



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

# KKS/ZDMT Vessels

## Presentation 2

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Innovations of Study specialisation Transport Vehicles and Handling  
Machinery with respect to market needs**

## Definition of water transport:

Water transport is transport by vessel using rivers, artificial and natural lakes, seas, oceans and canals both on and under the surface of the water. We can also include vessels on air cushions which move above the surface of the water. The generic term for means of water transport and other controllable floating objects is 'vessel'.

## Categories:

- a) personal
- b) cargo
- c) combined

- 1) maritime
- 2) inland (river, lake)
- 3) combined
- river-sea or sea-river



- ferry
- occasional

## Advantages:

- low energy requirements
- ecological
- high loads
- large passage space
- specialized ships available
- simple design

## Disadvantages:

- low speed
- dependent on hydrological and meteorological conditions
  - depth of rivers,
  - wind conditions
- costs of ship, ports
- excludes transportation of persons and goods, where the crucial factors are speed and regularity

# Connecting water and other transport

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## Connecting water and terrestrial transport:

- Use of standard ISO containers
- Transshipment via port cranes, road or rail vehicles

## Connecting river and maritime transport :

- Transshipment - inefficient
- Use of combined ships – mainly around the deltas of large rivers
- 'super containerisation' – special containers are used for river transport (lighters = flat-bottomed barge)

A waterway is any river or area of water which can be used to operate a ship.

## Categories of waterways:

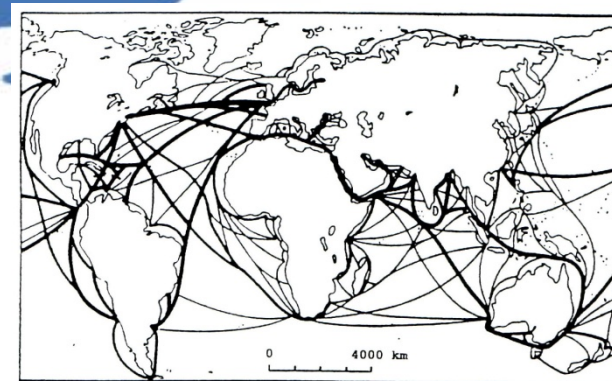
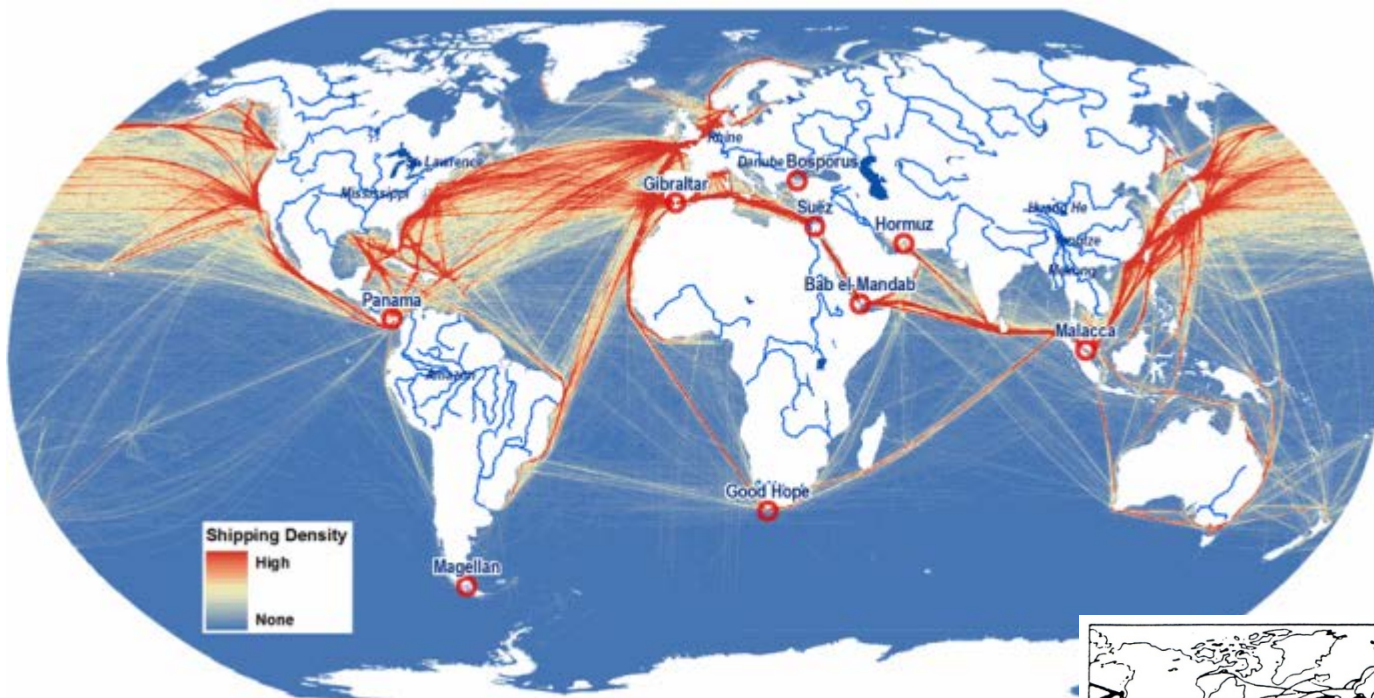
1. maritime

2. inland

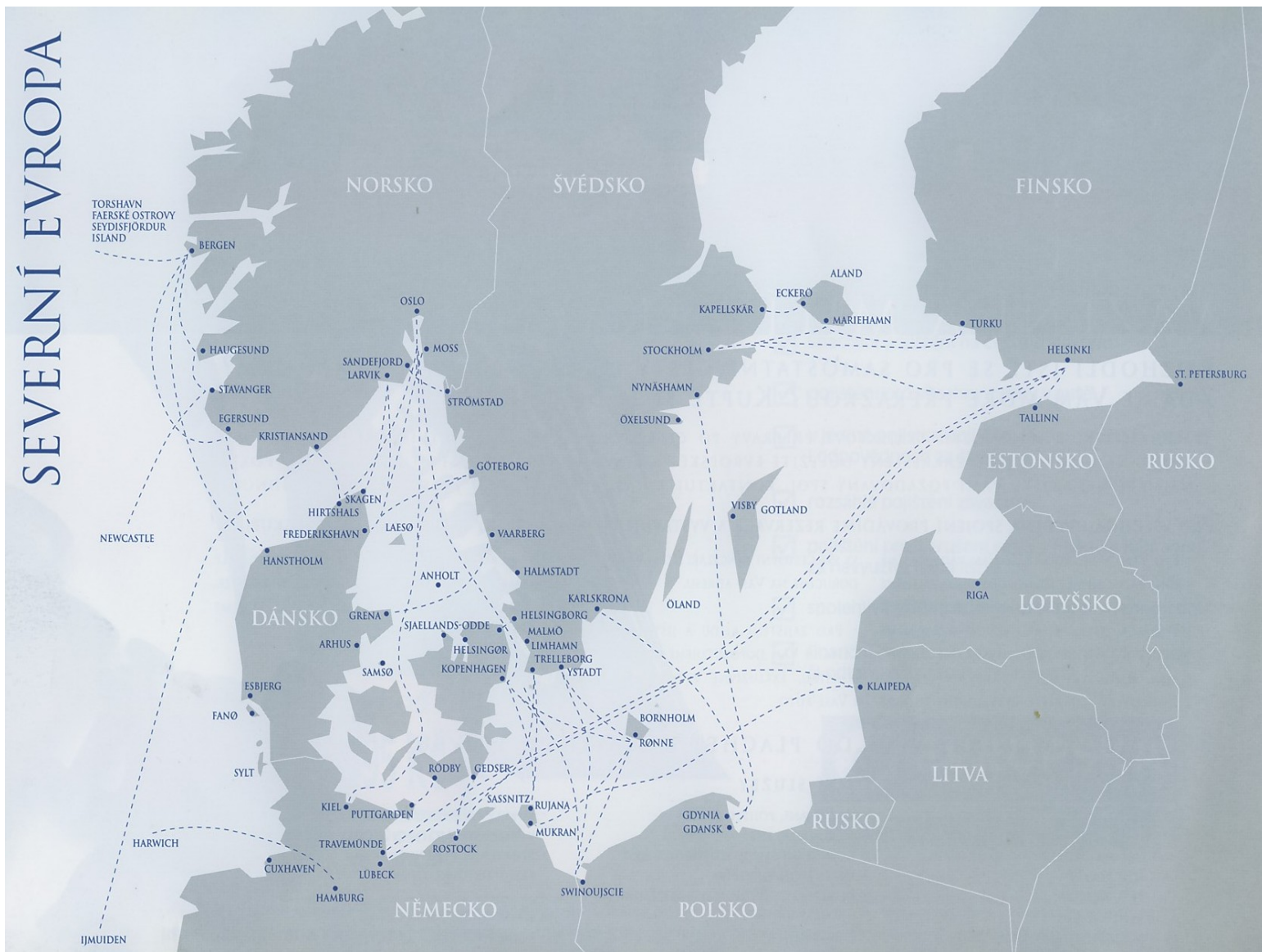


The world's waterways are usually the most convenient links between the world's large ports (Rotterdam, Singapore, Amsterdam, Hamburg, London,... ). They are usually maritime and can be either intercontinental or offshore in the case of cabotage (coastal) shipping.

## Map of the world's main waterways

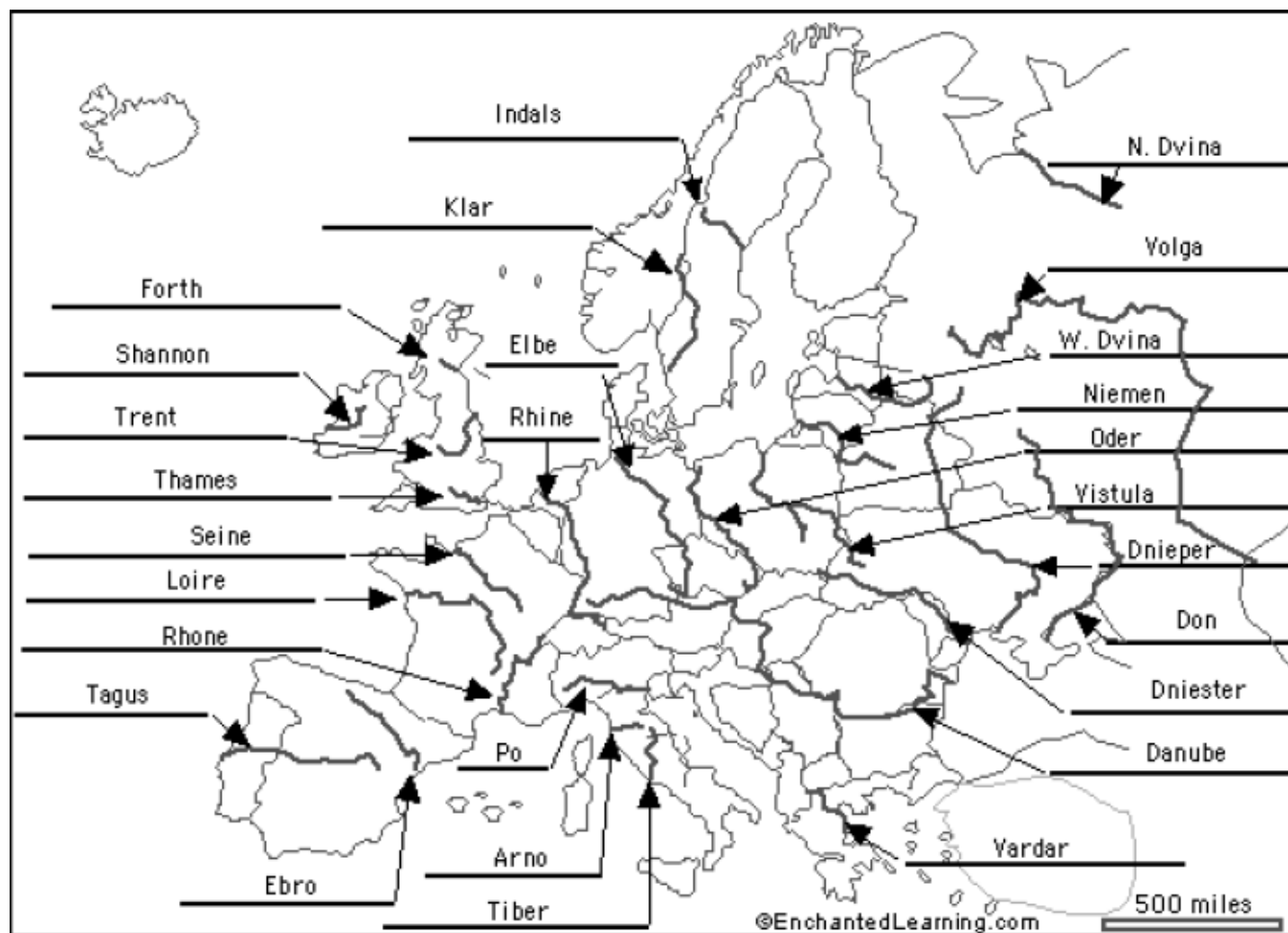






# Waterways

Europe's internal waterways along large rivers play an important role alongside maritime routes (the Danube, Rhine, Main, Elbe, Seine, Loire, etc.)





# Structures on waterways

Structures on waterways are those buildings which are firmly connected with the shore or to the bottom of waterways, but not raising the surface action of their own hydrostatic buoyancy. They are built for the purpose of facilitating or enabling shipping or for water management purposes.

## Categories of structures:

- a) navigational
- b) regulatory
- c) navigate (float through)
- d) other



## Navigational structures:

They have the task of alleviating captains' navigation, alerting them to the dangers in the waterway and control traffic in a given section of the waterway. Navigation structures take the form of lighthouses (which occur mainly on maritime waterways) and structures for marking waterways.



## Regulatory structures:

They are built on waterways to regulate water flow in the watercourse or on the water surface. In the sea breakwaters can be considered to be regulatory structures and are mostly formed from prefabricated concrete blocks or brought in aggregates. River waterway regulatory structures tend to have a more complex character.



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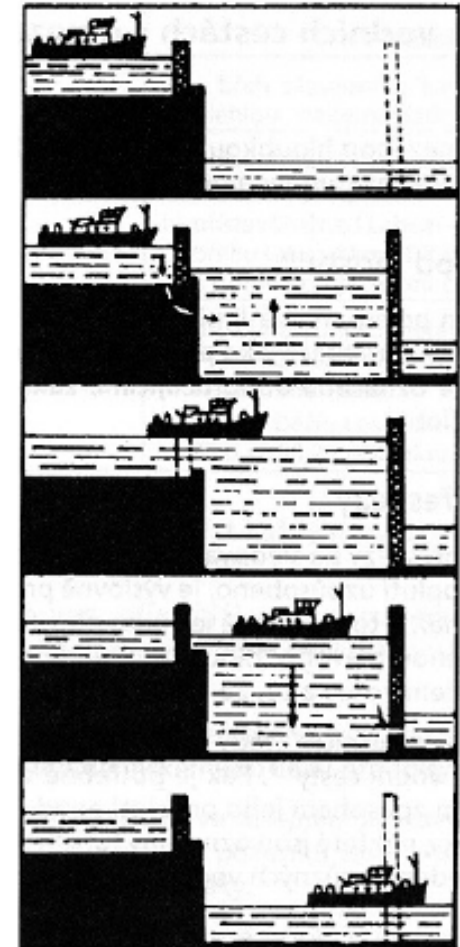
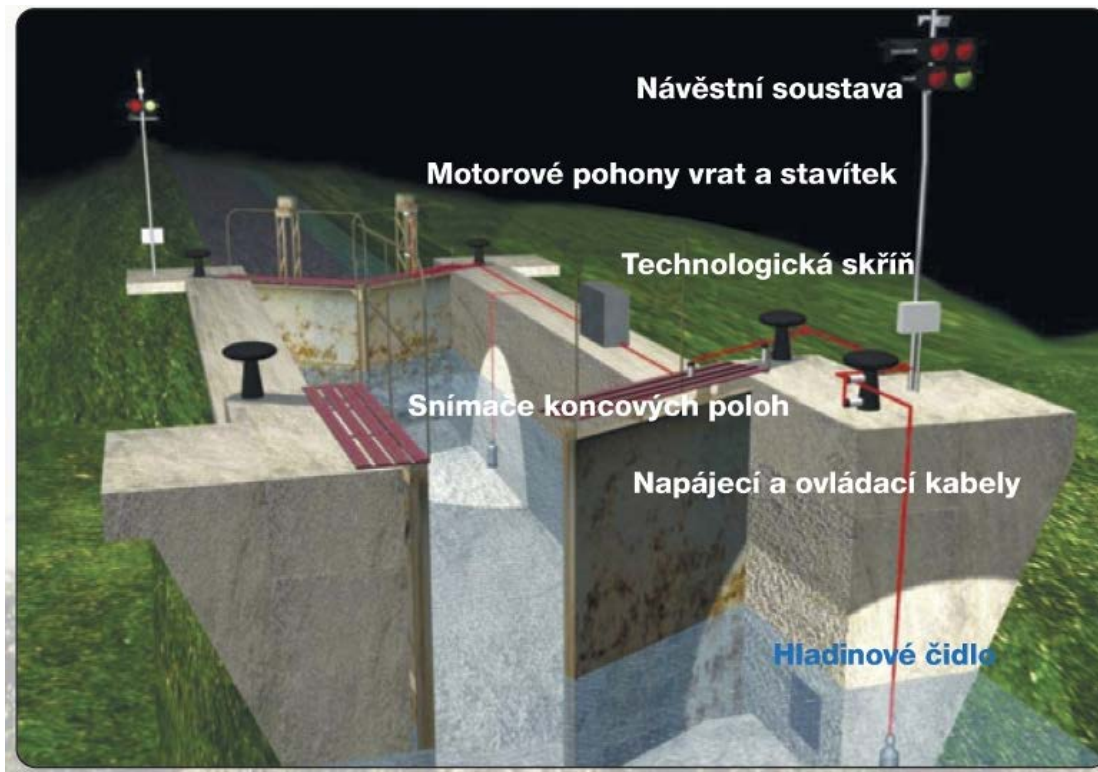


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## Navigate structures:

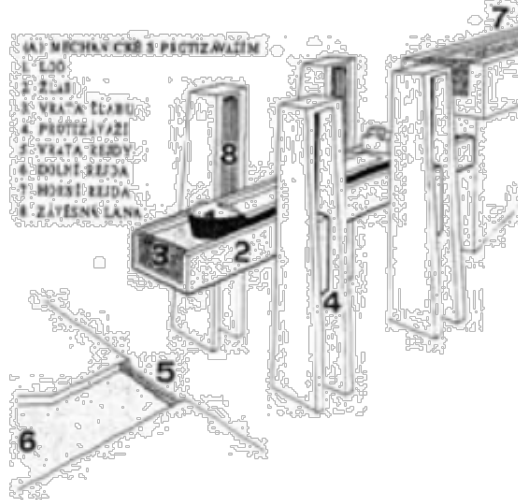
Locks use a system of direct and indirect filling.



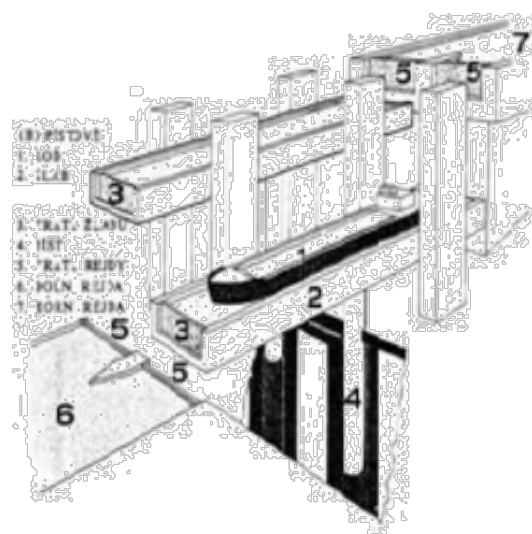
## Navigate structures : Inclined mechanical hoist



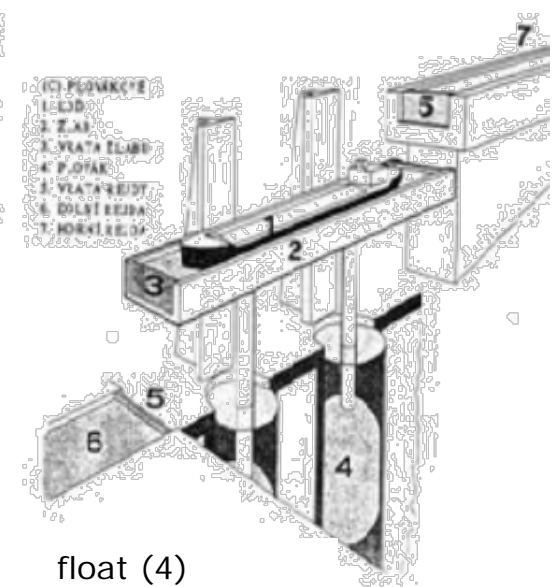
## Vertical mechanical hoist



mechanical with balance weight (4)



piston (4)



float (4)



## Other navigate structures:

### The Falkirk Wheel

The Falkirk Wheel ship hoist in central Scotland is the only one of its kind in the world. It raises ships to a height of and replaces the original system of 11 hoists. Two water tanks (2 x 302 tons) are situated at the end of powerful rotors. Regardless of the weight of the borne vessels, both tanks are always in balance. It is powered by a 22.5 kW motor which uses only 1.5 kWh, which turns the rotor through 180° in 5 minutes.



## Other navigate structures:

### Water bridges

Basically navigable aqueducts, these bridges create navigable waterways above rivers, valleys, railways and roads. They are notable for their size, as they are considerably larger than normal aqueducts. The largest in the world is the Magdeburg Water Bridge which spans the river Elba in Germany.

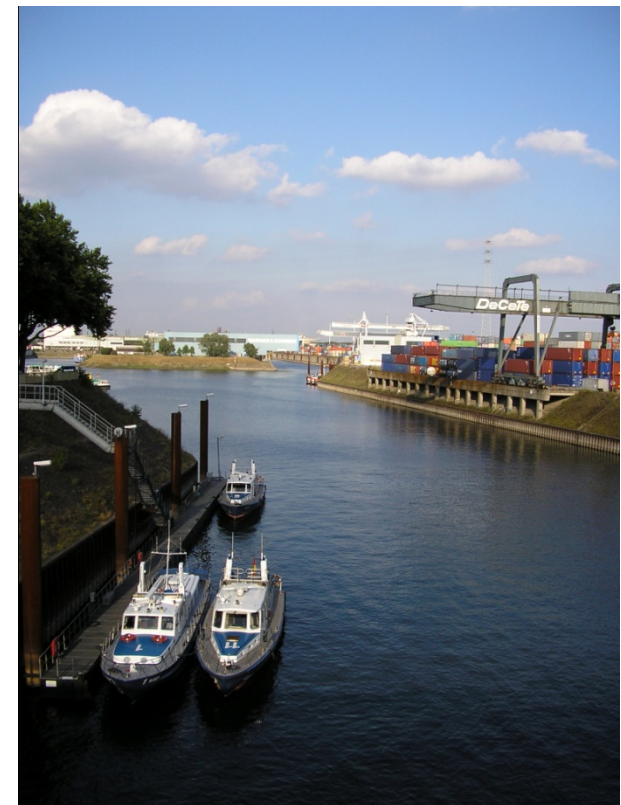


# Structures on waterways

## Ports:

A port is a place where many ships can be docked and where they are sheltered from unfavourable wind conditions. They can be divided into :

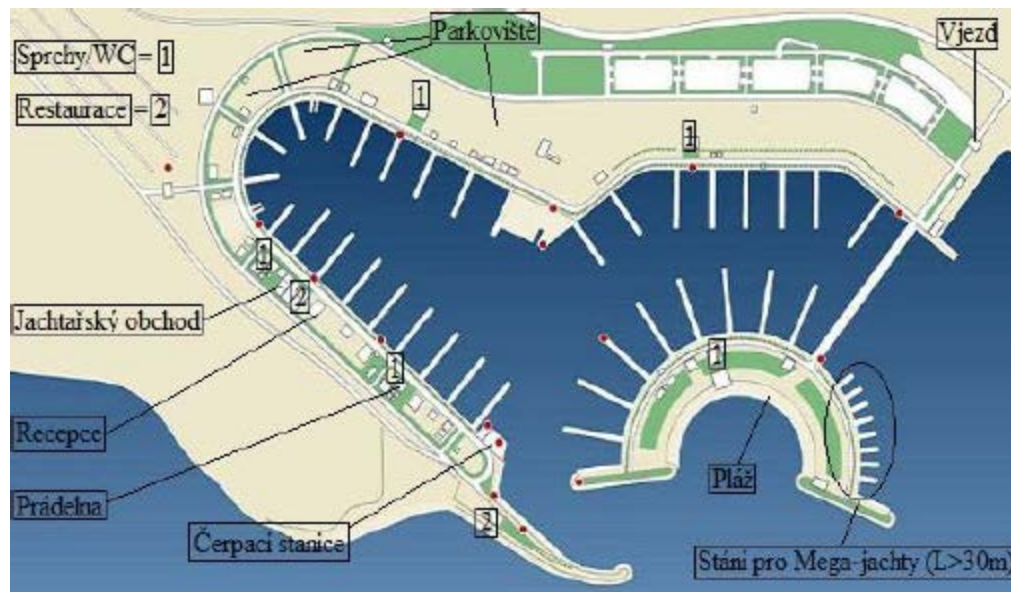
- natural
- artificial – maritime or river





## Kinds of ports:

- a) cargo port/dock– for shipping cargo
- b) jetty/pier– a smaller terminal usually for private transport
- c) marina – for private yachts, etc. for recreational purposes
- d) mooring– a place for mooring ships to the shore
- e) anchorage– a place for anchoring ships



Marina



mooring

## Basic navigation:

The basis of navigation is, and always has been, determining the approximate position of a vessel based on the azimuth (angle in the plane of water surface) and also to estimate the approximate distance the vessel has come from a specific orientation point.



## Adverse effects of the compass

**declination** – imprecision caused by the angle between geographic and magnetic poles.

**deviation** – compass deviation caused by different magnetic fields.



## Basic navigation:

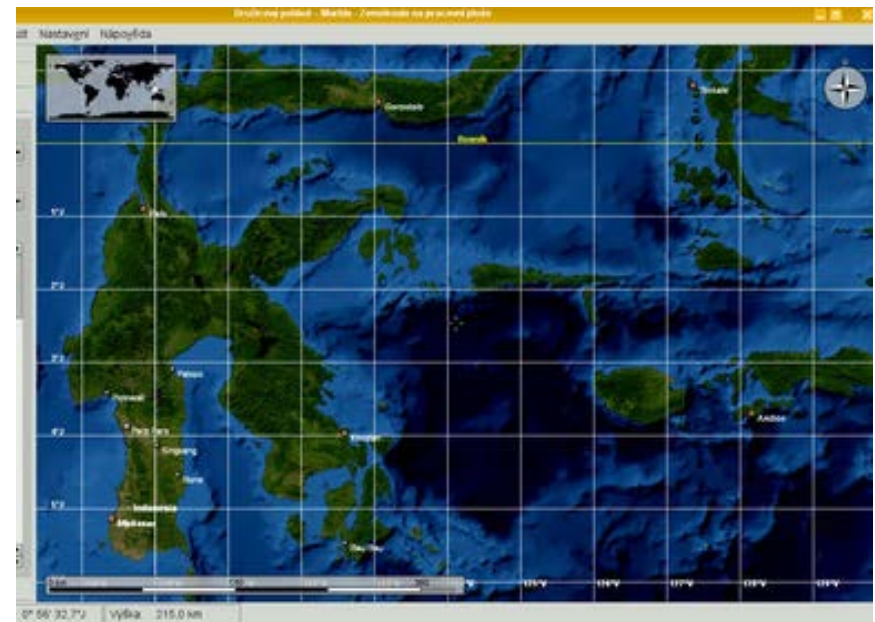
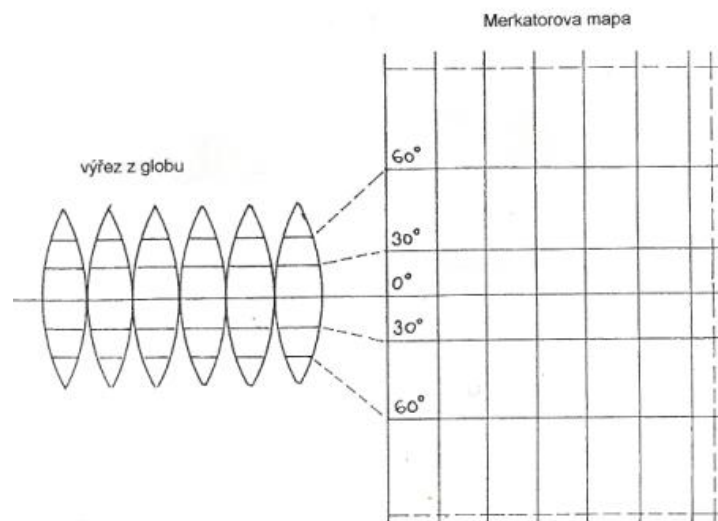
### GPS:

A very accurate determination of navigational data is provided by modern navigation systems based on GPS. Their use is advantageous mainly because of the instant display of the vessel position directly on a map, whose electronic version is included in the device software. A disadvantage is the possible loss of the captain's ability to deal with basic orientation. These capabilities can be crucial in situations of possible equipment failure.



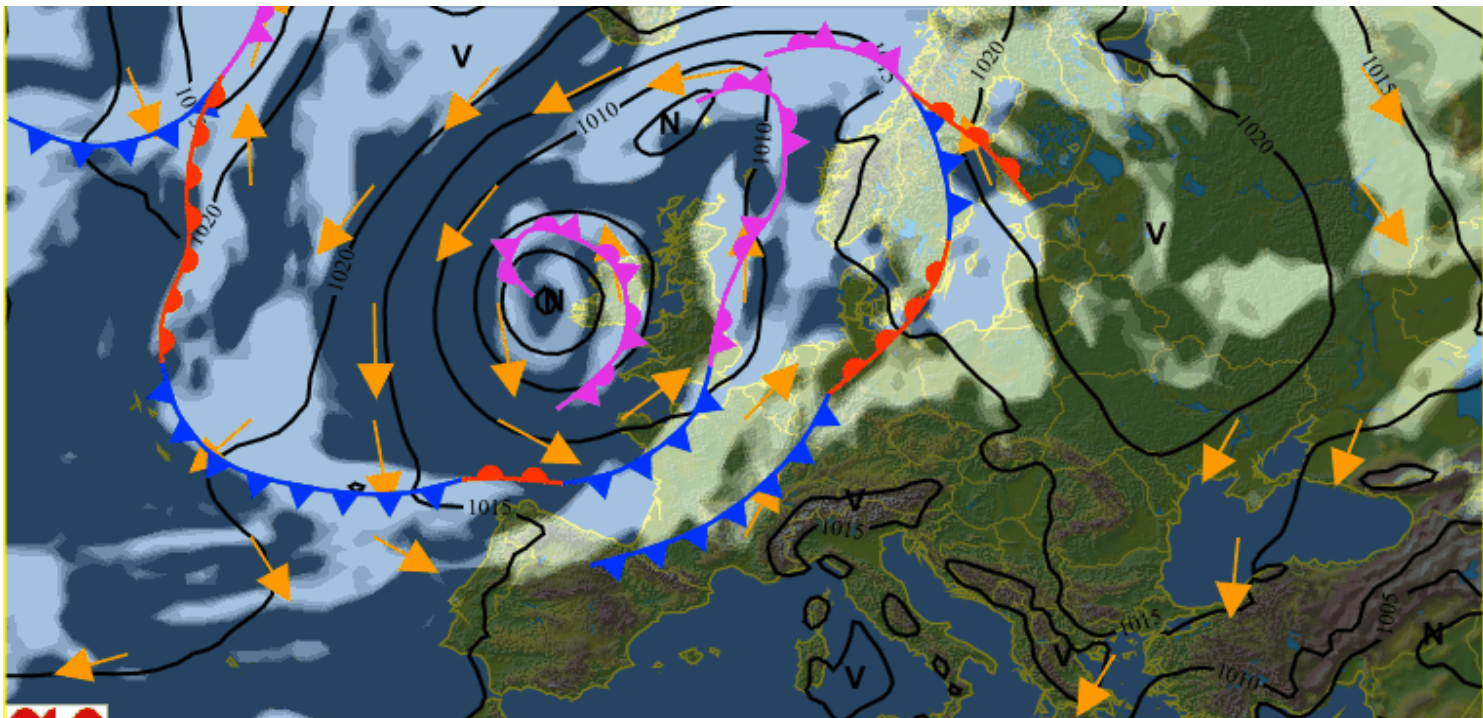
## Basic navigation:

Nautical maps are drawn in the form of Mercator maps, which are maps created by combining sections of the globe. All meridians are shown as mutually parallel lines, perpendicular to the parallels. This map distorts distances, but preserves angles, and thus facilitates navigation.



## Basic meteorology:

Meteorology is the science which deals with the atmosphere. It studies the atmosphere's composition, structure, properties, and events (weather). Development of weather can be read from a synoptic map, which describes the current status of processes in the troposphere. The pressure is shown with isobars.



## Basic meteorology:

**Pressure** is given in hectopascals. Normal atmospheric pressure corrected to sea level is 1013 hPa. Pressure generally decreases with increasing altitude (thin air).

**Humidity** of air is given in percent and gives the ratio the actual and maximum possible amount of water vapour in the air. When the air is over saturated (100%) with water vapour it condenses and forms fog or cloud.

**Wind** is the movement of air caused by differences in pressure. It usually blows from higher to lower air pressure. Of all the meteorological variables it has the most influence sailing conditions. Air currents create friction on the surface of the water surface, creating waves.

## Basic meteorology:

Cloud is divided according to its height above ground into three levels. Generally, the higher the altitude at which the cloud occurs, the lower the threat of rain.

The three basic types of cloud structure are:

- a) cirrus
- b) stratus
- c) cumulus

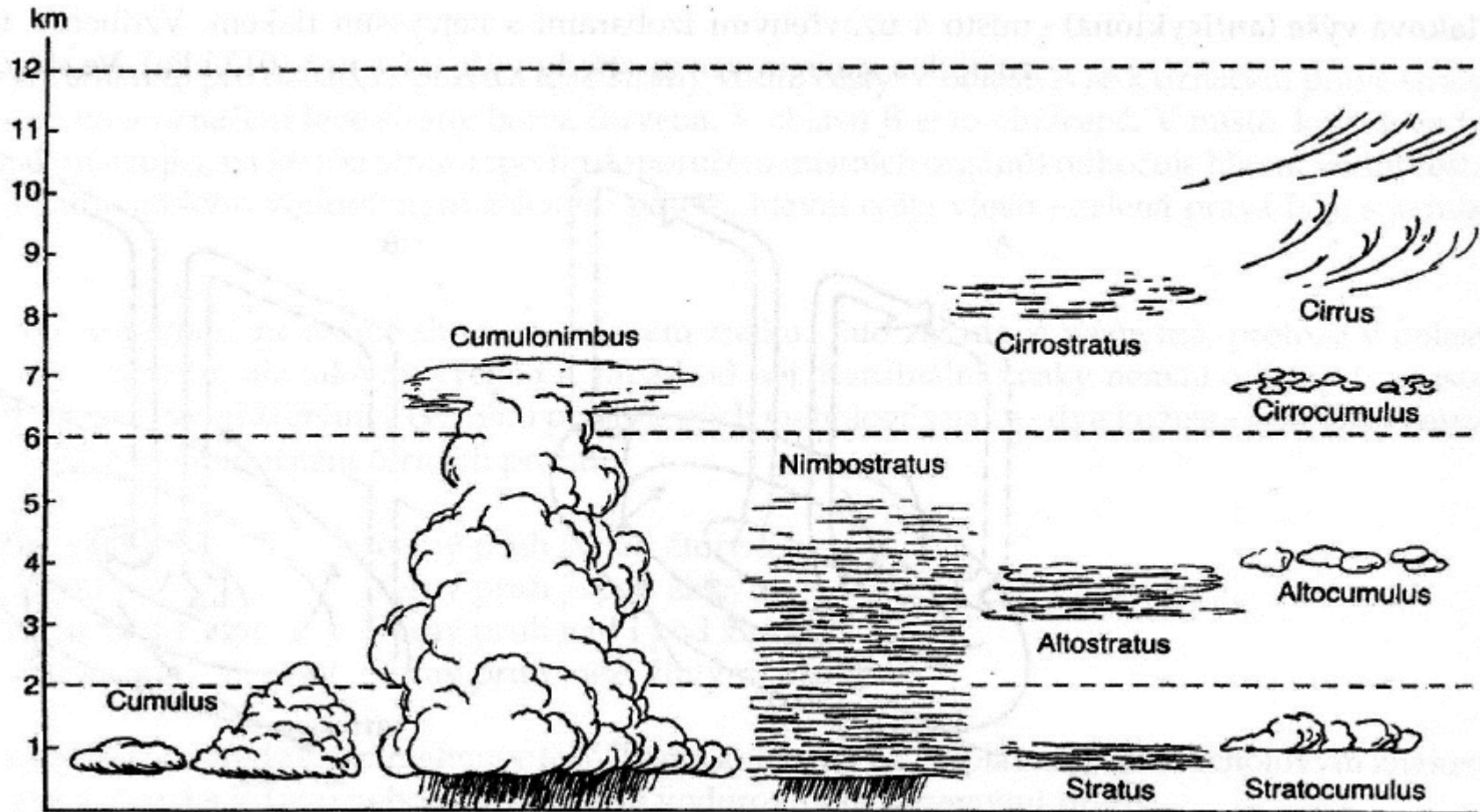
**Cirrus** are the highest of all clouds. They are formed of ice crystals and do not have their own shadow. They do not create showers.

**Stratus** are grey structures which, like cirrus, do not have a definite outline. They belong to the lower level of cloud and can form drizzle.

**Cumulus** are the last of the three basic cloud types. They have a definite outline, belong to the lower level of cloud and are formed of water droplets. Rain can be expected from them.



## Different cloud types:



## Legislation for aquatic transport:

International Maritime Organization– Geneva, 06. 03. 1948  
Governs movement in international waters, seas and oceans using international conventions and legislature.

Legislation for movement in national waters of seas and oceans is governed by the competent legislative bodies of individual states.





A vessel is an object capable of controlled navigation intended for service on water, for transporting e.g. cargo and people or machines and equipment.

## Vessels are divided into the following categories:

**Ship** - A hollow navigable vessel intended for transporting people or cargo or for towing or pushing other vessels.

**Small craft** – A boat with a length not exceeding 20 m, designed to transport up to 12 people, not intended or used for towing, pushing or guiding in side formations other than with small craft, and which is not a ferry.

**Floating machine** – A vessel equipped with a mechanical device for working on a waterway or in a port, e.g. dredger, floating crane, etc.

**Floating structure** - A vessel which is not equipped with machinery for self-propulsion or equipment for controlling navigation. It is not intended for repeated movement on waterways and generally is moored or otherwise attached to a permanent location. e.g. a floating garage, floating dock, etc.

**Floating body** - Other controllable, fixed object or group of objects, able to use navigation. e.g. houseboat, etc.

## Categorizing vessels:

**By use**

- a) civilian (sport and recreation, business and entrepreneurial)
- b) military (war, auxiliary)
- c) special (work, service, customs, patrol)

**By drive**

- a) with own power
- b) without own power (rafts, barges, floating structures)

**By type of energy**

- a) propelled by human or animal power (rowing, etc.)
- b) propelled by wind (yachts, etc.)
- c) propelled mechanically (steam engine, combustion engine, electric motor, etc.)
- d) using nuclear power

**By area of navigation**

- a) maritime
- b) coastal maritime
- c) inland

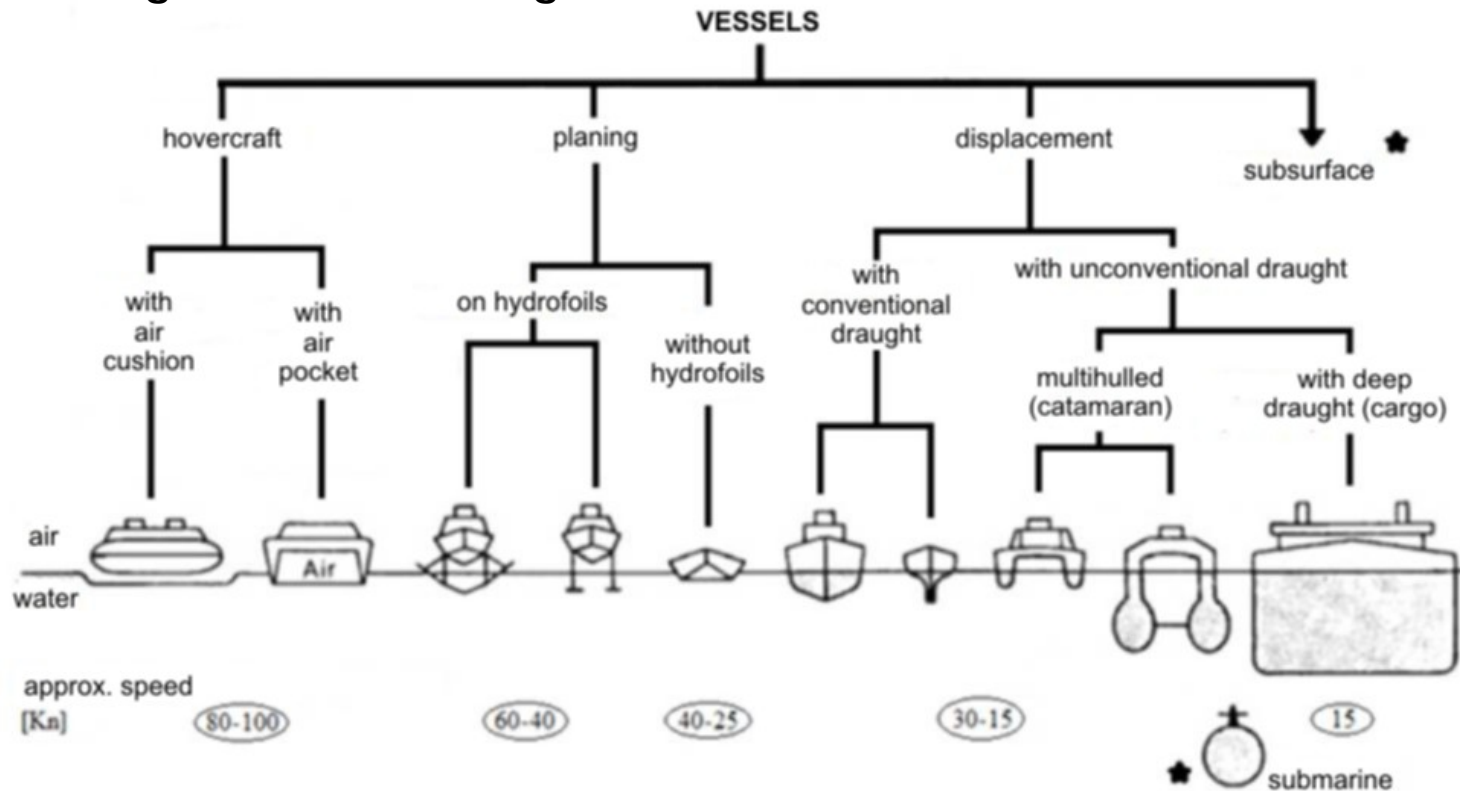


## Dividing ships/vessels:

According to purpose and use

- a) personal
- b) cargo
- c) mixed
- d) tugs
- e) technical vessels
- f) special
- g) industrial
- h) floating equipment

According to mode of sailing



## Displacement vessels:

Displacement vessels are the oldest of all types of vessels. Their movement on water is based on the validity of Archimedes' law. These vessels can excel in transport capacity, but their disadvantage is their low speed and inability to achieve planing.



## Planing vessels:

### On hydrofoils



Vessels with hydrofoils are at low speeds or motionless, immersed similar to normal displacement vessels. As their speed increases, the hull starts to rise. The degree of emergence of the hull is determined by the construction of the vessel and it is normal that at optimum speed the hull rises above the water surface and the vessel then glides across the water using only the foil. Safe navigation of vessels with hydrofoils is strictly limited by the height of waves as well as by greater weight of cargo.

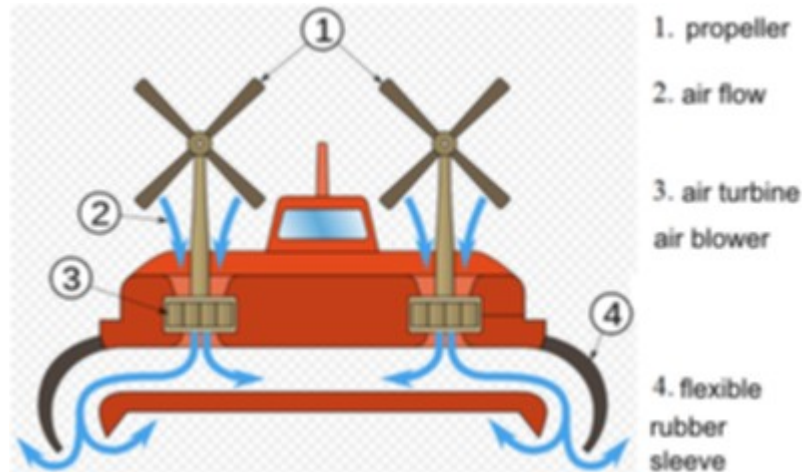
### Without hydrofoils



Planing vessels without foils reach planing sailing at a speed that depends on many factors, such as vessel length, weight and especially the shape of the hull.

## Hovercraft:

### Hovercraft with air cushion



### Hovercraft with air pocket

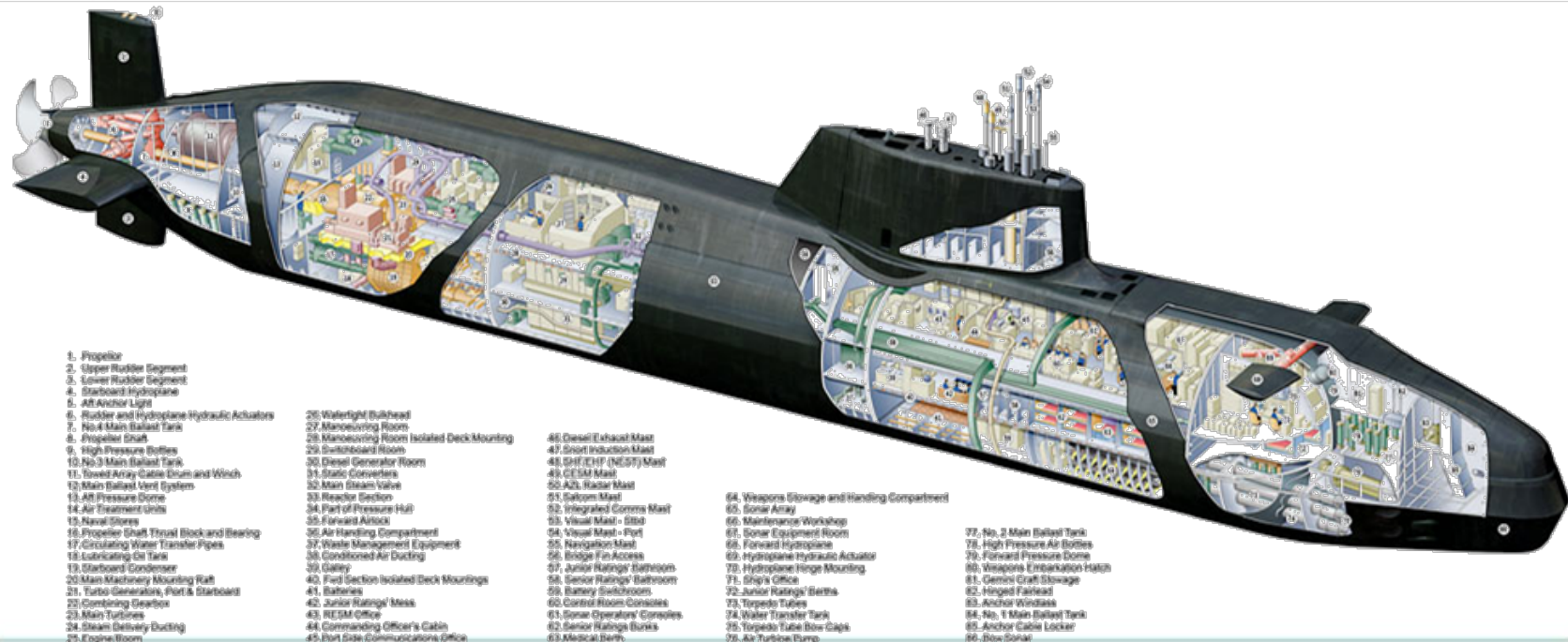


A hovercraft on a cushion of air is even able to move on land. Fans drive surrounding air under the craft and create an air cushion. For forward motion the fans are used as propellers which create pulling force.



## Subsurface vessels:

A submarine is a vessel able to navigate beneath the surface. A conventional submarine is composed of a pressurized hull containing the crew and equipment, above which projects the conning tower with entrance, periscopes, antennae and other devices. Submarines have hollow ballast tanks in their hulls which can be filled with air or water. To sink, they are filled with water. To surface, the water is displaced from the tanks by air. The latest nuclear submarines have fuel for the entire period of use and can produce oxygen by electrolysis of water, so they can operate continuously without surfacing.



## Military amphibious vessel:





## Special rescue vessel:



## Luxury yacht:





## Punts:



## Nuclear submarine:





## Tug and a container vessel:



## Ferry:





# Examples of Vessels

## Private river vessel:



## River barge:



## Coastal maritime cargo vessel:





## Maritime sailing vessel and sporting yacht:



## Naval open motor boat: (hydroplane)





## Suction dredger:



## Open sports motor boat:



## Houseboat:





## Floating crane:



## Zodiac motor boat:





## Trans-ocean cruise ship:



## Catamaran cruiser:



## Catamaran power boat:





## Catamaran yacht:



## Aircraft carrier:





## Cruise liner:



## Floating dock:





## Floating object!:



## Ferry:





## Catamaran:





## Ship with air pocket :



## Hydrofoil:







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## Acknowledgements

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