Unit 1

SHIPS AND SHIP TERMS
SHIP DESIGN AND CONSTRUCTION
(general introduction)

Basic terms

<table>
<thead>
<tr>
<th>hull</th>
<th>deck</th>
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<tbody>
<tr>
<td>superstructure</td>
<td>engine room</td>
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<tr>
<td>machinery</td>
<td>propeller shaft</td>
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<tr>
<td>stern</td>
<td>bow thruster</td>
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<tr>
<td>bow</td>
<td>rudder</td>
</tr>
<tr>
<td>amidships</td>
<td>bulbous bow</td>
</tr>
<tr>
<td>beam</td>
<td>hold</td>
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Ships are large, complex vehicles which must be self-sustaining in their environment for long periods with a high degree of reliability. A ship is the product of three main areas of skill, those of the naval architect, the navigating officer (deck officer) and the marine engineer (engineering officer).

The naval architect is concerned with the hull, its construction, form, habitability and ability to endure its environment. The navigating officer is responsible for safe navigation of the ship, and its cargo operations. The marine engineer is responsible for the various systems which propel and operate the ship. More specifically, this means the machinery required for propulsion, steering, anchoring and ship securing, cargo handling, air conditioning, power generation and its distribution.

There are two main parts of a ship: the hull and the machinery. The hull is the actual shell of the ship including her superstructure,
The machinery includes not only the main engines required to drive her but also the auxiliary machinery (boilers, generators, etc.) used for manoeuvring purposes, steering, mooring, cargo handling and for various other services, e.g. the electrical installations, winches and refrigerating plant.

The rear portion of the ship is called the after end or stern. When moving stern first, the vessel is said to be moving astern. The front portion of the ship is called the fore end, whilst the extreme forward end is called the bow. When moving bow first, the vessel is said to be moving ahead. Fore and aft are generally used for directional purposes. The area between the forward and aft portions of the vessel is called amidships.

The maximum breadth of the vessel, which is found in the amidships body, is known as the beam.

Many modern cargo and passenger liners have a transverse propulsion unit or bow thruster in the bows. Its purpose is to give greater manoeuvrability in confined waters, e.g. ports, and so reduce or eliminate the need for tugs.

The rudder, which enables the vessel to maintain her course, is situated right aft.

The bulbous bow can improve passenger and crew comfort, as it can reduce pitching in heavy seas and has been provided in tankers, bulk carriers, and modern cargo liners to increase speed when in ballast.

The modern tendency is to have large unobstructed holds with mechanically
operated hatch covers, both for the speedy handling of cargo, and to reduce turn-round time to a minimum.

A ship’s actual design and number of decks depend on the trade in which the ship will ply. A tramp, carrying shipments of coal or ore, will be a single deck vessel with large unobstructed hatches to facilitate loading and discharge. A cargo liner carrying a variety of cargo in relatively small consignments would have ‘tween decks to facilitate stowage. If such a vessel also conveyed wood and other commodities of high stowage factor, a shelter deck would be provided.

Additionally, container ships are equipped with specially designed holds with cells or slots to facilitate speedy container handling using shore-based lifting gear.

Machinery

Three principal types of machinery installation are to be found at sea today. Their individual characteristics change with technological advances and improvements and economic factors such as the change in oil prices. The three layouts involve the ship’s propulsion machinery using direct-coupled slow-speed diesel engines (the main engine), medium-speed diesels with a gearbox, and the steam turbine with a gearbox drive to the propeller.

A propeller, in order to operate efficiently, must rotate at a relatively low speed. Thus, regardless of the rotational speed of the prime mover, the propeller shaft must rotate at about 80 to 100 rev/min. The slow-speed diesel engine rotates at this low speed and the crankshaft is thus directly coupled to the propeller shafting. The medium-speed diesel engine operates in the range 250—750 rev/min and cannot therefore be directly coupled to the propeller shaft. A gearbox is used to provide a low-speed drive for the propeller shaft. The steam turbine rotates at a very high speed, in the order of 6000 rev/min. Again, a gearbox must be used to provide a low-speed drive for the propeller shaft.
A. Comprehension & vocabulary

A.1 Find the parts of the reading text which provide answers to the following questions:

1. What do the two main parts of the ship include?
2. What are the two extreme ends of a ship called?
3. Define the location and function of the following ship parts: bow, stern, funnel, mainmast, stem, sternpost, shipboard crane, double bottom, engine room, rudder, bulbous bow, bow thruster, hatchcover, free-fall lifeboat, forecastle, poop deck, bridge, wheelhouse, forepeak, afterpeak.
4. Which types of machinery are housed in the engine room?
5. Where are the anchors and windlasses placed?

A.2 Complete the following sentences:

1. The hull includes both ___________________.
2. The ship's machinery includes ________________.
3. When moving bow first, the ship ________________ and she ________________ when she moves stern first.
4. The midship portion of the ship is situated between ________.
5. The beam is ________________.
6. The rudder is designed to ________________.
7. The bow thruster gives the ship ________________.
8. Modern ship holds are equipped with mechanically operated hatch covers to ________________.
9. The use of the bulbous bow is to ________________.

A.3 Which ship terms are defined below?

1. ________________: the body of the ship.
2. ________________: the large hinged plate at the stern of the ship which controls the ship's direction.
3. ________________: space inside the ship for carrying the cargo.
4. ________________: a part of the ship which drives the ship through the water.
5. ________________: an opening in the deck through which the cargo is lowered.
into and lifted from the hold.
6. ____________: the measurement of the ship's largest width.
7. ____________: fore and after end of the ship's hull.

A.4 Complete the following text with the corresponding ship terms:
The forward end of the ship is called the 1. ____________ the after end is the 2. ____________ , and halfway between the two is 3. ____________ . The 4. ____________ of the ship is the distance from the port to the starboard side of the ship. The 5. ____________ or body of the ship includes the outer skin or shell and all members and parts which hold the ship together, divide it into 6. ____________ and give it strength and rigidity.

A.5 – Write down the labels indicating the parts of the ship of the ship following the arrows from the bow to the stern:

A.6 Indicate the parts of the ship below by drawing an arrow to the relevant position:

- bow,
- stern,
- funnel,
- mainmast,
- stem,
- sternpost,
- shipboard crane,
- double bottom,
- engine room,
- rudder,
- bulbous bow,
- bow thruster,
- hold No. 3,
- hatchcover,
- free-fall lifeboat,
- forecastle,
- poop deck,
- poop deck No. 3,
- bridge,
- wheelhouse,
- forepeak,
- afterpeak
A.7 Write down the terms relating to the arrows showing points of orientation on board an around the ship

B. Grammar

B.1 Supply the right form of the verb in brackets:

Description of a ship
The «Polar Star» (be) _____________ a ship (belong) ______________ to a class called multi-purpose ships. She (be) ______________ of 15,000 dwt (9,000 gross and 6,000 net tons). Her overall length is 130 m, beam 16 m, draught 9 m. Her five cargo holds (arrange) ______________ so that holds Nos. 1 to 4 (be) ______________ forward of the bridge superstructure and No. 5 is abaft it. Each hold (serve) ______________ by two 20 ton derricks, mounted in pairs. The hull (be) ______________ of a single ’tween deck type with raised forecastle and a bridge superstructure of medium height. The ship (fit) ______________ with a stern anchor and warping winch for (manoeuvre) ______________ in confined waters. With a single diesel engine and a controllable pitch propeller the «Polar Star» (run) ______________ at her economical service speed of 16 knots, her fuel consumption (be) ______________ around 20 tons per day.

B.2 Fill in the missing member of the word pair:

<table>
<thead>
<tr>
<th>adjective</th>
<th>noun</th>
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<tbody>
<tr>
<td>long</td>
<td>width</td>
</tr>
<tr>
<td></td>
<td>breadth</td>
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<tr>
<td>high</td>
<td>depth</td>
</tr>
<tr>
<td>strong</td>
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</table>
Description of a ship - main particulars

<table>
<thead>
<tr>
<th>GENERAL INFORMATION</th>
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<tbody>
<tr>
<td>SHIP TYPE</td>
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<tr>
<td>DESIGN CRITERIA</td>
</tr>
<tr>
<td>DESIGNER</td>
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<tr>
<td>PROJECT NO</td>
</tr>
<tr>
<td>PROJECT NAME</td>
</tr>
<tr>
<td>OWNER</td>
</tr>
<tr>
<td>SHIPYARD</td>
</tr>
<tr>
<td>HULL NUMBER</td>
</tr>
<tr>
<td>CLASSIFICATION SOCIETY</td>
</tr>
<tr>
<td>CLASS ID</td>
</tr>
<tr>
<td>CLASS NOTATION</td>
</tr>
<tr>
<td>STATUS</td>
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<tr>
<td>KEEL DATE</td>
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<table>
<thead>
<tr>
<th>SHIP GENERAL</th>
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</thead>
<tbody>
<tr>
<td>MAIN DIMENSIONS</td>
</tr>
<tr>
<td>LENGTH OVERALL</td>
</tr>
<tr>
<td>LENGTH BETWEEN PERPENDICULARS</td>
</tr>
<tr>
<td>BREADTH (MOULDED)</td>
</tr>
<tr>
<td>DEPTH (MOULDED)</td>
</tr>
<tr>
<td>DRAUGHT (DESIGN)</td>
</tr>
</tbody>
</table>

**SPEED, CONSUMPTION & CRUISING RANGE**

| DESIGN SPEED | 13.0 knots, 85% MCR |
| CONSUMPTION | 7.5 ton/day, 85% MCR |
| CRUISING RANGE | 7200 nm |

**HULL**

**HULL MATERIALS**
The vessel is to be constructed throughout of steel-plates and sections of approved shipbuilding quality, tested and approved by the Classification Society. In general, continuous and scallop welding to be adapted. Intermittent welds may be adopted where allowed by the Classification Society.

**EQUIPMENT FOR CARGO**

**CARGO SPACE DEFINITION**

| TYPE OF CARGO SPACES |
| Epoxy coated cargo tanks integrated in the structure separated by longitudinal and transverse corrugated bulkheads and integrated slop tank at fore of cargo space. |

| NUMBER OF CARGO COMPARTMENT |
| 10 Cargo Tanks + 1 Integrated Slop Tank |

| MAX CARGO DENSITY |
| 1.54 t/m³ |

**DECK CRANES FOR CARGO**

| GURDESAN, Cargo Hose Crane, SWL 5t, 12 m / Provision Crane, SWL 2t, 7 m |

**CARGO SYSTEM**

Cargo system is designed so that 11 different substances can be loaded/unloaded at the same time. Also a unique substance can be loaded/unloaded from all tanks by means of the two common line located aft and fore of cargo manifold. Cargo discharge system of the ship is capable of discharging six (6) tanks at the same time in full capacity.

**CARGO DISCHARGE CAPACITY**

Cargo discharge system of the ship is capable of discharging six (6) tanks at the same time in full capacity.

**CARGO PUMPS**

FRAMO, hydraulically driven pumps, 10 x 200 m³/h.

**CARGO PIPES & FITTINGS**

Cargo pipes are class II type mild steel pipe. The connections to be of butt welded if possible. The pipelines to be through cargo tank inside. The pipelines to be arranged with sufficient expansion possibilities.

**CARGO SYSTEM VALVES**

DANFOSS, Remote Operated Hydraulic Valves.

**SEPARATE STRIPPING SYSTEM**

There are two kinds of stripping procedures applying for this vessel. Cargo tanks 6P&S, 5P&S, 4P&S which are located aft of the manifold and cargo tanks 3P&S, 2P&S, SLOP which are at fore of the manifold. Stripping is done by using compressed air or nitrogen when substances can not face to contact the air ie oxygen. DN 25 x Sch 10s stainless steel seamless 316L 1.4404 for stripping pipes are used in stripping system.

**FREEZING, REFRIGERATING & HEATING SYSTEM FOR CARGO**

Stainless steel heating coils.

**INERT GAS SYSTEM**

Nitrogen system is designed so that to fill 95% ullage volume of all cargo tanks and slop tank at the same time.
Nitrogen main pipes are connected to each tank cargo access hatch by means of the flexible hoses. System contain 10 pieces 50 lt, 200 bar nitrogen tube, control cabinet (include reducer, safety, non return valves,), flexible hoses. The cargo tank inlet pressure of nitrogen gas is 0.13 bar. Nitrogen tubes control cabinet and flexible hoses will be keep in Nitrogen room located main deck above the pump room. System is also used for stripping and purging purpose as well.

**CARGO VENTILATION SYSTEM**

PV valves setting pressure is 2000 mmWG for pressure, -350 mmWG for vacum. The lines between PV valves and tanks are so arranged as to permit their self draining to the tanks. Pipe connections are to be full penetration butt welded type.

**TANK CLEANING SYSTEM**

Each cargo tank to be fitted with two tank cleaning hatches for tank portable tank cleaning machines. Tank cleaning hatches also to be used for ventilation gas freeing fans. Tank cleaning pump to be centrifugal, electric driven capacity 40 m³/h, 10 bar.

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**SHIP EQUIPMENT**

**MANOEUVRING MACHINERY AND EQUIPMENT**

**RUDDER**

GURDESAN, Flap type

**SIDE THRUSTER**

JASTRAM, 200 kW

**STEERING GEAR**

DATA

**ANCHOR, MOORING AND TOWING EQUIPMENT**

GURDESAN, Windlass & Mooring Winch / Mooring Winch.

**EQUIPMENT FOR CREW AND PASSENGER**

**LIFE SAVING EQUIPMENT**

GEPA, Freefall

**CREW CABINS**

13 single berth and 2 double berth (suit) cabins.

**SEWAGE TREATMENT PLANT**

JOWA

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**MACHINERY MAIN COMPONENTS**

**MAIN ENGINE**

MaK 6M25, 1x 1800 kW

**PROPULSION SYSTEM**

BERG, CP Propeller, 3500 mm

**BOILER / STEAM GENERATOR**

S-MAN

**AUXILIARY DIESEL GENERATOR**

VOLVO PENTA, 3 x 300 kW, 1500 rpm, 50 Hz

**EMERGENCY DIESEL GENERATOR**

VOLVO PENTA

**SHAFT GENERATOR**

AvK, 1 x 4560 kW

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**SYSTEM FOR MACHINERY MAIN COMPONENTS**
COOLING SYSTEM
BLOKSMA, Box Cooler

SHIP COMMON SYSTEMS

ELECTRICAL SYSTEM
BETESAN, Electric Contractor

ALARM SYSTEM
POLIMAR, CO2 System / Foam System

LOADING INSTRUMENT
DELTA MARINE, DeltaLoad

8 Factory ship
Classical freighter / cargo liner - general arrangement plan