



## Purpose:

The e-learning module (ELM) is designed for theoretical training of navigators in accordance with Chapter II of the STCW Convention in the part concerning of ship manoeuvring.

The ELM is included in the "*Shiphandling basics*" library.

## What is an e-learning module?

E-learning module is the electronic textbook on one or more sections. Theoretical materials can be accompanied by drawings, diagrams, photos, animations and videos. There is a test for assessment of knowledge gained at the end of each section.

## Contents:

- General terms and definitions
- Forces and moments acting on a ship
- Ship's manoeuvring characteristics
- Information on ship's manoeuvring characteristics
- Impact of various factors on course change performance of ship
- Impact of propeller-rudder system on ship's manoeuvring characteristics
- Ways to improve ship's manoeuvring characteristics
- AZIPOD overview
- Briefly about operation of ship main engine

## Target groups

Deck - Management  
Deck - Operational

## Ship types

Generic



## Regulations

### Table A-II/1 STCW Code

Competence:	Manoeuvre the ship
Knowledge, understanding and proficiency:	<i>Ship manoeuvring and handling</i> Knowledge of: .1 the effects of deadweight, draught, trim, speed and under-keel clearance on turning circles and stopping distances.

### Table A-II/2 STCW Code

Competence:	Manoeuvre and handle a ship in all conditions
Knowledge, understanding and proficiency:	<i>Ship manoeuvring and handling</i> Knowledge of: .1 the effects of deadweight, draught, trim, speed and under-keel clearance on turning circles and stopping distances.

### Table A-II/3 STCW Code

Competence:	Manoeuvre the ship and operate small ship power
Knowledge, understanding and proficiency:	<i>Ship manoeuvring and handling</i> Knowledge of factors affecting safe manoeuvring and handling.



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Version: 05/2022

Section 1: General terms and definitions

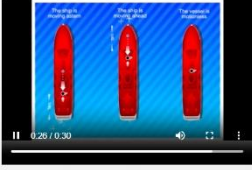
### Controllability

Ship controllability is mainly determined by the relative position of three points:

- center of gravity (CG);
- center of application of all motion resistance forces;
- center of application of propulsion forces.

The rotating motion of the ship occurs around the vertical axis – the center of rotation (Pivot Point – P) passing through the center of the resistance forces. The position of this axis on the ship depends on the shape of the ship, the direction and speed of the ship, the magnitude and point of application of various forces acting on the ship.

If the center of gravity remains stationary at a certain state of ship load, then the center of application of the resistance forces has no permanent location.



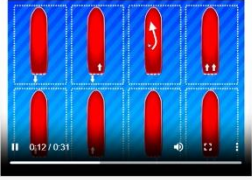
Slide: 9/211

Back Next

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Version: 05/2022

Section 5: Impact of propeller-rudder system on ship's maneuvering characteristics

The disadvantages of twin-screw vessels include the fact that at low speeds the rudder is ineffective, therefore, in this case, the main method of control is the maneuver using engines.



Behavior of a twin-screw ship under different propellers operating modes

Slide: 103/211

Back Next

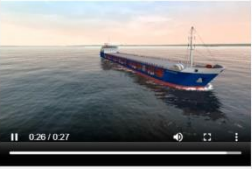
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Version: 05/2022

Section 3: Ships maneuvering characteristics

### Inertia characteristics of the vessel

In various situations it becomes necessary to change the speed of the vessel (anchoring, passing by, etc.). It is caused by a change in the operating conditions of the main engine or propulsors, after which the ship begins to make uneven motion.

Ship's deceleration performance is the required path and time to perform a maneuver associated with uneven motion.



Slide: 45/211

Back Next

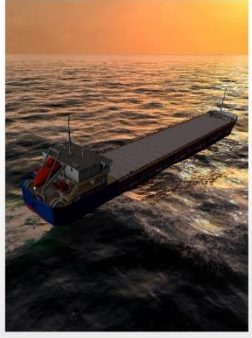
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Version: 05/2022

Section 2: Forces and moments acting on a ship

### Groups of forces

All forces acting on the ship are divided into three groups:

- propulsion forces;
- external forces;
- reactive forces.



Slide: 28/211

Back Next

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Version: 05/2022

Section 5: Impact of various factors on course change performance of ship

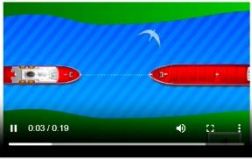
### Passing by in narrow channel

Two ships are approaching, keeping to the axis of the channel. The ship speed is reduced in advance to the minimum sufficient one for control.

When a distance equal to 2-3 hull lengths remains to the oncoming vessel, both ships vigorously turn the rudder to starboard and move closer to the edge of the channel. It is not recommended to approach the edge of the channel in advance, at a great distance between the ships, since it is difficult to keep the ship close to the edge for a long time.

At the time when the stems of the ships are leveled, the rudder is turned to port in order to divert the stern and start moving along the oncoming vessel, while increasing the speed of the propeller. Ships go round each other, making a smooth turn to port.

When the bow approaches the beam amidships of another vessel, the rudder is turned to starboard to prevent the stern




Passing by in narrow canal

Slide: 114/211

Back Next

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Version: 05/2022

TEST 0004



Test of question

Indicate at what position of the center of resistance forces (R) relative to the center of gravity, the vessel is more prone to yaw on the course.

Choose the correct answer

2

1

Attempts: 1

COMMENT

Slide: 18/211

Back Next