Masters and Mates Orals
Examination Questions and Answers
As Supplied By Australian Maritime College Students in 2007
[compiled by Rishiraj, in 2007]

Part 2 of 3

DISCLAIMER:
The University of Tasmania Library cannot guarantee the accuracy of the questions and answers. These oral examination questions and answers have been digitised as a service to students for oral examination preparations.

Some pages have been scanned in colour to enable legible reproduction.

Some images have been removed as the source of the images were not acknowledged and could not be verified. Removed images were not important to the content.

Reproduced by University of Tasmania Library, November 2012
Ice Accretion

Working North in Winter months is dangerous because of the chance of your vessel icing up because of ice accretion.
There are several reasons for ice accretion, these are;

(1) Spray hitting the vessel with the air temperature being at least minus 20º.
(2) Fog freezing on the structure of your vessel.
(3) Rain Freezing on the structure of your vessel.
(4) Seas entering your vessel and freezing up.
(5) Fresh water leaking or being discharged from a pipe on your vessel.

If your vessel starts to ice up through ice accretion then do the following;

(1) Turn the vessel around and head South toward a warmer climate.
(2) Minimise the spray coming onto your vessel by slowing your vessel down.
(3) If your vessel is listing to starboard, then take the ice off the port side first, you'll give your vessel a bigger list, but the centre of buoyancy will move out also and thus you will have a bigger righting lever.

The Law states if you encounter ice accretion on your vessel that was not issued with the shipping forecast, you must;

(1) Inform all ships in the area
(2) Contact the Coastguard

Ice accretion can occur as far South as 57º North, in the 1990's several fishing vessels working out of a fishing port called "Fraserburgh" encountered ice accretion.

Never ever take chances with ice accretion, this can and will severely affect your vessels stability, vessels have capsized because of the ANGLE OF LOLL effect that ice accretion has on the vessel, the vessel will become top heavy as the Centre of Gravity nears/meets of goes above the Metacentre. (The vessel with have an UNSTABLE EQUILIBRIUM).

Iceberg's
Statistics show that 9/10 of an iceberg is below the surface of the water; Icebergs are easily detected by radar, but caution must be taken for BERGY BITS (small icebgs broken off from a Glacier, or GROWLERS which are smaller than BERGY BITS and harder to detect by radar."

Growlers are a Berg that is less than 17 feet above sea level and not more than 50 feet in diameter

**MGN 84 Safe watch keeping**

*broken down into layman's terms*

(1) Always have 2 men on watch at all times, one of them should be a certified deck officer. (O.O.W., Mate, Skipper etc)

(2) The Wheelhouse should never be left unattended.

(3) The watch keeper has no other duties apart from watch keeping.

(4) If ever in doubt call the skipper out.

(5) Keep all watertight doors and hatches closed while at sea, they're only used when you required access through them.

(6) Switch on all navigation aids and use them but never over rely on them.

(7) Never miss a weather forecast, you could miss a gale or storm warning.

(8) If you ever take ill while on watch, call the next watch or/and the skipper.
(9) Plot your position on a chart ever 10 minutes.

(10) When changing over the watch, let the relieving watch keeper get accustomed to the dark and never change watch if your in a risk of collision/close quarter situation exists.

(11) Maintain a good visual watch.

(12) Use the radar's and go up and down the scales to check for hidden targets especially with rain clutter (Cumulonimbus cloud will block most of your radar screen).

(13) Have CCTV fitted throughout your vessel especially in the engine room aimed at the bilge's in case the bilge sensors fail to operate.

(14) In restricted visibility leave the autopilot switched on as long as you can switch it off in an instant (this leaves you more time to assess any situation and maintain a higher degree of safe watch keeping).

(15) Switch off the autopilot for 5 minutes ever watch and if making way for more than 24 hours then it must be switched off for a 2 hour period.

(16) While dogging in poor weather, a great idea to minimise damage aboard your vessel is to stream a sea-anchor through the fairlead at the stem of the vessel, DO NOT STOP YOUR MAIN ENGINE.

(17) In restricted visibility the skipper should be on command of the vessel, have men posted at the side windows listening out for fog signals, the mate should be on the radar looking for targets.

(18) Make up a passage plan and get the skipper to check it, have a backup passage plan in case the weather freshens and you need to go into port.

(19) The watch keeper must be fit, sober and not under the influence of drugs even if they are prescribed for him.

(20) Fatigue at sea counts for the most accidents that happen at sea, if you feel tired, open the wheelhouse windows, if this does not work call the next watch, never gamble, your crewmembers are relying on you to keep a safe watch.

(21) TV's, personnel hi-fi's and cassette/CD players should be in the mess deck not in the wheelhouse.

(22) Autopilot's should have a 3-minute alarm fitted and a backup system should be fitted to the crew's accommodation.

(23) When a pilot in onboard the skipper is still on command, he has the last say.

(24) If you're ever in doubt about a situation, then stop your vessel to give you more time to access the situation.
Officer of the Watch or Skippers standing orders

(1) If ever in Doubt call the skipper out

(2) Always have a Certified deck officer who holds a Certificate of Competency (He should know the Rules of the Road) on watch

(3) The radar should be used to it's maximum, even in nice weather to track the course/speed and C.P.A. of an approaching vessel

(4) The watchkeeper should be plotting his position on a chart every 15 minutes (Max)

(5) Always have the distress radios switched on listening for distresses

(6) If the watchkeeper feels ill or becomes fatigued the second watchkeeper should call the skipper who will call the next watch

(7) The watchkeeper must have no other duties than watchkeeping

(8) At night the relief watchkeeper must be allowed to get his/her eyes accustomed to the dark

(9) Never change over a watch while in a close quarter situation

(10) At sea all water-tight doors and hatches have to remain closed, the second watchkeeper should check this at the end of his watch

(11) The second watchkeeper should also check ever compartment visually for any ingress of water or fire

(12) Take the weather forecast

(13) Use all navigation aids

(14) Make a passage plan up and stick to it unless the weather breaks and you have to go to plan "B" and make for shelter

(15) In restricted visibility leave your autopilot switched on (as long as you can switch it off quick) this allows you more time to check for hazards

(16) When a Pilot in onboard the skipper is still in command of his vessel (there has been cases that a pilot put ships ashore) if in doubt stop your vessel and check your position and approaches to the harbor

(17) The watch keeper should not be under the influence or alcohol or drugs (even prescribed drugs)

(18) If you get into a situation, stop your vessel to give you more thinking time to access the situation
Authors Tip: Fatigue while on watch is very dangerous and can cost you and your crewmates their lives, open the windows, get a second watch keeper alarm fitted to the accommodation with a 3 minute time delay (better safe than sorry)

**Entering an Enclosed Space**

An enclosed space can kill with the potential gases or lack of oxygen in that area, what you're about to read actual happened;

Situation One

A Freezer trawler had just hauled and the hold-man went into the hold to get ready to put away the fish - a second man went to call him and see if he was ready to take the fish into the fish-hold and he saw the man lying at the bottom of the fish-hold - he went to investigate and see what was wrong with the hold-man - he too collapsed - a third man came to investigate and he also went to the bottom of the fish-hold and he collapsed also - all three men died because of the freezing gas escaping into the fish-hold.

Situation two

Another situation was with Bulk Fish held in tanks with no breather pipes on top of the tank lids - when it came time to land the fish - a crew member opened the tank lid and was catapulted into the harbour - the build up of gases given off from the fish had built up inside the tank and when the lid was opened it threw the man into the harbour - the man survived and the skipper did a risk assessment and place breather pipes on top of the tank lids

Precautions before entering an enclosed space (especially if the space has been closed for ages)

The enclosed space could be a tank/cargo hold/focssule or any sealed compartment

(1) Always get the skippers/masters permission before entering an enclosed space
(2) Get a permit to work
(3) Always know what if any toxic gases are in the enclosed space
(4) Ventilate the enclosed space
(5) Check the air content in the enclosed space (use an oxygen analyser (OXYMETER) - Plumbers have these)
TECHNOVATION Series 11 intrinsically safe oxymeter offers a personal Oxymeter range 0-25% Oxygen which can be hand-held, is portable and handy. The oxymeter is provided with an analogue scale 0-25% with 0-19.5% shown red, which range is hazardous to personal safety due to the insufficiency of O2 for breathing. The O2 sensor can be lowered into the confined space or vessel before man-entry to check for an oxygen deficiency condition.

(6) If needed wear Self-contained breathing apparatus (S.C.B.A.)
(7) There should be personnel checking your name/rank/time you entered and time your due out of the enclosed space
(8) Use a lifeline
(9) Have a form of communication between you and the person at the entrance;

1 pull = give me more slack;
2 Pulls = I'm coming out;
3 or more pulls = get me out

(10) Have someone at the entrance trained in First-Aid
(11) Watch your pressure gauge for the amount of oxygen you have in your S.C.B.A tank.

**Fires & Fire Fighting**

What ever fire your faced with NEVER let the fire get between you and your exit

<table>
<thead>
<tr>
<th>Class of Fire</th>
<th>Materials on Fire</th>
<th>Best Extinguisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class &quot;A&quot; Fire</td>
<td>Cloth - Paper - Wood</td>
<td>Water</td>
</tr>
<tr>
<td>Class &quot;B&quot; Fire</td>
<td>Flammable Liquids</td>
<td>Foam</td>
</tr>
<tr>
<td>Class &quot;C&quot; Fire</td>
<td>Electrical Fires</td>
<td>CO2</td>
</tr>
<tr>
<td>Class &quot;D&quot; Fires</td>
<td>Metal on Fire</td>
<td>Dry Powder</td>
</tr>
</tbody>
</table>

Dry Powder puts out all types of fires well

**Fire-fighting Situations**
(Q) What is the triangle for a fire to start?
(a) Fuel - Oxygen and Heat

(Q) What would happen if you took one of the sides of the triangle away?
(a) The fire would stop

(Q) How many fire hoses do you have in your vessel?
(a) Look in the Record of Particulars for this information remember to count portable fire hoses and any hoses for washing the vessel down with.

(Q) What type of nozzle do you have at the end of your fire hoses?
(a) Either Jet or Jet/Spray Nozzle

(Q) Do you carry spare fire hoses on your ship?
(a) You should have at least one spare

(Q) How many fire Hydrants do you have?
(a) Check this out in your Record of Particulars

(Q) What fire extinguishers do you have in your vessel?
(a) Check this out in your Record of Particulars

(Q) Where are they stowed/placed at?
(a) Check in the Record or Particulars (your best to get a notepad and go around the ship and write down what extinguishers/hoses is where)

(Q) Why so many extinguishers in the engine room?
(a) Because this is the primary source for a fire to start

(Q) A fire has broken out in Number 1 hold, what are you going to do?
(a)

(i) Sound the General alarm to Muster the crew
(ii) Put out a Mayday
(iii) Get personnel to don fire suits and S.C.B.A. (Self contained breathing apparatus)
(iv) Start all hoses up
(v) Spray the hatch with water
(vi) Get the Life raft's ready to launch
(vii) Get the portable emergency radios/spare flares/water/food and blankets ready to take to the Life raft's
(viii) Keep an eye on the vessels stability (with all this water going into Number 1
hold - you could loose your stability) so be prepared to start all bilge pumps and have portable pumps ready

(Q) What extinguisher can you refill on the vessel?
(a) Foam - Dry Powder and Water

(Q) How do you refill a foam extinguisher?
(a) 
(i) Unscrew the top off
(ii) Empty the contents
(iii) Wash the inside of the extinguisher with fresh water
(iv) Mix up the foam mixture and fill it up to the mark inside the extinguisher
(v) Replace the seals
(vi) Put in a new canister (Co2)
(vii) Screw the lid on (Hand tight only)

Galley Fire

(Q) You see a fire in the galley, its a chip pan on fire, what are you going to do?
(a) Your priority is to make sure you do not get hurt, close the door for the galley, scream "FIRE" and make sure everyone is alerted.

(Q) Can you manage to put this fire out?
(a) This would depend on what the heat source was, is it gas, electric, or diesel?

(Q) It's an electrical source of heating, can you put the fire out now?
(a) Yes, outside the galley there should be an isolator switch, if I switch off the electricity to the fire, this would help, now I can go in and put a fire blanket over the chip pan, as long as I have a fire team alongside me.

(Q) What would you do if it was a gas fueled cooker?
(a) Turn off the gas at the mains (Bottled Gas)

(Q) What would you do if it was a diesel fueled cooker?
(a) Turn off the main fuel source in the engine room.

(Q) What types of fire-extinguishers could you use on a chip pan fire?
(a) Dry-powder, Co2, Foam, try and avoid water, but if done in a certain way you
could put it out with a water fire-extinguisher, but it would have to come out as a very fine spray

(Q) What are you going to do, if the fire blanket and extinguishers does not put out this fire?
(a) Go in with fire hoses with a spray nozzle attached.

(Q) What type of call would you give the Coastguard for this type of fire?
(a) A Mayday, this fire can easily get out of control.

\[ F = \text{Fuel} \]
\[ H = \text{Heat} \]
\[ O = \text{Oxygen} \]

**Engine Room Fire**

(Q) The engine room fire alarm has went off what are you going to do?
(a) Sound the general alarm

(Q) What are you going to do now?
(a) Muster the crew at their muster stations and have a head count

(Q) What are the dangers with tackling this type of fire?
(a) In any engine room, there will be canisters of WD40 or oil drums, if pressure gets to them they will explode, also the fire could easily get around you and trap you in the engine room

(Q) How can you test you have a good seal around your breathing apparatus face mask?
(a) By placing a finger under the seal and you will hear the air coming out

(Q) How will you tackle this fire?
(a) Get someone don a fire-suit and breathing apparatus, roll out fire hoses, get
fire-extinguishers to the engine-room, pull the emergency fuel stops, close off all 
extractor fans and vents, go in to the engine room and attack the base of the fire.

(Q) What should you never let happen?  
(a) You should never let the fire get between you and the exit

(Q) You have taken your vessel into the dry-dock for a paint and a fire has broken 
out in the accommodation, what are you going to do?  
(a) If its a small fire then use an extinguisher and put it out

(Q) The fire is out of control, what are you going to do now?  
(a) Sound the general alarm and get everyone to their muster stations and also 
inform the port authorities as their employees are all trained in fire-fighting as well 
as getting the port authorities to call for the fire brigade

(Q) Can you tackle the fire?  
(a) As your in dry-dock you won't have access to water to pump the water to your 
main fire hoses

(Q) The fire-engines are away to a big farm fire 15 miles away and it will be 3 hours 
before they can attend to your vessel, what are you going to do now?  
(a) With the help of the shore party you can connect a universal coupling so you can 
charge your main fire hydrants with water and then use your own fire hoses to fight 
this fire

(Q) A major fire has started in the engine room and your CO2 did not activate, how 
can you put this fire out?  
(a) By sealing off the area, stopping the fans, close off all vents, and pulling the fuel 
stops, then boundary cooling with either the hand emergency pump or the 
emergency pump located forward in the vessel powered off the spare engine

(Q) A major fire has started in the engine room and you have no fixed fire fighting 
systems on your vessel, how are you going to put this fire out?  
(a) By starving it of air/fuel, close all vents/flaps close all doors into the engine 
room and pull the emergency fuel stops

(Q) Where are your emergency fuel stops located at?
going to do?
(a) Get out of there and find out why it went off

(Q) Is it possible for the fixed fire fighting system to go off by itself?
(a) Yes

(Q) If CO2 activated itself into an engine room, is it safe?
(a) No it's a gas and would kill you if you breathed it in and as it's a gas it could explode

(Q) Where is your fixed fire fighting controls at in your vessel?
(a) Look to see where they are at

(Q) The fixed fire fighting system has an alarm that goes off when the door is opened, can you hear the alarm throughout your vessel?
(a) You should be able too

(Q) You activate CO2 fixed fire fighting system into the engine room and it put the fire out, you now ventilated the engine room, what dangers for personnel going into the engine room?
(a) There will still be CO2 gas in the bilges

(Q) How do you get rid of the CO2 in the bilges?
(a) Pump your bilges

(Q) The vent/extractor fan in the galley, what dangers with these?
(a) A fire starting in the pipe behind the fan

(Q) How often do you clean them?
(a) It should be pretty often

(Q) Freon gas that is used for freezing on ships are they safe?
(a) They are the safest form of gas for freezing

(Q) Is freon gas heavier or lighter than air?
(a) Heavier
(a) You need to look in your own vessel and find this answer out, its also in your record of particulars

(Q) How do you prevent a fire from starting on your vessel?
(a) By keeping it spotless, no oily rags, no oil spills, no bare electrical wires, batteries boxed in a steel box, extractor fans cleaned often especially the one in the galley, no smoking, keep bilges dry, never leave chip pans unattended, fit fire sensors, fit CCTV, fit a save all to prevent fuel oil spillages, have plenty fire fighting equipment, know how to operate fire fighting equipment, have self contained breathing apparatus onboard, have an isolator switch just outside the galley, never leave electric blankets on unattended, don't put clothes over heating appliances to dry, have a fire plan (this should be part of a muster drill), do more fire drills so your crew know what they have to do

(Q) A deep fat fryer, are they completely safe?
(a) No some of the older models only have one thermostat inside it and if the thermostat became faulty the chip pan would over heat and catch fire

(Q) What type of extinguisher would you use on a diesel fire?
(a) A foam extinguisher

(Q) You had a major fire in your engine room and you sealed off the engine room and activated your CO2 fixed fire fighting system, but how do you know if the fire is out?
(a) Feel for any heat

(Q) There is no heat, how long before you can enter the engine room?
(a) You will not enter the engine room, why would you want to go into the engine room, after a big fire everything will be damaged so get a tow ashore and get the fire brigade to ventilate the CO2 out of there, they are the professionals

(Q) What precautions would you take before fighting a fire?
(a) Can I tackle this size of fire, is there any pressurized containers near the fire source, do you know what is causing the fire - can it explode, do you have the fire fighting equipment to fight this type of fire, is the fire giving off toxic fumes

(Q) What would you do if the fire alarm went off?
(a) Make for the muster station

(Q) Your in the engine room and the fixed fire fighting alarm went off, what are you
(Q) Where would the gas sensor be placed for freon in the engine room?
(a) Right below the freon pump

(Q) A major fire has taken control of the vessel and the CO2 has not put it out, the skipper has ordered the crew to abandon ship, you have lost one of two Life raft's, you cannot access the second Life raft's because the fire is between you at it, another vessel is close by, what can you do now?
(a) Get the other vessel to come alongside and launch one of his Life raft's and pass it over to you

Large fire in your vessel in the Drydock

(Q) You're vessel is in the drydock for repairs/paint, a fire starts in the cabin, what are you going to do?
(a)
Alert the port authorities/coastguard
Sound the General alarm and get everyone to the muster points
Get the fire extinguishers and try and extinguish the fire

(Q) The fire is out of control, what will you do now?
(a) Phone for the fire-brigade as well as contacting the port authorities for help

(Q) The fire brigade is away to a big farm fire and it will be at least 2 hours before they can get to your vessel, what will you do now?
(a) Get the port authorities personnel and your own crew to tackle the fire with the hoses

(Q) How can you get water to your hoses, your vessel is in the drydock and there is no water in the drydock?
(a) By using the shore connection and a universal coupling connected into your own ships connection, so now your vessel is armed with water to fight the fire with, then go in with caution with the hoses set on spray module, boundary cooling as your enter the cabin
Accidents at Sea

Accidents at sea are all too common, not long ago the statistics was that 96% of all accidents at sea was caused by HUMAN ERROR.

The M.C.A. has upped the standard and regulations of safety and that figure is gradually falling, it need not be like this.

Man overboard, collision, grounding, fire, falling between the pier and the vessel, machinery can all account for the fatalities and accidents that happen on vessels.

Care and caution is all that's required, ask yourself these questions;

(1) How much danger is there for me doing this job?

(2) If I'm skipper, would I do the job that I wanted the crew to do?

(3) Is there safety areas for me to go to if I need it?

(4) Is the weather too poor to work in?

If your answer to any of the above is "YES" then stop what you're doing, it's your life and money cannot replace it, if you're dead, no-one can bring you back to life.

"If you're worried about doing it, DON'T DO IT"

Helicopter Rescue & M.C.A. Oral questions

When you're in difficulties at sea for some reason, injured crewman, vessel sinking, vessel on fire, vessel aground or for some other reason, the crews of the rescue helicopters are always at hand, it would have to be some extreme reason before they could not come to your aid (Fog Bound).

These men risk their lives to save yours, so false alerts should be avoided at all costs, putting out a false Mayday, could endanger someone else's life.

If another vessel puts out a Mayday and you put out a false Mayday, and the helicopter comes to your vessel, you will land off in court and heavily fined and probably given a prison sentence.
Why are you not standing-by the oilrig, do you have to go to a Mayday?

Yes, you have to go to a Mayday, unless you're endangering your crew and vessel, or if it's too far away, or if the On Scene Commander (O.S.C.) has stood you down because there is enough vessels in the area.

While your fast rescue craft (F.R.C.) are at the helicopter, you have a major fire in the engine room and the fire has disabled all your hydraulic system, how will you get the fast rescue craft with the casualties back onboard your vessel?

If you have no means to winch them back onboard, then you will need to escort them back to the oilrig, where doctors and medics will be waiting for the casualties.

There is a vessel making way coming to close to the oilrig, and you've called them but are not getting any response from them, what are you going to do?

Make for the vessel and while alongside them sound your whistle several times to try and get his attention. (5 or more short and rapid blasts which means I'm unsure of your intentions).

You are still getting no response from the other vessel, what are you going to do?

Try and nudge the other vessel with your own vessel so it alerts someone on the vessel.

The skipper of the other vessel calls you up, and says he is sorry but his watch had fell asleep, what are you going to do now?

Take note of the vessels name and port and his registration and log it in the Official log-book as well as making an entry into an I.R.F. (Incident Report Form) and send it to the M.A.I.B.(Marine Accident Investigation Branch)

Food Hygiene - Questions associated with MGN 20 Health and Risk Assessment

You crew are all down with food poisoning and your the last one standing, you also ate what the others had, what are you going to do?

Stop the vessel, put up your Not Under Command lights (N.U.C.) and put out a Mayday, if you have eaten the same food as the rest of the crew then your going to get food poisoning also, therefore there will be no-one to command the ship (not under command)

You got your vessel back into harbour and your vessel was inspected, they found cockroaches in the food-lockers, what do you have to do next?

Clean out the food lockers and dispose of them safely, then disinfect the area with bleach to get rid of any bugs the wash the area again with some anti bacterial cleaning agent

Do you have any documentation to fill up regarding this incident?

Yes, the M.A.I.B. Incident Report Form (I.R.F.) as well as the Official Log Book (inspection of food and water)
The initial cost of bringing a helicopter to your vessel is high, but do not think about this cost if you need the services of the rescue helicopter, I personally spoke to a coastguard personnel, who told me to tell seafarers, if you need the coastguard then ask, that’s what they are there for.

A rescue helicopter has an average distance out of about 250 n.m and if there is any Oilrigs en-route, then they can stop they to refuel, making his distance even further.

Information the rescue helicopter will require is as follows;

1. Position
2. Name and registration number of vessel
3. Nature of distress
4. Your speed
5. Your course
6. The forecast in your area
7. What radios you have onboard
8. Do you have distress rockets/hand held flares on your vessel

Contact with the rescue helicopter is usually on Vhf 16 and his call sign will be RESCUE HELICOPTER followed by 3 numbers (E.g.) Rescue Helicopter 137

High line manoeuvres

When a helicopter comes to your assistance you should do the following

1. Listen to the captain of the helicopters orders
2. Speed should be between 5 - 10 knots
3. If your engaged in fishing do not haul your nets, this slows your vessel sheer
4. Try and put the wind 300 off your port bow
5. Once this achieved hold this course unless instructed to do otherwise
6. Clear the decks of obstacles
7. Have men ready for the high line wire
8. Never make the wire fast to your vessel, coil it into a plastic basket
9. Have 3-4 men pull on the wire and try and keep it tight
10. Do not touch the wire till it earths in the sea, its full of static electricity

M.C.A. Oral exam Question

(Q) You're Skipper aboard an oil-tender and at stand-by alongside an oilrig, when you hear a Mayday from a helicopter who has crashed into the sea 10 miles away from you, what are you going to do?
(a) If the weather permits, then launch your fast rescue craft (F.R.C.) and inform the oilrig that you're going to assist the helicopter
(Q) How clean is your cook?
(a) Most cooks that I've seen are clean but tell him how your cook is

(Q) How often does he clean the galley/mess deck?
(a) It should be before and after every meal

(Q) What does he clean the dining table down with?
(a) It should be with some anti bacterial disinfectant

(Q) How often does he change his dish clothes?
(a) After he has used them, after every meal

(Q) How many knives does your cook have to prepare his meals with?
(a) He should have separate knives for fresh - frozen and cooked foods, never use the same knife for cook/frozen, frozen/fresh, cooked/fresh

(Q) Your freezer/fridge, what temperatures are they set at?
(a) Your fridge should not be set higher than +5 degrees and your freezer must be at least -18 degrees

(Q) You have a cooked chicken and a frozen piece of beef, what goes on the top shelf of the fridge?
(a) The cooked chicken, you cannot put the frozen piece of beef in the fridge or you will get cross contamination

(Q) So what are you going to do with the frozen piece of beef, you need to defrost it?
(a) Defrost it at room temperature for 24 hours

(Q) Why should any hold be kept clean?
(a) In case you load any food substances into it (including fishing vessels)

(Q) How do you clean your fish holds/tanks or Cargo holds?
(a) Best way is with a steam hose or a power hose

Footnote from Author:- While at sea we went to the aid of the personnel of the Piper Alpha Oilrig, this was a major disaster, where 167 men lost their lives, doing a risk assessment could have prevented this from happening, you have to keep doing risk assessments on an ongoing basis to prevent accidents like this from happening again (HUMAN ERROR counts for most accidents)

Remember to report any incident to the M.A.I.B. as well as your insurance company

**You've spotted a red distress Flare**

(Q) Whilst on a voyage, you have spotted a red distress flare, what are you going to do?
(i) Take a Compass Bearing of the flare and not it down (Convert this to a True Bearing)
(ii) Take the Lat/Long of the ships position
(iii) Sound the General alarm of 7 short blasts followed 1 prolonged blast on the ships whistle
(iv) Alter course Towards the flare  
(v) Inform the Skipper/Captain and relate all the information to him  
(vi) Make sure all your radios are on the distress frequencies (they should always be left on distress frequencies) 
(vii) If no Mayday then it's up to you to Relay a Mayday (Mayday Relay - Mayday Relay - Mayday relay) 
(viii) Inform the crew at the muster station to get all lifesaving/fire-fighting and portable pumps made ready 
(ix) Post look-outs around the vessel  
(x) The mate should now observe the radar looking for a target  

(Q) **What information would you expect from the Coastguard?**  
(a) A S.I.T.R.E.P. (Situation Report) and any information about the E.P.I.R.B. or any S.A.R.T.'s  

(Q) **You arrived in the area, what would you expect to see?**  
(a) A vessel or at least a Life raft(s) / E.P.I.R.B / Life rings / debris and oil  

(Q) **The vessel has went down but why did the E.P.I.R.B. manage to launch itself?**  
(a) Because of the hydrostatic release  

(Q) **How many hydrostatic releases do you have in your vessel?**  
(a) One on each Life raft and one on the E.P.I.R.B.  

(Q) **There's no Life raft's there what will you do now?**  
(a) Inform the Coastguard and then stop the vessel alongside the E.P.I.R.B. and switch on the video plotter and make an event mark on the screen and start to plot, after 5 minutes you'll see the way the wind/tide is taking your vessel, this is the first section of your search  

(Q) **What types of searches can you do?**  
(a) There are many searches including  

(i) An Expanding Square Search  

(ii) A sector Search  

(iii) A Parallel search with one or more vessels  

(iv) A 90° parallel search with one vessel (Used by oilrig's and is very effective)
You'll be asked to do searches (i) (ii) & (iii)

(Q) A Parallel search how can this be done with one vessel?
(a)

(Q) How do you do a Parallel search with two boats?
(a)

If asked to do a search with 3 or more vessels, the extra vessel(s) will take the next berth while doing a parallel search and all vessels must go in the same direction initially

(Q) How do you do an Expanding Square Search?
(a)
(Q) How do you do a Sector Search Pattern?
(a) 

(Q) How do you do the 90° search pattern?
(a) 

(Q) What advantage is there with a 90° search pattern?
(a) You cover the expected area of a search quicker

STABILITY NOTES FOR MASTERS AND MATES ORALS EXAM

Make sure you know what's in the stability book before going for an Oral Exam.

Most vessels have a stability book and a common question from the captains is what are the loading conditions in a stability book, this can vary for different vessels, best to have a look and see how many loading conditions you have, this is an example:

(1) The bare vessel without any stores or weights before going to sea
(2) The vessel loaded ready to go to sea
(3) Fishing vessels when they arrive at their fishing ground
(4) When they finish their fishing trip with 20% maximum catch onboard before leaving the fishing grounds
(5) Before they arrive in harbour with 20% maximum catch
(6) When they finish their fishing trip with 100% maximum catch onboard before leaving the fishing grounds
(7) Before they arrive in harbour with 100% maximum catch

Every vessel must check their vessels if taking a heavy load onboard to make sure the vessel does not become top heavy, making the Centre of Gravity to rise up maybe above the Metacentre giving the vessel a capsizing lever.

Caution must be maintained regarding a vessel's stability when working North in winter months, Ice accretion can easy catch an experienced seaman out, never let ice accumulate on your vessel, this will give you an angle of loll.

Cargo vessels have to make sure they can carry any materials by working out the area they have in their hold and working out the mass of the material they're going to be taking aboard to make sure they can take that material, every material has different masses

Fresh water has a mass of 1.000t per metres cubed
Sea water has a mass of 1.025t per metre cubed

These figures are important for summer and winter loadlines on cargo vessels
While coming into port with a fresh water river, if the vessel has been loaded up to her maximum loadlines in a port that has sea water she will sink in a port with fresh water.

If your doing modifications to your vessel, get a stability captain down to make sure your vessel is safe to go to sea, your altering the vessels stability, you might capsize.

A lot of vessels have been lost because of the effects of F.S.E.(Free surface effect)
F.S.E. makes your vessels GM smaller and is very dangerous
Try this for a demonstration of F.S.E.
Place a half full plastic lemonade bottle on the flat of your hand
don't grip the bottle and let the liquid move slowly
It will fall off your hand
Imagine what this does to a vessel!!!!!!!!!!!!!!!!!
Keep F.S.E. to a minimum.
Keep all water tight doors and hatches closed while at sea.
Keep the bilge's dry.
Never let freeing ports to become blocked.
When at sea, never turn your vessel with any quantity of water on your deck.
You have to now the stability criteria for your vessel,

1. Area under curve up to 30 degrees not less than 0.055 metres radians
2. Area under curve up to 40 degrees not less than 0.09 metres radians
3. Area between 30 and 40 degrees not less that 0.03 metres radians
4. Maximum Gz to occur at an angle not less than 25 degrees but maximum Gz should occur at an angle exceeding 30 degrees
5. Initial GM not less than 0.35 m for fishing vessels and 0.15 metres for merchant navy vessels

A radian equals 57.3 degrees

**Stability Definitions**

**Centre of Gravity**
A point on the vessel through which all forces of gravity act vertically downwards

**Forces of Graphic**
All forces of gravity acting vertically downwards

**Centre of Buoyancy**
A point on the vessel through which all forces of buoyancy act vertically upwards equal to the water displaced

**Forces of Buoyancy**
A floating body experiences an upward force equal to the water it displaces

**Metacentre**
A point on the centre-line of a vessel through which all the forces of buoyancy pass when the vessel is heeled

**Righting Lever**
When the vessel is heeled by an external force, the centre of buoyancy/centre of gravity are not in the same line, now a horizontal distance exists, the buoyancy pushing the vessel upright (the righting lever Gz)

**Metacentric Height**
The distance from the Centre of Gravity to the Metacentre (G.M.)

**Height of the Metacentre**
The distance from the Keel to the Metacentre (K.M.)

**Displacement**
Is the total weight of the vessel equal to the water it displaces

(Displacement = Lightship + deadweight)
Draught
The vertical distance from the Keel to the waterline

Freeboard
The vertical distance from the waterline to the lowest deck-edge

Under keel allowance
The distance from the keel to the seabed

Trim
This is the difference between the fore and aft draughts

Mean Draft
This is the forward and aft draft added together and divided by the number 2

Stable Equilibrium
This is when a vessel has a positive righting lever (G below M)

Neutral Equilibrium
This is when the vessel has no righting lever (G & M together) (Danger of Capsize)

Unstable Equilibrium
This is when the vessel has a negative righting lever (G above M) (Capsizing lever)

Stiff Vessel
This is a vessel with a very large righting lever (G near the Keel)

Tender Vessel
This is a vessel with a vessel small righting lever (G very near M)

Angle of Loll
This is a vessel that is initial unstable but when heeled has a vessel small righting lever (Very dangerous condition, get rid of any weights on deck either by putting it overboard or down into the hold) (Caution watch an angle of loll through ice accretion, always take the ice off all rigging first the from the high side and push it towards the low side giving you a bigger list but your forces of buoyancy work harder to keep your vessel upright)

List
A list is caused by you moving anything on the vessel to one side
Curve of Statical Stability
this is a curve that shows the following:
(1.) angle of maximum stability
(2.) maximum g.z.
(3.) the righting lever at any angle
(4.) angle of vanishing stability
(5.) the range of stability
(6.) angle where deck-edge immersion begins
(7.) the amount of dynamic stability a vessel has
(8.) the point of contra flexure
(9.) the angle of inclination
(10.) the initial g.m.
(11.) the radians for that vessel

Stability
This is an act of keeping the vessel stable

Transverse or Statical Stability
The vessels ability to return to the upright position

Reserve Buoyancy
This is the volume of air trapped in a watertight space above the waterline

Centre of Floatation
This is the centre of the water-plane area of a vessel at any draught

Deadweight
This is the cargo, stores water, fuel that you've taken aboard

Light Displacement
The total weight of the vessel, machinery etc that stays on the vessel and cannot be moved, (stores, fuel water etc not included)

Lightship
The total weight of the vessel, machinery etc that stays on the vessel and cannot be moved, (stores, fuel water etc not included)

A righting moment or a moment of statical stability
The total weight X the righting lever (Gz)

A moment
A moment = weight x distance

Loaded weight regarding the centre of gravity
When a weight is loaded onto a vessel the centre of gravity moves towards it
Discharged weight regarding the centre of gravity
When a weight is discharged from a vessel the centre of gravity goes back to where it was before the weight came on board (Opposite direction from where the weight was placed at on the vessel)

Shifted weight regarding the centre of gravity
When a weight is shifted on a vessel the centre of gravity moves from where the weight was to the weights new position

Dynamical stability
The amount of work taken to bring a vessel back to its upright position

Range of positive stability
This is on a curve of statical stability, where the curve starts on the angle of inclination to where the curve stops at the point of vanishing stability

Angle of vanishing stability
This is on the curve of statical stability and where the curve comes down and has no (g.z.) (+ or -) then this is where stability vanishes

Initial GM
This is on the curve of statical stability, on the angle of inclination at 57.3 degrees there is a radian line, and a tangent line which starts from 0 degrees and leaves the first arc of the curve of statical stability and where the tangent line and the radian line at 57.3 degrees meet then this is the initial g.m.

Angle of Maximum stability
This is on the curve of statical stability, on the curve itself at the top of the curve down to the angle of inclination and this is the angle of maximum stability

Maximum GZ (on curve of static stability)
This is on the curve of statical stability, at the top of the curve look at the distance on the scale (metres) and this is the maximum g.z.

Importance of adequate freeboard
With freeboard raised then this will give you
(1.) a greater range of stability
(2.) a greater range of vanishing stability
(3.) a greater maximum g.z.
(4.) the maximum g.z. occurs at a greater angle
(5.) greater dynamic stability

Density
The mass of any object expressed in cubic metres
(i.e.) a dice is length x breadth x width =

Volume of displacement
This is where the vessel is equal to the water displaced and expressed in cubic metres
Stability Formulas

KM = KG + GM
KG = KM - GM
GM = KM - KG

Gg1 = wxd
...... W ± w

"w" is the weight being loaded/discharged/shifted and "d" is the distance the centre of gravity is going to move

"W" is the total weight of the boat and "w" is the weight being taken onboard/discharged/shifted

Table of Moments

To find the total moment for the item being used including the vessel, multiplying the items weight by the items KG
(Weight x KG = Moment)

Find the moments first then - If all items are loaded, add all the weights together as well as adding all the moments together, then divide the total weights by the total moments to give you your new KG

Find the moments first then - If all items are discharged, subtract all the weights from the vessels weight as well as subtracting all the moments from the vessels moments, then divide the total weights by the total moments to give you your new KG

Find the moments first then - If items are loaded/discharged, add all the weights being loaded to the vessels weight then subtract the discharged weight from the total loaded weight then all the loaded moments to the vessels moments then subtract all the discharged moments from the total loaded moments, then divide the total weights by the total moments to give you your new KG

Example

<table>
<thead>
<tr>
<th>Item</th>
<th>Weight tonnes</th>
<th>metres</th>
<th>Moment</th>
<th>Moments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>loaded</td>
<td>discharged</td>
<td>KG</td>
<td>loaded (+)</td>
</tr>
<tr>
<td>Vessel</td>
<td>2000 (+)</td>
<td>4.2</td>
<td>8400</td>
<td></td>
</tr>
<tr>
<td>Fuel</td>
<td>200 (+)</td>
<td>1.9</td>
<td>380</td>
<td></td>
</tr>
<tr>
<td>Stores</td>
<td>10 (+)</td>
<td>3.9</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Grain (discharged)</td>
<td>500 (-)</td>
<td>3.4</td>
<td>1700</td>
<td>1700</td>
</tr>
<tr>
<td>Totals</td>
<td>2300</td>
<td>500</td>
<td>8819</td>
<td>1700</td>
</tr>
<tr>
<td>Final Totals</td>
<td>1800</td>
<td></td>
<td>7119</td>
<td></td>
</tr>
</tbody>
</table>

KG = Final weight
...... Final moment
KG = 1800
......7119

KG = 0.2528445 metres
KG = 0.253 (3 decimal figures)

More Formulas

Centre of Gravity = Total Moment
Total Weight

M.S.S. = W x Gz
M.S.S. is Moment of Statical Stability

Gz = GM Sin Θ
Where Θ is the angle of heel (Θ Theta symbol)

T.P.C. = 1.024A....Where (A) is the area of waterplane in Metres²
100

Sinkage from SW to FW = Displacement inches
40 TPI

Sinkage = F.W.A. x 1.025 - dock water inches
1.025 -1.000

GZ = KN - KG x Sine Θ
Where Θ is the angle of heel (Θ Theta symbol)

Always Add FSE to KG or Subtract FSE from GM
Stability Sums made easier

Drawing a stability problem makes it easier to understand.

When working with a stability sum use the KG's for the vessels displacement and the weight that's being loaded/discharged or shifted, forget the weights at the moment.

Draw a big "E" as follows and insert 4 dots.

Name the bottom dot "K"
Name the middle dot "G"
Name the top dot "M"

Find if the weight being loaded/discharged is bigger than the vessels own KG or below it, if its bigger then put g1 above the vessels own KG, if less than the vessels KG, then put g1 below the vessels KG.

From the Keel lay off the distance for the vessels displacement (KG)
From the Keel lay off the distance for the weight loaded/discharged (Kg)
Subtract (KG from Kg1) this gives small "d"
If the weight is a shifted weight subtract where the weight was and where it is now (Kg1 - Kg2) = "d"

Using the formula: Gg1 = w x d = W d (+ if loaded, - if discharged) (only use W if a shifted weight) (don't use small d for shifted weight)

If using more than one weight, best to do a Table of moments

Remember these Formulas they are important

KG = KM - GM
GM = KM - KG
KM = KG + GM

Always add F.S.E. to KG or Subtract it from GM.
### Tables of Moments

Formula for a moment is Weight x KG

#### Loaded weights

<table>
<thead>
<tr>
<th>item</th>
<th>weight (tonnes)</th>
<th>kg</th>
<th>Moment (+) Loaded weight (+)</th>
<th>Moment (-) Discharged weight (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessel</td>
<td>100,000</td>
<td>8.4 meters</td>
<td>840,000.00</td>
<td></td>
</tr>
<tr>
<td>Grain</td>
<td>20,000</td>
<td>2.9 meters</td>
<td>( + ) 58,000.00</td>
<td></td>
</tr>
<tr>
<td>Fuel</td>
<td>1,000</td>
<td>1.5 meters</td>
<td>( + ) 1,500.00</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>300</td>
<td>1.9 meters</td>
<td>( + ) 570.00</td>
<td></td>
</tr>
<tr>
<td>Stores</td>
<td>3.8</td>
<td>3.9 meters</td>
<td>( + ) 14.82</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>21,303.8</td>
<td></td>
<td>840,084.82</td>
<td>900,084.82</td>
</tr>
</tbody>
</table>

\[ KG = \frac{\text{Total Moments}}{\text{Total Weight}} \]

\[ KG = \frac{900,084.82}{21,303.8} = 42.24996573 \]

if required to round it up to 3 decimal figures \( (KG = 42.250) \)

Vessels final KG is 42.250 metres, the vessel has more draught and less freeboard

### Discharged weights

<table>
<thead>
<tr>
<th>item</th>
<th>weight (tonnes)</th>
<th>kg</th>
<th>Moment (+) Loaded weight (+)</th>
<th>Moment (-) Discharged weight (-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessel</td>
<td>100,000</td>
<td>8.4 meters</td>
<td>840,000.00</td>
<td></td>
</tr>
<tr>
<td>Grain</td>
<td>20,000</td>
<td>2.9 meters</td>
<td>( - ) 58,000.00</td>
<td></td>
</tr>
<tr>
<td>Fuel</td>
<td>1,000</td>
<td>1.5 meters</td>
<td>( - ) 1,500.00</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>300</td>
<td>1.9 meters</td>
<td>( - ) 570.00</td>
<td></td>
</tr>
<tr>
<td>Stores</td>
<td>3.8</td>
<td>3.9 meters</td>
<td>( - ) 14.82</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>21,303.8</td>
<td></td>
<td>840,000.00</td>
<td>600,084.82</td>
</tr>
</tbody>
</table>

\[ KG = \frac{\text{Total Moments}}{\text{Total Weight}} \]

\[ KG = \frac{779,915.18}{21,303.8} = 36.60920493 \]
21,303.8

if required to round it up to 3 decimal figures (KG = 36.609)

Vessels final KG is 36.609 metres, the vessel has less draught and more freeboard

Equilibrium
**Stable Equilibrium**

This is how a vessel's stability should be, with the Metacentre above the Centre of Gravity. Caution: watch your vessel is not a Stiff or Tender vessel, between Stiff and Tender is Best!

**Neutral Equilibrium**

This vessel has too much weight on her deck, this is usually caused by Ice Accretion, but could be caused by a lot of things including too much fish!!!!!! She has NO righting lever and eventually will capsize.

**Unstable Equilibrium**

This vessel is in a dangerous condition, she has a Negative righting lever and is ready to capsize, get rid of what ever is on your deck or put it down into the hold, this might help put your vessel into a stable equilibrium.

What the Abbreviation stand for
M - Metacentre
G - Centre of Gravity
K - Keel

$G^\top - G^\top$ is where the Centre of Gravity will go to when heeled by an external force

F.O.B. - Forces of Buoyancy
F.O.G. - Forces of Gravity

---

**Don't Take Chances - Accidents waiting to Happen**

A lot of fishing vessel are being lost because of the ships stability and the skippers pushing their vessels to the limits

The vessel becomes fast on an obstruction on the seabed, what does the skipper do, most trawler skippers gives the vessel all the revs he has and tries and forces the vessel away from the obstruction

This is the perfect way to loose your vessel and more importantly your crews lives

More than 50% of the time your going to knock your fishing nets in atoms (expensive)

Are you going to be responsible enough to go home to their wives and say it was your fault that you lost your crews lives

If you knock your nets in atoms you are not fishing, so heave your nets clear of the obstruction and once you have check it then shoot away again and fill your boxes up

**Gantry height**

This is a concern to me, newer types of fishing vessels freeboard are massive and their gantry's are the same height again above the deck,

if the vessel becomes fast on one side then the height the hanging blocks where the wires come onboard your vessel will pull your vessel over and probably give you an unstable equilibrium capsizing your vessel

Think about this !!!!!!
A man who is 7 feet tall and weight 15 stones stands upright with his feet together, you take hold of his arm and pull him from his side, he will keel over because he is top heavy, try the same with a 3 foot man of the same weight, you’ll have a harder job to get him to keel over, if the hanging blocks are placed as low as possible at the side of the vessel then chances of capsizing are reduced dramatically

Try this

If you’ve completed your certificate of competency, you’ll know about F.S.E. (Free Surface Effect) but have you ever felt F.S.E.?

Using a 2 litre plastic lemonade bottle, half fill it with a liquid, and place it on the palm of your hand, don't grip the bottle, and start a slow rocking motion with the bottle, it doesn't take a lot to have the bottle fall off your hand, so therefore F.S.E. on any boat is lethal, don’t let any quantity of water accumulate on your deck or in any compartment.

Boat's Overloaded

Fishing vessels and merchant navy vessels persistently overload their vessels, a Naval Architect works out the load-lines for Merchant Navy vessel and the waterline for fishing vessels, they’re there for your safety, when the water-line hits the water, then your vessel is full, what is left if freeboard and the freeboard is there to prevent your crew being washed overboard.

In Merchant Navy vessels, the loadlines are the maximum loads for the cargoes your carrying, this all depends too if your going through a stretch of water that has a lot of fresh water as this will make your vessel sink further into the water as fresh water has less density that sea water

Fresh Water has a density of 1.000t/m cubed
Sea Water has a density of 1.025t/m cubed

Vessel Owners/skippers have been heavily fined for breaking these guidelines, but these guidelines are there for your safety.

How to Calculate the Curve from a Stability Booklet
(1) Enter with your Draft & Trim  
(2) Find Displacement & KM from HYDROSTATIC Curve tables  
(3) Construct table moments, using the following:-

Lightship Weight + KG  
Capacities & KG's of Compartments/Tanks  
Loaded KG  
F.S.E.  
GM/KG

Then Enter KN Curves to produce GZ's  
Construct Curve  
Check this against the Minimum Stability Criteria

RADAR NOTES

Radar plotting tips, radar plotting made easy

Radar Plotting Formulas

\[ \text{Time to C.P.A.} = \frac{"A" \text{ to } C.P.A. \times \text{ Plotting Interval}}{\text{Distance } "O" \text{ to } "A"} \]

\[ "W" \text{ to } "O" = \frac{\text{Own ships speed} \times \text{Plotting interval}}{60} \]

Course Line = "W" though Centre of "A"

Targets speed = \[ \frac{\text{Distance from } "W" \text{ to } "A" \times 60}{\text{Minutes from } "O" \text{ to } "A"} \]

Aspect = The angle of the course your going and from the centre of the screen to "A" (Draw a line from the centre of the plot to "A" and measure the angle between this line and your course) (red if you would see targets}
Tidal problems using Radar

\[ \text{Slip} = \text{Distance from "A" to "W"} \]

\[ \theta = \text{Direction from "A" to "W"} \]

\[ \text{Rate of Tide} = \text{Distance from "A" to "W"} \times 60 \]

---

Basic Radar Plot

---

**Warning**: Watch to see if you are using Relative or True Compass Bearings. Using a relative bearing is how you would take a compass bearing of another vessel.

**Yellow Plot is the targets first plot**
(1) Find the course your going, and draw a line for your course
(2) Draw a line where the first plot is and mark the distance, call this "O" (Drawing 1 above)
(3) Lay off 2nd bearing course and distance (Drawing 2 above)
(4) Lay off 3rd bearing course and distance, call this "A" (Drawing 3 above)
(5) From "O" draw a line through "A" and carry the line well past the centre line on the screen (Drawing 4 above)
(6) Using your course line, transfer this onto "O" and pull the line down the sheet (Drawing 5 above)
(7) This line is where "W" goes
(8) To find the distance you would find "W" use this formula
1) Measure this distance and make a mark, call this "W" (Drawing 6 above)
2) From "W" draw a line through "A" (this is the other vessel's course and speed) (Drawing 7 above)
3) From the centre of the screen - draw a line to meet the "O" to "A" line so they meet at 90 degrees
4) This is called C.P.A. (Drawing 8 above)

**Aspect**

This is the angle between your vessel and the target vessel and what colour of sidelight you see from the course line your steering draw a line onto plot "A", the angle between the 2 lines is the aspect and if you saw a green sidelight then it would be (E.g. Green 048 degrees) and if a red sidelight then (E.g. Red 056 degrees)

In this case, the Aspect would be roughly "RED 015 degrees"

**Alteration of Course**
(1) Make Basic radar plot
(2) Find out the amount of degrees you're going to alter course
(3) The "W" to "O" is the course your steering must be. Assume your going to alter 90 degrees to starboard using a protractor with the zero degrees of the protractor in the "W" to "O" line - measure off 90 degrees to starboard and make a mark
(4) From "W" draw a line towards the mark you just made
(5) With a set of compasses measure the original "W" to "O" and draw an arc towards and past the new line
(6) Call this Mark "O one" (this is your new course) "W" to "O one"
(7) From "O one" draw a line through and well past "A"
(8) Make a new C.P.A. by drawing a line from the centre of the screen onto the new "O one" to "A" line so the line joins at 90 degrees
(9) Measure C.P.A. line

Change of your vessels speed
Make Basic radar plot
Find your new speed
On the "W" to "O" line if you reduce your speed then this line will get shorter
On the "W" to "O" line if you increase your speed then this line will get bigger
Use this formula to find the distance you need to measure back from "O" to get "W"

"W" to "O" = Own ships speed x plotting interval

60

1) From "W" measure this distance and call it "O one"
2) From "O one" draw a line through "A" and go well past the centre line of your screen
3) From the centre of the screen draw a line so it meets the new "W one" to "A" line at 90 degrees
4) This is your new C.P.A.

Change of course and speed
(1) Make Basic Radar Plot  
(2) Find out your new speed  
(3) Use this formula to find the distance you need to measure back from "O" to get "W"  

\[ \text{"W" to "O" = Own ships speed x plotting interval} \]

(4) From "W" measure this distance and call the new mark "O one"  
(5) Now find out the amount of degrees you have to alter course  
(6) The "O one" to "W" is the course your steering just now, lets assume your going to alter 90 degrees to starboard, using a protractor with the zero degrees of the protractor on the "O" to "W" line - measure off 90 degrees to starboard and make a mark  
(7) With a set of compasses measure "O one" to "W" and draw an arc towards and past the new line  
(8) Call this Mark "W one" (this is your new course) "O one" to "W one"  
(9) From "W one" draw a line through and well past "A"  
(10) Make a new C.P.A. by drawing a line from the centre of the screen onto the new "W one" to "A" line so line joins at 90 degrees  
(11) Measure the new C.P.A.  

(C) Navigation Orals at it's Best 28/3/02
<table>
<thead>
<tr>
<th><strong>Radar Display's</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>M.C.A. Question - What radar display do you use in your vessel?</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Ships Head Up</strong></th>
<th><strong>North Up</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Your heading marker uses the course your steering</td>
<td>Your heading marker will always stay at North - you could be steering 200° but your heading marker will always point to North</td>
</tr>
<tr>
<td>Compass course if you're using a magnetic compass</td>
<td></td>
</tr>
<tr>
<td>True course if using a Gyro compass</td>
<td></td>
</tr>
<tr>
<td>I.E. if you're steering 345° then this is the course your ships head will steer as will your heading marker on your radar screen</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Stabilized</strong></th>
<th><strong>Unstabilised</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>When the vessel veers/yaws the target's echo <strong>DOES NOT GET STRETCHED</strong> it is exactly where is is seen on screen</td>
<td>When the vessel veers/yaws the target's echo <strong>DOES GET STRETCHED</strong> (it is elongated) so you have no idea exactly where the target is</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>True Motion</strong></th>
<th><strong>Advantages/Disadvantages of True Motion</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is linked to the GPS/Compass, it uses the information given from these instruments and makes the center of the screen move relative to your course and speed (Moves in the same way as a ships video plotter)</td>
<td><strong>Advantages</strong> is - targets move on the screen is a true course and speed</td>
</tr>
<tr>
<td><strong>Disadvantages</strong> is - the center of the screen moves to the edge and could be hiding a target just off the edge of the screen</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Sea Stabilisation</strong></th>
<th><strong>Ground Stabilisation</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>This is where the radar is hooked up to the <strong>ships log</strong> so it can tell you the ships speed through the water</td>
<td>This is where the radar is hooked up to the <strong>doppler log</strong> to tell you the ships speed over the ground</td>
</tr>
<tr>
<td>&quot;S&quot; Band</td>
<td>&quot;X&quot; Band</td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>Frequency is 3000 MHz - this gives better detection of targets through rain and sea clutter</td>
<td>Frequency is 9500 MHz is best for finding smaller targets because of the more powerful beam width which is a lot narrower that the &quot;S&quot; Band</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Short Pulse</th>
<th>Long Pulse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the best for finding targets in the middle of a heavy rain shower</td>
<td>Is the best for finding a target on the opposite side of a heavy rain shower</td>
</tr>
</tbody>
</table>

For Navigation your **best set up** has to be Ships head up stabilised, using "S" Band Frequency for seeing targets in rain or the "X" Band for finding smaller targets and switching between long and short pulses.

---

**Radar**

![Radar Diagram](image)

Radar means Radio Detection and Ranging.
Radar works by putting out microwave radiation pulses and when it hits a target (ship, land etc) it returns to the Radar, the Radar then measures the time, frequency, strength of the pulse and the direction.

When a pulse is transmitted then this is a TX Pulse and when its received then this is a RX Pulse.

It is an electromagnetic system that uses RADIO WAVES which travel at the speed of light which is approximately 300,000 kilometers (186,000 miles) per second.

A Pulse is sent out at the speed of light which is 300,000,000 m/s and once it hits a target, the pulse is sent back as an echo, the antenna then picks up the pulse (RX) and delivers it to the receiver as an electronic signal, the signal gets amplified and displayed on the radar screen.

Antenna

The antenna rotates slowly to pick up any targets in your area, it sweeps a 360 degree angle putting out a narrow beam of TX Pulses from the Transmitter (1 degree = 1 Pulse).

The Antenna also receives RX Pulses (echoes from targets) this RX Pulse is put to the Receiver.

Transmitter

The Transmitter puts out a very large burst of energy (a pulse) which last for 0.1 - 5 microseconds and then does nothing until the next pulse is ready to send.

The Transmitter has to send short pulses because it has to be able to receive pulses too, so in reality its listening for pulses more than it is transmitting pulses.

The Transmitter has a switch that switches from TX (Transmitting) to RX (receiving)

Receiver

The antenna recieves an echo and this echo is converted to a frequency of around 30 MHz and then amplified at this frequency and then sent to the computer inside the radar, the computer now converts the analogue
signals to digital signals using an analogue to digital convertor and decifiers the information about the target.

Radar Display Unit

The Radar Display Unit is simply a cathode ray tube (CRT), the information from the computer is placed onto the screen by a sweeping motion going clockwise, when an echo is placed onto the screen a bright spot appears showing you the course and distance from your vessel.

(Caution) watch incase your picking up false echoes, rain and sea gain set incorrectly will cause false echoes to appear on the screen as will a large vessel or high cliffs.
A sailing vessel is a very bad target as most of the vessel is low in the water, recommended to place a radar reflector on every vessel.

Pulse Modulator

The Pulse Modulator delivers power to the transmitter, it has to make the power continuous regarding the voltage, power, duration and timing to the transmitter.

The power & voltage to the transmitter should never vary during a pulse.

(WARNING)

Never stand in front of a Radars antenna, the radiation emitted from it can cause sterilization or even cancer.

Oral Exam Tips

Make sure you know what set up you have on your vessels radars

Ships head up, stabilized

North up, stabilized

Know the following too;

(1) Know what scales your radars are set up on
(2) Make sure you know about sea and rain clutter and how to get rid of it

(3) Know how to set up a radar

(4) Range hopping, know how to retune your radar once you've moved the scale

(5) When coming close to land or any target, switch the scale down and re-tune the radar, keep dropping the scale and you'll see the mouth of the harbour opening up.

E.B.L. stands for Electronic bearing line.

V.R.M. stands for a variable range marker.

A large target will affect how good a target is picked up on your radar screen, a very high cliff will give you a good picture on your radar screen, one of the worst targets is a sailing vessel without a radar reflector or a low gradient beach.

During a radar exam you will be asked to set up a radar, screw all the knobs to zero, and switch on the radar, wait till the allotted time has expired and switch the radar on, now turn up the gain so you can see a green/blue screen, tune in till you get the maximum boxes for the strength of the pulses, adjust the rain and sea clutter switches (Important,_____adjust the sea/rain clutter knobs even it its a beautiful day, the examiner will send you out with this if you don't do it)

(Q) You'll be asked how to check that the radar is working at its Best
(a) by using the Performance Monitor button (On a radar consol its called "Perf Mon")

(Q) He'll ask you how to check the performance of the radar
(a)
Push the PERF MON button on the consol

Switch it to the 24 miles scale

Press and Hold the T.R. Monitor (This tests the transmission performance)

Use the "Data Wheel" to obtain 4 or Maximum arcs on screen

Release the PERF MON Button

Press the PERF MON Button again this will now check the T.X. Monitor (This checks the receiving performance)

**Racon Beacons**

The word "RACON" is taken from the words "RADAR & BEACON"

Racon Beacons work on the "X" and "S" Band Radars

The "X" Band radar uses the (3cm) Bandwidth

The "S" Band radar uses the (10cm) Bandwidth

A radar will send a pulse and the Racon beacon will pick up the pulse and send a Morse Letter back to the vessels radar, this will then show some Morse on the radar screen (Morse D is most common, but other letters in Morse could be used)

Once you have the Morse letter on screen, you can see what bearing and distance it is from your vessel.

**ORAL EXAM QUESTIONS**

CAUTION this question has been coming up during the Oral exam
The captain gives you a nautical chart and it has racon beacons on it one of the Racons has 3cm alongside it (it can only pick up pulses from an "X" Band radar

if it had (10cm) alongside the Racon then it would pick up the "S" Band Radars pulses only

(Q) What radar works best with RACON Beacons?
(a) Racon Beacons are dual purpose, they work on the "X" & "S" Band radars
RACON INFORMATION

3CM "X" Band Racon Beacon (Most common Radar)

The relative short wavelength at "X" band frequencies allows a radar to show very high quality images to be shown on the radar screen, this allows you to pick up targets easier.

The Racon Beacon will only pick up pulses that come from an "X" Band radar

10CM "S" Band Racon Beacon

This type of radar requires a very large antenna, some vessels will not have room to place an antenna of this size on their vessel. The Racon Beacon will only pick up pulses that come from an "S" Band radar.

International Safety Management

(I.S.M. Code) (M.G.N.40)

Management Starts at the top then goes to the bottom of the scale

(Climb the ladder to success)

The Company

Chief Executive

Managers

Assistant Managers

Designated Person (D.P.)

The Ship
Captain
1st Mate
2nd Mate
Chief Engineer
2nd Engineer
Safety Officer
Deck-hands

(Safety Officer can over-ride the Captain to let the D.P. ashore know about any defects/dangers on the ship)

(Questions and Answers)
(Q) Who Issues it?
(a) MCA through the Secretary of State

(Q) What is the purpose of the I.S.M. Code?
(a) To minimise accidents and pollution

(Q) When was the I.S.M. Code made mandatory?
(a) Every Merchant Navy vessel over 500gt since 1994 and every vessel since 2002

(Q) Who is responsible for the safety of the crew?
(a) The skipper/Captain

(Q) Who is responsible for the running costs and repairs to the ship?
(a) The owners

(Q) Who's signature goes on the health and safety policy of the ship?
(a) The Chief Executive of the company

(Q) What is the main cause of accidents/pollution on a ship?
(a) Human error

(Q) Why is it so important to have muster drills and debris on a ship?
(a) To minimise accidents and prepare for emergencies on a ship

(Q) What precautions while bunkering a ship (re-fueling a ship)?
(a)
(i) Double up mooring ropes
(ii) Have someone man ready to shut off the fuel stop at the fueling rig
(iii) Have someone ready to shut off the fuel stop on the ship
(iv) Have fire extinguishers handy
(v) Have an oil dispersant ready
(vi) Block freeing ports in case of spillage
(vii) Use Save-alls
(viii) Have no smoking signs (placards) posted
(ix) Make sure no hot work to be carried out
(x) No naked flames
(xi) Make sure you have adequate ventilation
(xii) Make sure you know the amount of fuel you need and slow it down the last few litres

(Q) What are your responsibilities if you have a fuel spill?
(a) Notify the Coastguard and then follow procedures in the S.O.P.E.P. manual

(Q) The Coastguard is responsible for oil pollution monitoring. What would happen if you had a fuel spill?
(a) In the S.O.P.E.P. manual, you would have a list of authorities you are required to report to

(Q) What is a D.P. and who regards this person as important?
(a) A Designated Person and the M.C.A. regards information from him with the highest esteem

(Q) A.D.P. what level of management can he approach?
(a) Straight to the top (Chief Executive)

(Q) What does a company receive when it achieves a successful audit?
(a) A.D.O.C. (Document of Compliance)

(Q) What documents are required to get a D.O.C.?
(a) A.I.R.S.M.S. (Safety and Management System)

(Q) How long does a D.O.C. last for?
(a) 5 years plus minus 3 months (it also has an annual inspection)

(Q) How long does a S.M.S. last for?
(a) 5 years with an inspection every 3 years to keep it valid
(Q) What are the bare-bones of a S.M.S.?
(a) The Code of Safe Working Practice

(Q) What are the bare-bones of the I.S.M. code?
(a) The safety and management system (S.M.S.)

(Q) What ships does the I.S.M. apply to?
(a) From 2002 all ships over 500grt

(Q) If under 500grt do they have to use the I.S.M. code?
No, they use it voluntarily but the MCA want everyone to use it.

(Q) What is the cornerstone of good safety management?
(a) Commitment from the head of the company (Chief Executive)

(Q) Who should define and document the responsibility in authority of shipboard personnel?
(a) The Company

(Q) What document will the company supply to all their ships under its management?
(a) The Safety and Management manual (Health & Safety Policy)

(Q) How do you report any accident(s) and non-conformities?
By reporting to the skipper/safety officer, to the D.P. ashore or by V.H.F. to the MCA/M.A.I.C.B. or an F.R.F. as well as to the company

(Q) Who is responsible for verifying compliance with the I.S.M. code ashore and afloat?
(a) M.C.A.

(Q) What size of ships should voluntarily use the I.S.M. code?
(a) Ships between 150grt and 500grt

(Q) What two statutory instruments do you require for an application for an I.S.M. code?
(Q) When will a D.O.C. be issued?
(a) When a company demonstrates plans to implement a S.M.S. meeting the full requirements of the code.

(Q) What will be issued to each ship after a successful onboard audit of the S.M.S.?
(b) An S.M.C.

(Q) What is the 'Company'?
(d) Anyone who has assumed the responsibility of the operation of the ship and taken the responsibility from the shipowner.

(Q) What should be the safety management objectives of the company?
(a)
(i) Provide safe ship operations and safe working practice
(ii) Do a risk assessment on the vessel
(iii) Keep improving safety standards and skills of personnel onboard and onshore (Musters and drills)

(Q) What should the safety management system ensure?
(b) It should ensure compliance with rules, regulations, and all codes, guidelines, standards, and recommendations by IMO, MCA, and classification societies.

(Q) What should a company do to implement, maintain, and develop an S.M.S.?
(c)
(i) A safety and environmental policy
(ii) Instruction on procedures for safe operation of ships and protection of the environment
(iii) Defined levels of authority and lines of communication between shore and ship personnel
(iv) Reporting procedures for accidents and defects of the ship
(v) Musters and drills
(vi) Internal audits

(Q) What is the master's responsibility?
(e)
(i) Carrying out the safety and pollution control policy of the company
(ii) The master has the authority to take any steps and issue orders for the preservation of lives and safety of the ship.
(Q) What should provide the required training in support of the S.M.S.?
(a) The Company

(Q) Who is responsible for correcting defects on a ship?
(a) The company

(Q) What action is taken to review the companies/ships S.M.S.?
(a) Internal audits

(Q) Where are the D.O.C./S.M.C. kept at?
- It's kept onboard the vessel

(Q) Does the M.C.A. have power to impound a ship if it has defects or does not have a D.O.C.?
(a) Yes, the ship can be impounded for both
Seismic Streamers

Seismic vessels tow cables, sometimes as long as 2 miles behind the vessel.

Just behind the stern of the Seismic vessel is a dracones with a white light indicating that he is towing dracones, this white light flashes as follows (flashing Morse "U" - 2 short and 1 prolonged blast) BY DAY AND BY NIGHT.

At the end of the tow, there is dracones, these dracones have a white flashing light (flashing Morse "U" - 2 short and 1 prolonged blast) BY DAY AND BY NIGHT.

Each dracones has a radar reflector on top of it.

Remember to listen out on Channel 16 for any Security messages that make come from this vessel, they constantly monitor this channel as well as keeping a good radar and visual watch.