# MANOEUVRING

GZV/ GRADE II

## 3 COURSE BLOCKS

<table>
<thead>
<tr>
<th>Block</th>
<th>Grade I Repetition</th>
<th>Grade II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Propellers, Rudders, Manoeuvring data, Watch keeping.</td>
<td>hydrodynamics, Twin Propellers + Configuration, Manoeuvring with twin props</td>
</tr>
<tr>
<td></td>
<td>Some manoeuvres with current, wind, anchor. Storm and shallow manoeuvres, Taking pilot, Entering Harbour</td>
<td>Towing at sea. Tug use in port</td>
</tr>
<tr>
<td>2</td>
<td>Subjects still to discuss. Repetition Grade II subjects</td>
<td>Exam preparation</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Hydrodynamic forces

- Hydrodynamic forces are caused by fluids (here water) in motion to a body.

- Our vessel itself, the rudder, the propeller, (keel) are body’s under influence of this fluid in motion

- Here there are two laws of importance:
  1. Continuity Law
  2. Bernoilli’s Law

![Continuity Law Diagram](image)

**Continuity Law**

The amount of water \((A \times v)\) passing a random cross section of a tube (river) per time is constant

When the tube gets narrower, the velocity of the liquid will increase, or **the larger the cross section, the lower the speed and vica verca**

In formula: \(A_1 \times v_1 = A_2 \times v_2\)
Bernoulli’s Law

In formula: \( \frac{1}{2}V^2 + P = \text{constant} \)

*Which means that:*

*When the water speed increases, the pressure will reduce*

*When the water speed decreases, the pressure increases*

1. Continuity Law: \( A \times v = \text{constant}: \text{waterspeed forward shoulder} < \text{waterspeed aft ship} \)
2. Bernoulli’s Law: \( \frac{1}{2}mV^2 + P = \text{constant and } v \text{ forward shoulder} > v \text{ aft}, \text{ which means } P \text{ aft} < P \text{ forward}, \text{ causing banksuction} \)
Hydrodynamic forces
Where/when also noticeable:

• Interaction during overtaking and passing another vessel

Squat = inzinking

Hydrodynamic forces
Where/when also noticeable:

Shape of a propeller blade creating underpressure (Lift force)

Shape of a Duct or Nozzle around the propeller (again Lift force)

Shape of a rudder (creating Lift Force)

During altering course or turning
Propellers

See book for the items:

• The Pitch
• Propeller speed
• Slip
• Suction/Pressure plane
• Right/Left handed
• Fixed/Variable
  Variable Pitch Propeller for Ships 4 Blades Adjustable.mp4

Right handed – fixed propeller

Ship’s behaviour

*Explain with the aid of drawings the movement of the stern (the bow follows in opposite direction) of a vessel equipped with a:*

1. Fixed pitch propeller
   • Right handed (Rh)
     • Engine ahead
     • Engine astern
   • Left handed (Lh)
     • Engine ahead
     • Engine astern

2. Variable pitch propeller
   • Left handed  *engine ahead as fixed Lh pitch, engine astern as fixed Rh*
   • Right handed *engine ahead as fixed Rh pitch, engine astern as fixed Lh*
Ship’s behaviour

CONCLUSIONS:

• The direction of the movement of the stern of the vessel is the turning direction (wheeling) of the propeller

• The wheeling effect with engine ahead is hardly noticeable, on astern however the influence is significant and important to know

How the vessel moves forward, astern and stops

1. Impuls theory: thrust by giving energy to the water

2. Blade theory: thrust by Liftforce through optimal form of the propellerblade

3. Stopping by ‘stopping on the Lift’ or by astern propulsion
1. The suction of the propeller will increase the velocity of the water from $v_0$ till $v_1$, until the water reaches the propeller

2. Because of the increase in speed the pressure will reduce from $p_0$ to $p_1$

3. The propeller will pass energy to the water, the velocity has already increased, therefore the supply of energy will effect an increase in pressure: $p_2$

4. After the water has passed the propeller, the water pressure in the propeller wake will reduce again to the pressure of the surrounding water. $p_3 = p_0$

5. As a result the velocity of the water will increase from $v_1$ to $v_2$. The propeller wash will contract, rotating and will cause an even spread of the water flow along the rudder surface
Propeller and Bernoulli

Blade theory

Cross section topblade RH propeller seen from above

• Engine full ahead
• $\alpha =$ (optimal) angle of inflow
• Lift perpendicular on inflow
• Forward thrust

Stopping on the Lift

Engine slow ahead

• Engine from full ahead to slow ahead, speed still high
• Negative inflow angle
• Lift perpendicular on inflow
• Gives a stern thrust while the vessel is steerable
From full ahead Stop engine and full astern 1

- The propeller stalls which causes a lot of turbulence behind it
- Only small or zero Lift and small negative thrust
- Vessel not steerable

From full ahead Stop engine and full astern 2

- Angle of inflow becomes smaller causing a better flow to the propeller
- More Lift and higher negative thrust
Type of Propeller - Azipod

Veder-LNG-Carrier-Final-TM-P1-High.wmv

Type of Propeller - Propeller Duct-Lift
Type of Propeller - Water jet

Type of propeller - Voith Schneider

Tugs and Ferries – twin prop
Bow Thrusters

Bow- and stern thrusters
Bow- and stern thrusters

• Bow- and stern thrusters can only be used at lower speeds. WHY?

• Moving backwards, the bow thruster is a great help in steering. Why?

• Your vessel is equipped with both stern thruster and bow thruster. While proceeding forward to the berth, you like the bow to move to starboard. Which thruster do you use to achieve this movement?

Bowthruster and steering torque

P = Pressure point

Short and long arm of a couple
RUDDERS

Must give:

• An effectively wake bent
• With a minimal drag = small rudder angles, achieved by a wing shaped profile giving a Lift force

Rudder types – Spade rudder
Rudder types – Flap rudder

Rudders - Mariner Semi Balance Rudder

Upper part: Wing Profile (compare with Oertz rudder)

Lower part: Balance
Rudders – Fishtail Rudder

Rudder and forces

• What movements makes a vessel after giving starboard rudder

  1. Leaning shortly over to starboard
  2. Turns to starboard
  3. Tranverse movement to port (kick)
  4. Leaning to port during turn
  5. Loss of speed

• Explain with the book these movements of the ship
Manoeuvring data

- Turning circle
  - Difference deep and shallow waters!
- Stopping distance
  - In the formula: $mv^2$ high speed means large stopping distance.
  - Compare this distance with advance turning circle!
- Speed tests
- MOB manoeuvres tests
  - Williamson turn tests both SB Port turn on bridge poster
- Zig zag tests
  - For checking course stability
Turning circles – stopping distance

1. Why diameter turning circle larger in shallow water.
2. Why speed reduction less in deep water?
Controlled stop in narrow waters with engine and low frequency rudder cycling

By using the Stopping on the Lift principle (reduce revolutions of the propeller step by step) as well as speed reduction by the drag of the rudder and vessel. The final astern manoeuver should be given to stop the vessel and to turn the vessel into the original heading (depending left/right prop)
Controlled stop with engine and low frequency rudder cycling *(only effective on deep water)*

Chapter 4  Standing and handing over the Watch
The watch

• Standing the watch is taking care of navigation and act when needed
• Responsibility even when captain is on the bridge.
• Know the captains standard orders
• Warn the captain instantly upon any doubt as to safety
• Watch keeping while pilot on board!
• Anchor watch
• How to hand over the watch

The watch

• Handing over the watch
  • be in time to consider the oncoming navigation
  • Handing over: al relevant information as course(s), speed, drift, ships, lights, dangers, and so on
• Heading and course both given in figures 150 = one five zero
  • What’s the difference between heading and course
• REPEAT ALL and what does it means
  • Hard a starboard  Starboard a bit  Starboard a bit more
  • Starboard 30  Ease to 20  Midships
  • Steady  Steady as she goes  Course 3 4 5
GRADE 2  TWIN SCREW

- Twin propellers (two screws) improve 1. operating reliability and 2. maneuverability.
- With twin props the shafts mostly are at equal distance from the center line. The further the shafts are away the easier the ship will turn.

- The propellers can be in turning or outturning. Fixed or variable.
- Most vessels are equipped with outward rotating fixed propellers, or inward rotating variable propellers. WHY?
- The maneuverability is improved when the vessel is equipped with a rudder after each propeller and a bow thruster.

Single rudder is situated on the center line between the two propellers, even with hard over is rudder partially or wholly out of propeller wash.

Very poor single rudder response at very slow speeds.
Out turning fixed propellers - one rudder

- Port propeller left handed
- Starboard propeller right handed
- Turn over starboard with port engine ahead and sb engine astern
- Two momentums are effecting the propeller:
  - One because of one propeller reversing while the other one is still in forward gear
  - The other one due to wheeling propeller effect.
- Both momentums together will increase the turning.
- With slow speed the rudder to starboard has none or little effect
In turning fixed propellers - one rudder

- Port propeller right handed
- Starboard propeller left handed
- Turn over starboard with port engine ahead and sb engine astern
- Two momentums are effecting the propeller:
  - One because of one propeller reversing while the other one is still in forward gear
  - The other one due to wheeling propeller effect but now counteracting
- So both will oppose each other and therefore making turning more difficult or even impossible

Mooring and unmooring twin screw

- Fixed inturning
- Fixed outturning
- Variable pitch inturning
- Variable pitch outturning
- With
  - one or two rudders
  - bowthruster or bow-and sternthruster
  - bowsprit
  - Non parallel propeller shafts
  - With the aid of lines
Unmooring

conventional twin screw ship fixed-outturning
one propeller (sb) working ahead

wheel effect

one propeller (sb) working astern
one propeller (sb) working astern, the other propeller (port) ahead

when the rudder force is also applied the vessel will rotate like this
Inward turning fixed pitch propellers

When the vessel has inward turning propellers the momentum between the two propellers is outweighed by the wheel effect.
Traverse with outward turning propellers without bow thruster

Here negative wheel effect sb propeller

Traverse out turning props with the aid of a bow thruster

Here positive wheel effect port propeller
How to Manoeuvre with Your beauty with one rudder-twin outturning controllable pitch propellers and bowthruster

Particulars Clipper Oman and China

- One rudder
- Twin propeller Controllable pitch outturning
- The propeller shafts are not parallel to one another
- A bow thruster

The best maneuverable ship are equipped with
- Twin rudder. A rudder after each propeller
- Twin Controllable pitch in turning or fixed outturning
- The propeller shafts parallel
- A bow thruster
Propellers Clipper

Turning over port without bow thruster Clipper

- Weak engine momentum
- Counter acting wheeling effect
- Rudder no effect

Clipper: 1 rudder 2 outturning contr pitch

Turning over port without bow thruster Other

- Good engine momentum
- Positive wheeling effect propellers
- Rudder helps to turn

Other: 2 rudders 2 inturning contr pitch
NOW TURN OVER PORT 2

Rudder hard to port
Port engine ahead
Starboard engine astern
Bowthruster to port

1. The engine momentum is negative but small
2. The wheel effect of the starboard propeller is positive ($F_{wh}$)
3. The rudder together with port propeller gives a positive momentum (Thrust)
4. Bow thruster to port helps the turn at slow speeds ($F_{b}$)
UNMOORING CLIPPER

- The rudder hard to starboard
- Starboard engine Pitch Ahead)
- Port engine Pitch Astern
- The Starboard engine and starboard rudder turn the stern off the quay and cause a forward movement
- The port engine prevends the foreward movement and also the propeller pushes the vessel further from the quay while the propellor wash comes between the vessel and the quay
- The bowthruster pushes the bow away from the quay

BLOCK II

- 2nd Grade TOWING at Sea
  Dangers Tug use in port

- 1st Grade Mooring/unmooring/anchoring manoeuvres
  Shallow and narrow waters. Entering breakwaters with cross current. Taking pilot and more pArtly to be done in BLOCK III
TOWING AT SEA/ TUGS IN PORT

Towing – General

• Tugs have the experience, the materials and are designed for towing/pushing.
• Merchant vessel – no experience and not designed for towing
  • As materials the vessels have a towing line on board. Length and strength depending the equipment number. If not on board they must use more mooring lines, connected to each other
  • The towing point on a tugboat is midships, on a merchant vessel the towing point is on the stern
  • Less engine power.

Tugs
Towing Line

Materials

• Steel wire.
  • Most economic (relative light and cheap and less space
  • Disadvantage: no elasticity, need maintenance, they rust
• 8 strand braided Polypropylene
  • Advantage: A large elasticity
  • Disadvantage is the space they require to store, they are big and heavy
• High grade cables (synthetic fibre - polyethylene, aramid)
  • very strong, very light, low elasticity but also very expensive
  • Used by tugs
The length of a Towing Line

- Sufficient length for elasticity and lesser change to collide with tow
- The length of the connection must be so both vessels are on top of a wave at the same time. If the line comes taut it definitely will break.
- Be aware of waterdepth. In shallow waters the towing line must be shortened
- A disadvantage of a (too) long towing line would be the wire length hanging down after breakage. It might take a long time to heave the wire

Achorchain-anchor- towing line
Length of towing line

Connection on a vessel to be towed

- Towing line prepared and given by vessel to be towed
- To obtain more weight and elongation the steel wire can be connected to the crown shackle of the anchor or after disconnecting the anchor (NOT easy to carry out) to a kenter shackle of the anchor chain
- Pay out as much anchor chain as needed to obtain weight and the length.
- Run the anchor chain through the hawse pipe. Secured the chain with the chain stopper
- Careful attention should be paid on towed ships with a jibboom or bowsprit. Once again the best option is to connect the towing line through the anchor hawse pipe.
- If you want to reduce sheering try to make fast in the amidships. Try to follow the towing vessel on a small angle by using the rudder.
- In narrow waterways make fast out of the amidships. The towed vessel stays out of the wake of the towing vessel to avoid the tow to slow down.
Bowsprit and more

Towing manoeuvre tug

- slepen op zee.mp4

- The tug is very maneuverable
- The towing point of a tug is more midships
- The tug can use his winch, a tug bit or a hook (on the bit)
Winch fore and aft

Connection on a towing vessel

- Comparing to a tugboat it is difficult to belay the towing line in a safe way.
- The towing line will be taken through the stern lead and belayed on more mooring bits, so the force is spread amongst them.
- Do not take more than two turns on the bits, secure wire on the last bit.
- Use anti chafe material for stern lead and each bolder.
Approach in open sea.

- The approach depends on the state of the sea, the wind and the maneuvering characteristics.
- First determine which one has more drift on the same course by drifting directly behind the vessel to be towed.
- Depending on the drift of both vessels, the vessel to be towed is passed on windward or leeward side.
- Beware, making a towing connection may take a couple of hours.

Most Dangerous Object in the Office Ikaros Line Thrower.mp4

Approach

- Pass carefully and heave over a thin line when abeam of each other (line thrower?).
- On this line a strong line can be pulled over connected to the towing wire or line.
- The towing vessel will move ahead slowly and passes the bow of the other vessel.
- Make sure you have a safe distance between the vessels. Now you can heave in the towing line and belay.
- The towed vessel pay out more line (and chain).

The vessel to be towed has more drift.

The towing vessel has more drift.
The vessel to be towed is at anchor or aground

- Anchor to windward or upstream of the vessel to be towed. Bear in mind the possible tide change because you will need some hours.
- The towing vessel has to use quite a lot of anchor chain because it will have to hold two ships for a while.
- When the vessel to be towed is at anchor, he will have to heave anchor after the connection is made
- Then the towing vessel can heave anchor and gives easy ahead
- If the vessel is aground, use the engine *and* the anchor winch to create a large towing force. It also keep the towing vessel on the desired heading.
- Be aware if you do not use the anchor/long anchor chain you probably run aground as well

Pay attention!!:

- Whichever manoeuvre you choose keep your propeller clear.
- This, and hitting each other, is the largest danger
- When connected the towing vessel has to increase speed very, very carefully. If done too fast the line might snap.
- When changing course, the towed vessel will have to steer for a wide outer curve, this helps the towing vessel steering and prevents the towing line to hang loose and snap tight again.
- COLREGS!! On a frighter or sailing ship only the towed vessel can show her mandatory lights (sidelights and sternlight) the towing vessel must lit the towing line and warn other ships by searchlist, Aldislamp and VHF
Dangers tugs in port

- Interaction between tug boat and ship

Girting aft tug

- Be aware that the vessel to be assisted must have a very low speed to avoid this danger
- or the tug must lead the tug line through a fairlead on the stern
Dangers tugs in port

Girting fore tug
• Watch the speed
• Warn the fore tug before making a bold rudder manoeuvre
• If a fairlead was used the tug would come alongside (on opposite course)

Caroussel tug

No danger for girting with a Carouseltug

https://www.youtube.com/watch?v=868_GvlE9Qw p4
REPETITION GRADE 1

- Mooring unmooring
- Storm maneuvers
- Entering port with cross current
- Manoevring in shallow waters
- Passing a lock
- Mob maneuvers
- Taking a pilot
- IAMSAR
Mooring

- Preparations
- Bowthruster and speed
- Foc’sle. Before let go anchor – look down!
- Aft. Keep the propeller clear. If not-line, hieving line, boatman-, give notice to the bridge
- Check and control the movement of the vessel with a fore-background bearing or doppler log (instruments)
- Do not hold the line(s) when the vessel is still moving. The line will break (dangerous!) or if it does not break, the vessel can be damaged.

ships bollards, bits, fairleads and drums

1. warping head
2. drum
3. bollards
4. stopper eyes
5. fairlead
6. centre lead
7. /9. lead way or roller fairlead
The spring directly from drum, the headline on warping drum winch

Anchor winch + mooring drum and warping drum
Mooring and Unmooring - danger and risk

how to belay a mooring line

on a bollard after heaving tight
stoppers and stopper knots

line ashore and taken on the winch (warping head or capstan)
line heaved tight

load taken by a stopper
line taken off the warping head and the roller

line belayed on the bits of the bollard in figure of eight turns (steel wires)
or in loops around one bit (fibre lines)

stopper released
SOME MANOEUVRES without current/wind - with current – with wind

- Mooring Approach
  - How to proceed
  - Which line first
- Unmooring
  - Engine/rudder use
  - Which line last
- Using anchor
  - Which anchor
  - How many shackles
  - Holding or dragging
  - Running moor/dropping moor/deep water
- Maneuvering
  - Why turning over port/starboard
  - Engine/rudder

Manoeuvres with current
Mooring with current on the bow

- Always keep the bow pointing into the current
- When the ship is on a level with the berth the engine keeps it stationary relative to the shore.
- With the current coming in from straight ahead, the rudder is then moved slightly to the shore
- The ship will turn slightly to the shore and the current will slowly push it towards the quay
- In pos. 3 the ship must give counter rudder on time, so it ends up in pos. 4 parallel to the quay and a strong head line is issued to the shore and belayed

Note: When counter rudder is given too late there is a great risk that the ship-to-shore angle gets too wide and the bow is pushed onto the quay, causing great damage.
Manoeuvres with current
Mooring with current on the bow with anchor

- Drop the outer anchor upstream of the berth with rudder to the shore (pos. 1),
- Veer over to the shore as much as possible and then issue and delay a strong head line to the quay (pos. 2).
- When the anchor chain is slowly given out, the current will push the ship against the quay (pos. 3).

Manoeuvres with current
Mooring with current from aft

- Best to avoid this manoeuvre! Turn around (anchor?) and moor bow into the current
- If the manoeuvre is inevitable and the current is strong, use an aft tug*.
- If there is little current approach the berth ”floating“ Close to the berth, bring in the stern and quickly issue a strong rope to the shore and reverse (keep propeller clear) Pos 2
- Hold the rope and issue or heave it in as needed. Stand by for a second rope. Pos 3

*If bowthruster available another possibility is to proceed with stern first on a small angle, steering with the bowthruster. The first line again the sternline (keep propeller clear!)
Manoeuvres with current
Unmooring current from fore

• Hold a strong aft spring and a strong head line (pos. 1).
• By slacking the head line the bow will veer away from the quay by the current. This can be helped by rudder from the quay.
• Pos. 2 Cast off the aft spring but hold the head line. The current will push the stern away from the quay.
• In pos. 3, when the propeller is clear go forward. Cast off the head line.
• If the spring or head line gets into the propeller, drop anchor immediately. By slowly reversing the engine whilst carefully heaving in the rope one can try to clear the propeller.

Manoeuvres with current
Unmooring current from aft

• Pos 1. Keep a long the forward spring and a strong aft line.
• Turn rudder away from the quay and slacken the aft line, so that the stern veers out.
• Pos 2. Hold the aft line and reverse the engine, let go the forward spring.
• The current between ship and shore will also push the ship to Pos. 3.
• Pos 3. Stop the engine and cast off the aft line. Keep the propeller clear.

• ! If the aft line casted too soon with the propeller in reverse the rope can get into the propeller.
• Immediately drop the shore-facing anchor, hoping the ship will swing away from the shore.
Manoeuvres with current
Unmooring current from aft ship is on opposite course

- Forward spring on the bow
- Cast off all other lines and swing to pos. 3.
- Reverse engine and cast off forward spring.
- In pos. 4 rudder hard to port and full speed ahead.
- On course in pos 5

If in pos 3 there is not enough room behind the ship, the anchor can be dropped between pos. 3 and 4, causing the ship to swing out to pos. 5.

Manoeuvres with current
Unmooring current from the bow ship is on opposite course

- Aft spring from the stern
- Cast off all other lines. Rudder away from the shore.
- The bow will veer out and the ship will come to pos 3
- In pos. 3 cast off stern line (spring) and engine forward, rudder to shore and bring ship on course.

- The propeller or rudder must not be at risk of damage from the shore or quay.
- Usually the ship will come away from the quay when swinging around
- The engine slow forward can help
- Only execute this manoeuvre if there is no room for turning elsewhere
Turning 180°

- Pos 1 steer for port side basin
- Pos 2 start manoeuvre with stopped vessel or with very slow speed
- Pos 3 hard sb rudder and engine half ahead
- Pos 4 stop engine, engine half astern. Rudder midships. When making sternway rudder hard a port until pos 5
- Pos 5 Stop engine. Rudder midships. Half ahead and rudder hard SB
- Pos 6 proceed as you like

Some remarks

- With right handed fixed over SB
- With left handed fixed over Port
- If a fresh wind from port always turn over Port
- Wind from astern. Advice to use an anchor

Turning 180° on a holding anchor

- Pos 1 Anchored with sb anchor and moves forward slowly to port so the anchor chain does not come around the bow.
- Pos. 2, 3 and 4 By slowly going forward with the rudder to starboard the chain points back so that it emerges from the water amidships
- Pos 4. Stop the engine and heave in the chain, bringing the ship on course in pos. 5
- If anchored with port anchor turn over port
MAKING A 180° TURN ON A NARROW WATERWAY

- Pos 1-2 Heave anchor with the aid of the engine and move slightly across the current to the ort side
- Pos 2 With the rudder hard over and without the propeller turning, the ship will float along the shore through pos. 3, 4 and 5 while the current is stronger in the middle than it is near the shores;
- In pos. 5, the ship goes full speed ahead with the rudder hard to starboard.
- Pos 6 If the ship is not on course by then, it will have to reverse with the rudder to port to end up on course (pos. 7).

*Avoid making this manoeuvre along the starboard shore with a right handed fixed propeller*

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Manoeuvres with current turning into the current with a dragging anchor

- Slowly move as far to port as possible.
- Pos. 1 Rudder hard starboard and give a short burst ahead to make a quick starboard turn.
- Pos. 2, at about a right angle to the current, stop the vessel and drop the starboard anchor.
- Let the anchor drag along the bottom, but not bite. The anchor will hold the bow back, and let the ship swing.
- When the ship has made the turn (pos. 3) the anchor can be heaved again.
Wind

- A ship has a Lateral Point L below the waterline and a Sailing Point S above the waterline.
- The resistance against sideways drifting is supposed to work in L.
- When the vessel is making headway L seems to move forward.
- When the vessel is making sternway L seems to move aft.
- The wind force is working in S.
- Making headway this vessel is luffing, making sternway she is paying off.

ANCHORING PREPARATION

Charts, Pilots and other data help to determine where to anchor. Things to pay attention to are:

- shelter/lee
- prevailing winds
- weather forecast
- depth and tidal difference (UKC)
- current
- cables (above and below the water)
- turning space for the ship
- surrounding ships
ANCHORING

- Determine anchorage position and proceed with the wind or current on the bow with reduced speed
- At the anchor position is, stop and reverse the engine. By the time the wash reaches amidships or stopped relative to the ground, drop the anchor.
- Once the anchor has dropped, pay easy out more chain; if the chain runs out well the engine can be stopped.
- Hold the chain when the required number of shackles has been paid out. The chain will first pull taut because the ship is moving astern, and then go slack; this is a sign that the anchor holds.

*If the chain goes taut and slack more than once, it is a sign that the anchor is dragging. This may also be the case when the chain is visibly vibrating and resonating*
the way the anchor works
the way the anchor works

the way the anchor works
ANCHORING

• As a rule the for the number of shackles: depth plus 2 shackles
• Pay out more chain if the anchor is not holding well, or if the seabed is unsuitable or bad weather forecast.
• Once the anchor has held, take your bearings by taking compass bearings, by radar or GPS
• Apply Colregs for lights and anchor ball
• Note. The anchor is dropped whilst moving astern to prevent the chain to fall on top of the anchor and damage or disable it.
• An anchor watch should be held
• If very bad weather is forecasted it is better to haul anchor and await the weather on the open sea.

let go anchor!
ANCHORING at great depth and V-shaped

At great depth
• Pay out the anchor chain on the windlass for some ¾ of the depth before dropping it the rest of the way.

V-shape by using two bow anchors
• To prevent yawing behind the anchor in strong current or wind a second anchor can be used
• Pos 1 Drop the windward anchor and slowly sail to pos 2 and drop the other anchor and pay out enough chain on both sides until there is approximately the same force on both chains in pos. 3.

ANCHORING Dropping and Running Moor
• When with a changing tide there is not enough room to swing around a single anchor, one can apply a dropping or running moor.
• Now one bow anchor will be pointing ahead, and the other bow anchor to the stern. The ship can swing across the bow using minimal space.
• To prevent the twisting of the chains pay close attention when the tide turns; if the ship wants to turn the wrong way this can be prevented by using the engine.
dropping moor

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>sail to the upstream anchor position and drop the lee anchor.</td>
</tr>
<tr>
<td>2.</td>
<td>let the vessel drift to the downstream anchor position by veering the chain, and drop the second anchor.</td>
</tr>
<tr>
<td>3.</td>
<td>heave on the upstream anchor chain and veer the downstream chain till the vessel is in the required position halfway both anchors.</td>
</tr>
</tbody>
</table>

dropping moor in case of a constant cross wind or a possible cross tide during slack water.
running moor

1. sail to the downstream anchor position and drop the windward anchor

2. stem to the upstream anchor position meanwhile veering the chain, and drop the second anchor

3. veer the upstream chain and heave on the downstream chain till the vessel is in the required position halfway both anchors

running moor in case of a constant cross wind or a possible cross tide during slack water
the result

during change of tide (slack water)
MOORING ON THE LEE SHORE WITH A STRONG WIND

• Approach the quay at a wide angle
• Pos 1 Drop the windward anchor more than one ship’s length from the quay for an easier leaving.
• Pay out the chain and approach the quay slowly with the aid of engine and rudder
• Pos 2 Carefully let the bow come to the quay and hold the chain in time. Quickly issue a forward spring
• With the engine and rudder bring the stern to the quay (Pos 3)
• Show anchor lights/ball

MOORING WITH DRAGGING ANCHOR

• Used by severe wind circumstances
• After moored hieve anchor
• Mostly not allowed to leave the anchor in the ground (other shipment)
Hauling the anchor

- The winch is turned on and the gypsywheel clutched in
- Water on deck to wash the chain
- If the locker is not self-stowing one should be in the locker to stow the chain.
- The anchor is heaved at the captain's command. A crewmember signals the direction of the chain with his arms to enable the captain to decide how to manoeuvre to ease the heave.
- Bell signals are given to the bridge to announce the amount of shackles heaved up and also when the anchor is off the ground.
- The anchor is heaved into the hawse pipe with the flukes flush against the hull. Brake on. At the captain's command, the chain stoppers are secured.
- Remove anchor ball. Switch off anchor lights

Manoeuvring in stormy weather - preparations

*increase the seaworthiness of ship and crew*
• Foc’sle anchors, purling pipe, ventilators, hatches

• Deck check all openings ,loading gear, lashings cargo, rig lifelines on deck

• Accommodation watertight doors lifeboats, accommodation ladder, warn cook

• Ship as soon as the ship starts to roll and pitch heavily and even starts pounding, speed will have to be reduced and when things are getting worse, a storm manoeuvre will have to be carried out

In irons (head into wind)

• Speed adjusted to hold course and minimize wash

• Heavy pitching and rising of propeller above water

• Not preferable for larger ships
Heave to

- If there is sufficient room
- Wind and sea at 3-4 points on the SB or Port bow
- (Very) low speed
- A leeward side on deck is created
- Less tension in the fore and aft ship
- Less damage to ship and cargo
- Large vessels suffer from severe torsion forces
- Oil film calms sea at windward side (carefull deck slippery!)

*Hove to port= wind and seas 30-50 degrees on sb bow (sailing vessels: hove to on starboard tack)*

torsion
torsion

Scuddung

- When the ship runs before sea and wind, the impact of the waves is less.
- There must be sufficient sea room
Scudding

However,

- for small ships there is the danger of broaching or bow diving
- for big vessels heavy rolling can occur
- the stability is influenced negatively
- there is a great danger of capsizing
- when the weather gets worse it is not easy to notice

further,

- it is difficult and dangerous to turn the ship around if necessary
- when the ship has the seas from the quarter, she will roll heavily and ship a lot of water on deck, also negatively affecting the stability
Rolling heavily

letting adrift

• when none of the aforementioned manoeuvres can be carried out, some ships have successfully survived by letting adrift.
• the engine is stopped and the vessel will take a course where the wind is usually a bit aft, or forward of the beam
• the speed of drift will calm the waves at the windward side
• seen the drift speed a lot of sea room to lee is needed
Running Adrift

- sea will be becalmed on the windward side
- trough
- crest

**USE OF WAVE QUELLING OIL**

- The most dangerous for ships are heavily braking (big) waves
- A thick oil, vegetable or fish oil, but in a real emergency, lubricating oil can be used to prevent these seas from breaking
- The oil forms a film on the waves, preventing the crests from breaking
- The oil is gradually let out via a drain pipe or scupper, near the bow and stern and with longer vessels also amidships
- However, wave quelling oil is no longer standard on board of ships, as letting out oil deliberately is a violation of Marpol
- Nevertheless, knowing of this technique might save ship ad lives when caught under very severe circumstances!!!
POURING WAVE QUELLING OIL

- Crest
- Trough
- Drift direction and speed
- Oil outlets
- Spreading of the oil

Deliberate beaching

- If beaching is inevitable, run aground in the most favorable position.
- Both anchors must be heaved in or let go.
- With an empty forepeak and a shore side list the ship is run onto the beach, as high as possible with an angle to the waves.
- After the ship has run aground it wait on board. Usually help will arrive soon in the form of rescue lifeboats or helicopters.
Running aground

Action depends on the situation

• On a rocky shore with high waves it is important to get loose as quickly as possible, and to call assistance.
• Getting loose in this situation is only advisable if the ship is not taking in too much water.
• On a soft seabed in a tidal region, be very careful in using the engine if the bottom is flat. The propeller can cause holes and bumps in the seabed, causing greater tension on the hull.
• Better wait for the upcoming tide to try to get the vessel afloat.
• Dropping an anchor after grounding is often a sensible precaution. It prevents the ship moving higher to the seabed, but also may damage the hull.

Entering a port with cross current
Entering a basin with cross current 2

In shallow and narrow waters

- The ship pushes the water away (bow wave) and leaves a cavity behind the ship to be filled up
- A reverse current beside and under the vessel passes the rudder and fill up the cavity

BUT...

- When reverse current brings not enough water, it must be compensated with water from behind. This is called the Following wake.
- This may happen when there is little space between ship/shore and ship/bottom
- To much following wake makes a ship no longer steerable
- Slowing down is he best way to regain control
Squat

- When a vessel is making way through the water the reverse flow causes a lower level on both sides of the vessel
- The fast waterflow below the keel also causes an under pressure under the keel
- These effects cause an increase of draft, which is SQUAT
- In defined waters (narrow channels) the squat is twice the squat in deep water
- In the calculation of the UKC (under keel clearance) the squat should be included

![Squat Diagram](image)

Squat (meters) = \( C_b \times \frac{V^2 \text{(knots)}}{100} \)

In defined waters x 2

How to proceed in narrow waters

- Proceed at moderate speed
- Keep to the middle of the waterway as much as possible
- As soon as the ship responds less to the wheel or moves away from the middle, slow down
- Too much speed can cause wake damage to the shores or to vessels moored.
- Be aware of the dangers while meeting, overtaken or being overtaken by other vessels

![How to proceed Diagram](image)
When two ships meet in a narrow channel

- Ship A keeps safe distance to ship B preventing ship C to pass two oncoming ships in one manoeuvre
- After passing A, C returns to the middle of the narrow channel
- If C loses control, both ships have time to react and solve the situation (pass green to green?)
Overtaking
Waterlevels meeting and overtaking

Locks—where fresh water and sea water meet

- From sea: against the current
- From canal: with the current
- Remember this when entering and leaving the lock
- Approach in the center line
- If only a few room beside and under the keel of the vessel, it needs continuous engine power to proceed
- Be careful of shooting forward when halfway in the lock while most water has past the vessel
- Pay attention of the rise or fall
MOB manoeuvres

The moment you see someone falling overboard, do the following:

1. Sound the alarm as loudly as possible by shouting: "Man overboard!" and keep looking and pointing at the victim.
2. Throw the nearest lifebuoy, if possible with light, and a Dan buoy after the victim.
3. On the bridge the watch officer records the ship's position with the MOB switch on the GPS and starts a MOB manoeuvre.
4. Inform the captain.
5. Prepare the MOB boat for lowering, plus all other necessary affairs.

MOB manoeuvres

- **Williamson turn**
  - Good in reduced visibility
  - MOB on starboard – turn to starboard
  - Little wind or on the tail

- **Scharnov turn**
  - Cannot be used immediately
  - Less distance, saving time

- **One turn**
  - Fastest method
  - Difficult because approach to person is not straight

- **Ellipse turn**
  - Used when wind on the bow
  - The victim position must be known
  - When wind on bow
MOB back on board

- To the victim on board can be very difficult, especially on bigger ships. In calm weather it can be attempted without an MOB boat.
- In all cases, keep the victim away from the propellers. Use the bow thruster to manoeuver alongside the victim.
- Devices to get the victim on board are the pilot ladder, a Jason's Cradle, loading nets and possibly a loading crane.
- MOB boats are especially suited for this task. The MOB boat should have at least the following on board:
  - SART; lifejackets and/or survival suits; portable VHF; a crew of 2 persons

Taking a pilot on board

- Ordering a pilot
- Preparations while approaching
  - Pilotladder on leeward side
  - Stanchions
  - Buoy with light
- Boarding course and speed
- Officer with walky talky at the pilot ladder
- Nederlands-Loodswezen-Powerclip-2014.mp4
IAMSAR (consists of 3 Volumes)

• The primary purpose is to assist States in their SAR needs and the obligations
• These volumes provide guidelines for a common aviation and maritime approach to organizing and providing SAR services.
• Volume 3 is intended to be carried on board rescue units, aircraft, and vessels to help with performance of a search, rescue, or on-scene coordinator function, and with aspects of SAR that pertain to their own emergencies.

RESPONSIBILITY

• According SOLAS regulation ship masters are obligated to assist others in distress at sea whenever they can safely do so.

The master deciding not to proceed should:
• Make an appropriate entry in the ship’s logbook.
• Report the decision not to proceed to the SAR service concerned.
Search Patterns

Sea areas

- The equipment on board depends on their range. The world regions:
  - A-1 = up to 30 miles out of the coast.
  - A-2 = up to 200 miles out of the coast.
  - A-3 = between 70°N and 70°S.