory of the People's Republic of China, the registration, qualification, training and occupational security of seafarers as well as the provision of seafarer services.

1.3.1 Registration of Seafarers

(1) Conditions of registration

According to Article 5 of these Regulations, to apply for seafarer registration, the following conditions shall be met:

- ① Being not less than 18 years old (or not less than 16 years old for those who are cadets or in probation on board) but not more than 60 years old;
- ② Meeting the medical fitness standards for seafarers;
- ③ Having received basic safety training for seafarers and passed the examination held by the maritime administration agencies.

Those who apply for registration as seafarers serving on vessels of international voyages shall, in addition, pass the professional foreign language examination for seafarers.

(2) Seafarer's Identity Document and passport

① Seafarer's Identity Document

The maritime administration agency shall, within 10 days from the date of acceptance of an application for seafarer registration, make a decision to register or not register the applicant; if the requirements prescribed in Article 5 of these Regulations are met, the maritime administration agency shall register the applicant and issue the Seafarer's Identity Document.

The Seafarer's Identity Document is the occupational identity certificate of a seafarer, which shall indicate the seafarer's name, address, contact person(s), contact methods and other relevant information.

② Seafarer's passport

A Chinese seafarer who enters and leaves China as a seafarer or serves on a vessel flying the flag of a foreign country shall apply for a seafarer's passport of the People's Republic of China to the maritime administration agency designated by the maritime administration agency of the State.

The seafarer's passport of the People's Republic of China is a document for a Chinese