

## **Core of ship layout, structure, devices and seaworthiness**

### **1. Introduction and general concepts**

- 1.1. The concept of the vessel. Properties of the vessel
- 1.2. The science of shipbuilding. Subject Program
- 1.3. Types of vessels, their classification and characteristics
- 1.4. The concept of the balance equation for the vessel displacement

### **2. Strength and structure of the vessel hull**

- 2.1. General rules for testing the strength of ship structures
- 2.2. The overall longitudinal strength of the vessel hull
- 2.3. The local strength of the vessel hull
- 2.4. Vessel hull vibration
- 2.5. Shipbuilding materials
- 2.6. Parts of ship structures and how they connect
- 2.7. The development of constructive types of vessels
- 2.8. The classes of the ship hull framing
- 2.9. Structure of floors and other parts of the ship's hull
- 2.10. The construction of a submarine

### **3. Ship devices**

- 3.1. Devices for control of the vessel
- 3.2. Anchor gear
- 3.3. Mooring device
- 3.4. Haulage gauge
- 3.5. Hoisting gear
- 3.6. Lifeboat launching gear
- 3.7. Special devices of high-speed vessels

### **4. Ship floatability, stability and insinkability**

- 4.1. Geometric characteristics of vessel hull
- 4.2. The theoretical drawing of vessel hull contours
- 4.3. Vessel floatability
- 4.4. Stability of the vessel at a small angle of heel
- 4.5. The effect of cargoes transfer on ship position, and the stability at a small angle of heel
- 4.6. The effect of suspended cargo on the stability at a small angle of heel
- 4.7. Free surface effect of liquid cargo on the stability at a small angle of heel.  
Displacement of liquid cargo
- 4.8. Influence of admission and removal of cargo on the ship position and the stability at a small angle of heel
- 4.9. Experimental determination of the vessel stability at a small angle of heel
- 4.10. The vessel stability at a high angle of heel
- 4.11. The vessel dynamical stability
- 4.12. Basic regulatory requirements for the stability of ships
- 4.13. The vessel insinkability
- 4.14. Actions to restore the vessel insinkability when the accident
- 4.15. Basic regulatory requirements for flooding the ship - the hull subdivision for compartments
- 4.16. The features of the submarine static seaworthiness (floatability, stability and insinkability)

## **5. Hydrodynamic resistance to movement of the vessel**

- 5.1. General information about the water resistance of the vessel. Fundamentals of the hydrodynamic similarity
- 5.2. The terms total resistance to movement of the vessel
- 5.3. Effect of operating conditions on the vessel movement resistance
- 5.4. Determination of water resistance with the results of the ship model towing tests
- 5.5. Approximate methods of calculating the total resistance to movement of the vessel and towing power
- 5.6. Features of the water resistance when the vessel is dynamically supported (hydrofoils and hovercraft)
- 5.7. Features of the water resistance of multihull vessel
- 5.8. The problems of water resistance reducing

## **6. Marine propulsion**

- 6.1. Function of propulsion, the principle of action and classification
- 6.2. The main conclusions of the theory of an ideal propeller. The real efficiency of propulsion (propulsion ratio)
- 6.3. Geometric characteristics of the propeller
- 6.4. Hydrodynamic and kinematic characteristics of the propeller
- 6.5. Overview of the vortex theory of propeller
- 6.7. Methods of experimental studies of propellers
- 6.8. Charts to calculate propeller
- 6.9. Propeller cavitation
- 6.10. Hydrodynamic interaction of the propeller to the hull
- 6.11. Designing of the propellers
- 6.12. Propellers with the controllable pitch
- 6.13. Reversing of the propeller
- 6.14. The facilities of improving the hydrodynamic performance of propellers
- 6.15. Sea trials of ships
- 6.16. Vibration transmitted from the propeller to the hull, and ways to reduce vibration

## **7. Pitching of the vessel**

- 7.1. General information about the roll of the ship
- 7.2. Rolling of the vessel in still water
- 7.3. Pitch and heave of the vessel in still water
- 7.4. Sea swell
- 7.5. Rolling of the vessel on a regular swell
- 7.6. Longitudinal pitching of the vessel on a regular swell
- 7.7. Influence of the vessel course and velocity on the characteristics of pitching
- 7.8. The concept of nonlinear theory of roll
- 7.9. The concept of pitching of the vessel on an irregular swell
- 7.10. Devices for soothing roll of the vessel

## **8. Controllability of the vessel**

- 8.1. The core information about the controllability of the vessel
- 8.2. The general example of the ship on a curved path
- 8.3. Circulation of the vessel move
- 8.4. The vessel roll when it moves with circulation
- 8.5. Effect of wind on the vessel controllability
- 8.6. The concept of the vessel stability on path