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General Summary of World climatic chart:

The following are approximate figures and values and for general reference only. The relevant charts should be consulted for any practical use.

North Atlantic

January (Northern Winter)	July (Northern summer)
Portugal current	Portugal current
Azores current	Azores current
Canary current	Canary current
Guinea current	Guinea current
North equatorial current	North equatorial current
	Equatorial counter current
Guyana current	Guyana current
Florida current	Florida current
Gulf Stream	Gulf Stream
North Atlantic current	North Atlantic current
Norwegian current	Norwegian current
Irminger current (Off Iceland)	Irminger current (Off Iceland)
West Greenland current	West Greenland current
East green land current	East green land current
Labrador Current	Labrador Current
Canadian current	Canadian Current

South Atlantic

January (Southern summer)	July (Southern Winter)
South equatorial current	South equatorial current
Brazil current	Brazil current
Falkland current	Falkland current
Benguela current	Benguela current
Southern ocean current (40 S)	Southern ocean current (40 S)

Indian Ocean

July (Northern Summer) Southwest monsoon	January (Northern Winter) (Northeast monsoon)
Somali current (to NE)	Somali current (to SW)

Aden current (Outwards)	Aden current (inwards)
East African current	East African current
SW Monsoon current. (Replaces north equatorial current and equatorial counter current)	NE Monsoon current. (Replaces north equatorial current)
	Equatorial counter current
South equatorial current	South equatorial current
Mozambique current	Mozambique current
Agulas current	Agulas current
South Indian ocean current	South Indian ocean current
West Australian current	West Australian current

North Pacific Ocean

January	**July**
Alaskan Current	Alaskan Current
Aleutian current	Aleutian current
Kamchatka current (SW)	Kamchatka current (SW)
Oyo shio current (SW)	Oyo shio current (SW)
Japan current (Kuroshio) NE	Japan current (Kuroshio) NE
Tsushina current (NE)	Tsushina current (NE)
North pacific current	North pacific current
Californian current	Californian current
Davidson current (N) (November – Feb)	Davidson current (N) (November – Feb)
Holychild current (S) (Jan – Mar)	Holychild current (S) (Jan – Mar)
North equatorial	North equatorial
Equatorial counter current	Equatorial counter current
South equatorial current	South equatorial current
West Australian current	West Australian current
Southern ocean current	Southern ocean current

ICEBERGS:

North Atlantic:

July: Northern Summer

- The worst season for ice berg off the Newfoundland is between March and July
- A general ice berg limit can be drawn from 65˚ N - 30˚W curving inward to 55˚ N and 45 ˚W and flowing down to 40˚N and 40 ˚W.
- No pack ice is seen off new found land or to Baffin bay entrance
- The ice bergs are not found south of 40˚ N and E of 40˚ W.
- The limits of icebergs around Newfoundland can be said to be North of 40˚ N and West of 40˚ W. (Generally)

January: Northern Winter

- The winter normally results in increased concentration of pack ice and reduced ICE bergs.
- The limits for Ice bergs off Newfoundland and can be said to be 45˚N and 45 ˚W (Generally)
- Further north they are close along the coast of the green land
- Pack ice can be found north of the Newfoundland up to the entrance to the Baffin Bay.

South Atlantic / S. Indian Ocean / South Pacific Ocean

January (summer):

The icebergs can be traced as follows:

- Along the coast of South America up to 32˚ S / 050˚ W
- Then they curve down along to 36˚ S / 040˚ W
- The curve moves up to 25˚ S / 025 ˚ W
- Then it falls down to 40 ˚S / 010 ˚W
- Then it flows straight (almost) along to the cape of good hope (South Africa),
- Then it continues to flow to the south of Australia (38 ˚S / 120˚ E)
- Then to south of Tasmania and then to south of New Zealand
- Then it rises along the coast of New Zealand and then flows as an alternating wave towards the Cabo de Hornos and to resume again at the Magellan strait.

Pack Ice:

The pack Ice limit is well south of 60˚ S.

July (winter):

Not much change in the position of the iceberg as in summer.
The pack ice around 55˚S around the South African coast and other wise it runs all along the Lat of 60˚S.

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Pressure patterns:

Common for July and January

Permanent High in North and South Atlantic (35˚N/S)
Permanent High in the Indian ocean SE of Mozambique (35˚S)
Permanent high in North and south pacific (35˚N) and 35˚S off Chilean coast.
Permanent Low SW of Iceland close to the east coast of green land.

July (Northern summer / Southern winter)

Atlantic:

There usual permanent Low SW of the Iceland and North Atlantic high and South Atlantic high.

Indian Ocean:

This being the northern summer the land mass is highly heated up resulting in the formation of a huge low over the northern India off Karachi (Cause of the SW monsoon).

This being the southern winter the Australian land mass is cooled and there is a high pressure formed over the central Australia.

Pacific Ocean

The usual Permanent high in the north and South Pacific Ocean.
This being the northern summer there is a low over the west American coast off the Californian coast.

January (Northern Winter / Southern Summer)

Atlantic

There usual permanent Low SW of the Iceland and North Atlantic high and South Atlantic high.
Being the Southern summer there is a Low developed over the central South America
Being the northern winter there is a High over the central Green land.

Indian Ocean:

This being the northern winter the land mass is highly cooled and this results in a high over Asian continent off 45˚N / 100˚ E.

This being the southern summer the African continent and the Australian land mass is heated up and results in the formation of a Low over the central Africa just above the equator and over the NW of Australia.

The above 3 together drive the NE monsoon during the northern winter.

Pacific Ocean

The usual Permanent high in the north and South Pacific Ocean.
This being the northern winter there is a high over the West American coast off California.
There is also a deep low just south of the Aleutian Islands.

Wind pattern

The wind direction and speed is determined by the position of the Highs and Lows.
Wind flows outwards from the high and towards the low, in the northern hemisphere the direction of wind is anticlockwise around a low and clock wise around a high, similarly in the southern hemisphere the wind flows towards the low but in clock wise direction and outwards from the high but in anticlockwise direction

The various winds belts are:

- Doldrums or Inter tropical convergence zone (heat equator) or Equatorial trough.
- North east trade winds
- South east trade winds
- The variables (Horse latitudes)
- Westerlies

North Atlantic:

Doldrums:

- The ITCZ remains north of the equator throughout the year.
- Light winds over this area having a normal width of 200 – 300 nm (this may vary as per the strength of the trade winds and may be narrowed down quiet drastically).
- The weather being showers, squalls or thunder storms etc
- Good visibility except in rain

North east trade winds

- This area lies above the ITCZ and is anywhere between 10 ˚ N and 30 ˚ N in summer.
- Average strength of wind is force 4 and might reach force 7 occasionally.
- Haze is prevalent in the east part of the trade wind zone.

South West monsoon

- In summer the ITCZ moves up further north close to the coast of NW Africa and this results in the SE trade winds getting drawn across the equator and veering to become the SW monsoon.
- This phenomenon occurs off the W coast Africa of between equator and 15˚N.
- This results in considerable rain and associated poor visibility

Variables (Horse latitudes)

- This is an area lying between the North east trade winds and the westerlies.
- This is an area of light or variable winds and the limit of this area oscillates between 28˚N – 32˚N in summer
- The direction of wind is between N and NE and can be considered to be an extension of the NE trade winds especially in summer.

Westerlies

- This is the area above the Variable and on the polar side of the anticyclone.(north of 40˚N)
- This area experiences predominantly unsettled weather.
- Wind direction is SW'ly and off the coast of Iceland the weather is worse with the presence of the permanent Low off the SW coast of Iceland.
- In summer the stormy area is reduced around this area and July is the quietest month for storm in this part of the ocean with wind of force 7 being 7 days a month.
- In winter there is a continuous passage of depressions across this zone in an East or NE direction.
- Gales are very common in winter with winds of more than force 7 more than 10 days a month

Fog

- During summer / late Spring Fog is prevalent north of 40˚ N off the coast of New Foundland and the area enclosed by the iceberg limits (to say in general) right up to the Baffin bay entrance and the southern tip of green land.
-

Hurricane area:

- Hurricanes are very frequent in the west part of the North Atlantic Ocean.
- Areas affected are Caribbean Sea, Gulf of Mexico, Florida, the Bahamas and Bermuda.
- The Hurricane season being June to November and peaking during August – October.

South Atlantic Ocean

Doldrums:

- There is no ITCZ and hence no tropical storms

South east trade winds

- In summer this area lies around 2˚ south of the equator to 28˚/30˚ S.
- In winter it lies extends up to the equator and to the oceanic high lying around 20˚ - 28˚ S
- The direction of the wind is predominantly SE
- Average strength of wind is force 4 and might reach force 7 occasionally.

Variables (Horse latitudes)

- This is an area lying between the South east trade winds and the westerlies.
- This is an area of light or variable winds and the limit of this area oscillates between 26˚S – 31˚S in summer
- The direction of wind is between S and SE and can be considered to be an extension of the SE trade winds especially in summer.

Westerlies (Roaring forties)

- This is the area south of the Variable and on the polar side of the anticyclone.(south of 35˚S)
- This area experiences predominantly unsettled weather.
- There is a continuous passage of Low's from West to east.
- The centres of the lows move from the Cabo de Hornos in the direction of south Georgia and then approximately along 50˚S
- Gales are prevalent south of 40˚S even in summer
- Wind force is 7 for 7 – 9 days per month especially in the area south of a line joining Falkland Islands and Cape of Good Hope.

Fog

- Fog is prevalent during summer.

North Indian Ocean

- The wind and weather in the north Indian Ocean is dominated by the alteration of the monsoon.
- During the summer it is the SW monsoon
- During the winter it is the NE monsoon

Doldrums:

- The ITCZ remains south of the equator for a major part of the year.

SW trade winds

- Since the ITCZ lies south of the equator the SE trade wind cross the equator and are deflected to the right to become the SW trade winds.
- This area lies above the ITCZ and is covering the whole of the northern Indian ocean
- Average strength of wind is force 6 and might reach force 7 more than 10 days per month
- **The worst area is off the Suqutra (250 nm E)**. The average wind force here is 7
- The severity of the weather might necessitate the reduction of speed by vessels heading west.

North East Monsoon

- This is during the winter of the northern hemisphere (November to march).
- The winds are NE'ly and are caused by the intense high formed over the Central Asia and the Low over the Central Africa.

Gulf of Aden

- The winds here forms a part of the monsoon circulation.
- SW swell in Summer and NE swell in Winter

South Indian Ocean

Doldrums:

- The ITCZ lies south of the equator from November to April and hardly above the equator except of the Sumatra where it get to be north of the equator.
- Fair weather, Calms and light variable alternating with squalls, heavy showers and thunder storms.
- Good visibility except in rain

North West monsoon

- Since the ITCZ lies south of the equator the north east monsoon winds cross the equator and blow as the North west monsoon winds in the south Atlantic

South east trade winds

- In summer this area lies between the ITCZ and 30˚S
- In winter it lies between the equator and 27˚S
- The direction of the wind is predominantly E and SE
- Average strength of wind is force 3 - 4 in summer and 4 – 5 in winter
- The winds reach force 7 or above on 1-3 days per month. And generally in the winter the SE trades average a force of 5 most of the time.

Variables (Horse latitudes)

- This is an area lying between the South east trade winds and the westerlies. (off the oceanic high)
- This is an area of light or variable winds and the limit of this area oscillates between 30˚S – 35˚S between winter and summer.
- The weather is dependent on the intervening east moving Low pressures when it gets cloudy and showery weather. Normally the weather is Fair/fine associated with the high.

Westerlies (Roaring forties)

- This is the area south of the Variable and on the polar side of the anticyclone.(south of 30˚ - 35˚S)
- Westerly winds predominate.
- This area experiences predominantly unsettled weather.
- There is a continuous passage of Low's from West to east.
- The centres of the lows move south of 50˚S
- Gales are prevalent south of 40˚S especially in winter and also in summer
- Wind force is 7 for more than 10 days per month

Tropical Storms

- Tropical storms occur in the Arabian sea, Bay of Bengal and in parts of south Indian ocean
- Tropical storms are known as cyclones in this region and Hurricanes off the west coast of Australia.
- Arabian Sea – May to November (Greatest frequency in October and November)
- Bay of Bengal it is May to November (Greatest frequency in May, June, October and November)

North Pacific ocean

Doldrums:

- The ITCZ remains permanently north of the equator in longitudes East of about 160˚W.
- Light and variable winds alternating with squalls heavy showers or thunder storms.
- The width and the mean position varies with the movement of the sun. the average width is about 150 nm
- The weather being showers, squalls or thunder storms etc
- Good visibility except in rain

North east trade winds

- This area lies above the ITCZ and is anywhere between 10 ˚ N and 30 ˚ N in summer.
- Average strength of wind is force 4 and might reach force 7 occasionally.
- Dust Haze is prevalent along the American coast.

North east Monsoon

- In winter the Asiatic landmass cools down and results in the formation of an intense area of high pressure over Mongolia and Siberia.
- This results in the NE winds associated with the NE monsoon.
- The height of this season is in December January the wind force is likely to reach 7 for 6-10 days a month.

South West monsoon

- The intense heating of the land mass in the Summer results in the formation of an intense low over the Asia (off Karachi and over the coast of California).
- The ITCZ is north of the equator and this results in the SE trade winds being drawn across and deflected by the earths rotation to the right to form the SW winds associated with the south west monsoon.
- This is felt in the West part of North pacific ocean and south and east china sea and yellow sea.

Variables (Horse latitudes)

- This is an area lying between the North east trade winds and the westerlies.
- This exists as a belt situated in about 25˚N to 30˚ N in winter and 35˚ N to 40˚N in summer.
- This is an area of light or variable winds.
- In summer winds might reach force 7 only when associated with TRS and otherwise is fair.
- At the height of winter wind force may reach 7.
- In winter the visibility is mostly good except in rain and over the open ocean fog is uncommon.
- In summer Fog and poor visibility become increasingly common towards the northern limit of the zone. (40˚ N during this season)

Westerlies

- This is the area above the Variable and on the polar side of the anticyclone.(north of 40˚N)
- This area experiences predominantly unsettled weather.

WINTER

- In winter there is a continuous passage of depressions across this zone from the vicinity of China and Japan in the NE'ly direction towards Aleutian Islands and S Alaska and
- North of 40˚N the wind force and direction greatly varies with these Lows.
- Gales are very common in winter with winds of more than force 7 more than 10 days a month
- The region of highest Gale frequency extends from E of Japan to the area south of the Aleutians and the Alaska peninsular
- Rain and snow reduce visibility

Summer

- Depressions are less frequent, less intense and their tracks are further north than in winter
- Still winds may reach force 7 more than 10 days per month in most areas
- Fog is prevalent west of about 160˚W and occurs for about 5 – 10 days per month and rising to more than 10 days per month in some parts
- The fog is again prevalent in the west coast of America although not as severe as in areas west of 160˚W.

South Pacific Ocean

Doldrums:

- The ITCZ remains permanently north of the equator in longitudes East of about 160˚W. some areas it lies just south of the equator.
- Light and variable winds alternating with squalls heavy showers or thunder storms.
- The width and the mean position varies with the movement of the sun. the average width is about 50 – 300 nm
- The weather being showers, squalls or thunder storms etc
- Good visibility except in rain

North-west Monsoon

- During the summer in the southern hemisphere the Australian land mass is heated up and results in the formation of a Low over it. The ITCZ when it lies in the region results in the North east trade winds crossing the equator and deflected to the left by the earths rotation and becoming the northwest winds associated with the North-west monsoon.

South east trade winds

- The northern limit of the SE trade wind is determined by the position of the ITCZ.
- In winter it lies between the equator and extends up to 15˚-20˚ S and 30˚S in summer
- The direction of the wind is predominantly SE but varies over different parts of the ocean as per the characteristics of the intervening land mass and monsoon.
- Average strength of wind is force 4 and might reach force 7 occasionally.

Variables (Horse latitudes)

- This is an area lying between the South east trade winds and the westerlies.
- This is an area of light or variable winds and the limit of this area oscillates between 25˚S – 40˚S in summer and 20˚S to 30˚S in winter.
- The direction of wind is between S and SE and can be considered to be an extension of the SE trade winds especially in summer.
- The frequency of poor visibility increase with increase in latitude especially off the coast of Peru.

Westerlies (Roaring forties)

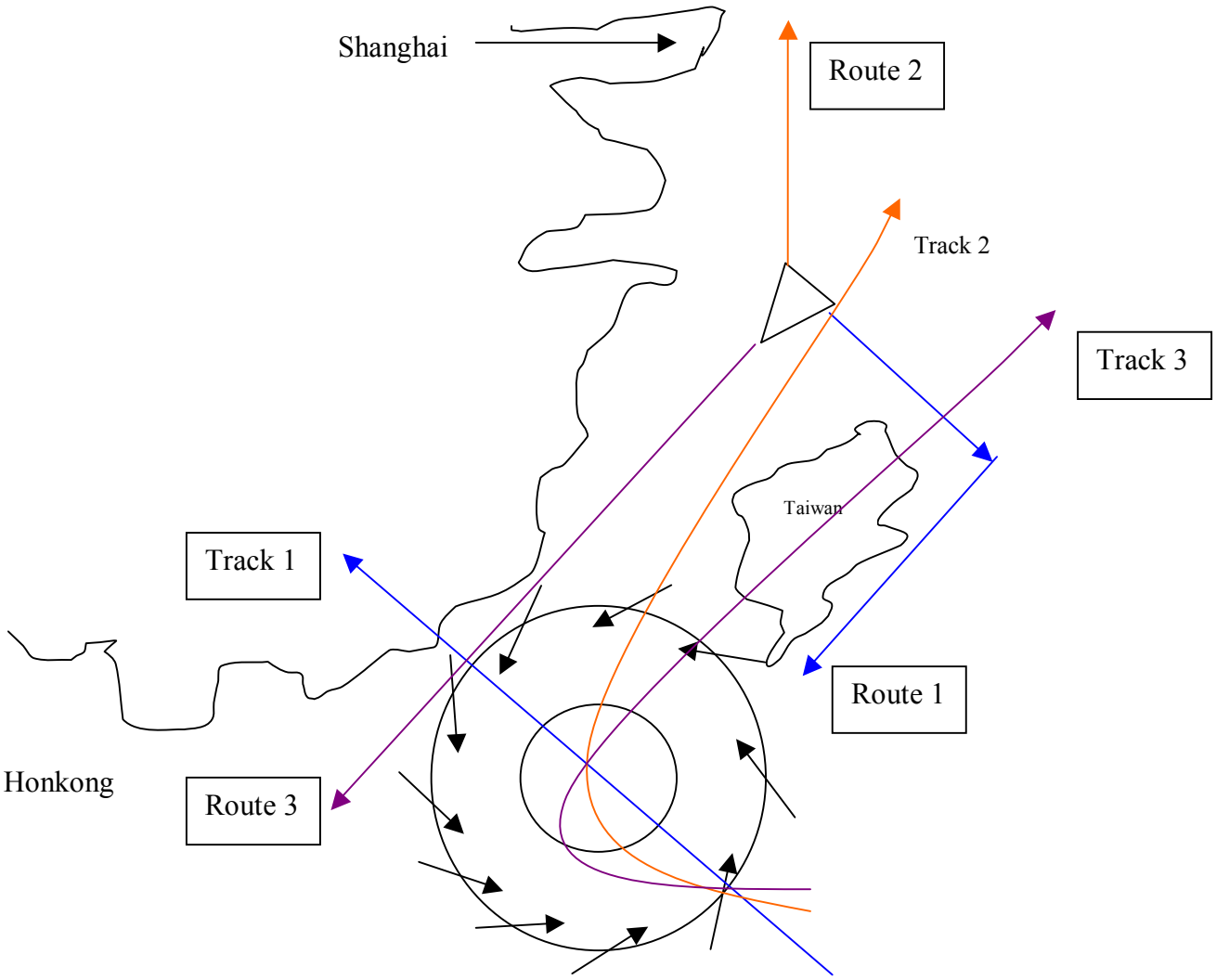
- This is the area south of the Variable and on the polar side of the anticyclone.(south of 35˚S)
- This area experiences predominantly unsettled weather.
- There is a continuous passage of Low's from West to east.
- Gales are common in winter south of 40˚S even in summer they are not uncommon.
- Wind force is 7 for 5-10 days per month over most of the area and it is more than 10 days south of 40˚S.

Fog

- Fog is rather common summer and can be expected on 3-5 days per month.

November 2004.
In mid September a loaded container ship is in position 26˚ 30’ N 121˚ 20’ E bound through the strait of Taiwan for Honkong, steaming on a SW’ly course at 16 kts. A weather report from indicates that a typhoon currently in position 21˚ 30’ N 117˚ 15’ E has re-curved on to a NE path, moving at 25 kts
On a work sheet Q4 plot each of the following:

1. The two quoted positions, and the alternative tracks that the typhoon’s centre may follow in this area;



Storm Track 1 and Vessel Route 1:

If the TRS is proceeding on a NW course as most northern hemisphere TRS do before their recurvature
The vessel can follow Route 1.

Advantages:

- As long as the TRS is on this path the vessel will be well away from the storm centre and away from bad weather.

Disadvantage:

- When the TRS eventually recurves and if it proceeds as in track 3 then the vessel might be in the path of the storm and in the dangerous semicircle. Vessel will be subject to severe weather damage.
- Vessel is in the dangerous semicircle even thought not in the dangerous quadrant.
- Also the wind circulation when the vessel is off the coast will be so as to drive the vessel towards the shore (Lee shore). In case of loss of engine or steering this could be dangerous.
- Extra distance steamed and subsequent loss of revenue.

Storm Track 2 and Vessel Route 2:

The present direction of the TRS is NE 25 kts and this indicates clearly that the storm has attained its latitude of recurvature and recurved. The storm is likely to continue on this track till it loses its energy.
But the TRS have known to have changed their direction of movement even after recurving. Their movements are erratic and hence to be continuously monitored.

Advantages:

- The vessel will be well clear of the storm centre
- The vessel can also proceed to a safe anchorage at shanghai if available
- Even if the TRS were to proceed on a northerly path vessel will be well beyond its reach
- Vessel will always be on the navigable semicircle in this route and hence this route will be the least damage route.
- The wind direction in the navigable semicircle is such as to push the vessel away from the storm centre and away from worse weather.

Disadvantages:

- The vessel will have to discontinue her voyage till such time as she is safe to resume her voyage
- Loss of charter / Cargo laycan timings.
- Additional fuel costs
- Commercial loss

Storm Track 3 and Vessel Route 3:

If the TRS track/path is to pass over Taiwan then the vessel might consider using the route 3.

Advantages:

- Vessel will be well clear of the storm centre
- Vessel will be in the Navigable semi circle and subsequent moderate weather than in dangerous semi circle.
- Vessel can continue on her voyage with no commercial loss

Disadvantages:

- The wind circulation in the navigable semicircle is pushing the vessel away from the storm centre which is good but the presence of Lee shore with any engine disabilities is of concern.
- Also the manoeuvring of the vessel is difficult in narrow areas.
- The resultant negative storm surges in narrow channels can also cause concern regarding under keel clearances
- The vessel will be passing quiet close to the storm centre as compared with other routes
- Since the behaviour of the TRS is often erratic and unpredictable the grave possibility of the TRS changing its path and heading as in track 2. this will mean that the vessel will be in the path of the TRS and with no space to manoeuvre. **A very dangerous situation.**

The track to be chosen by the Master:

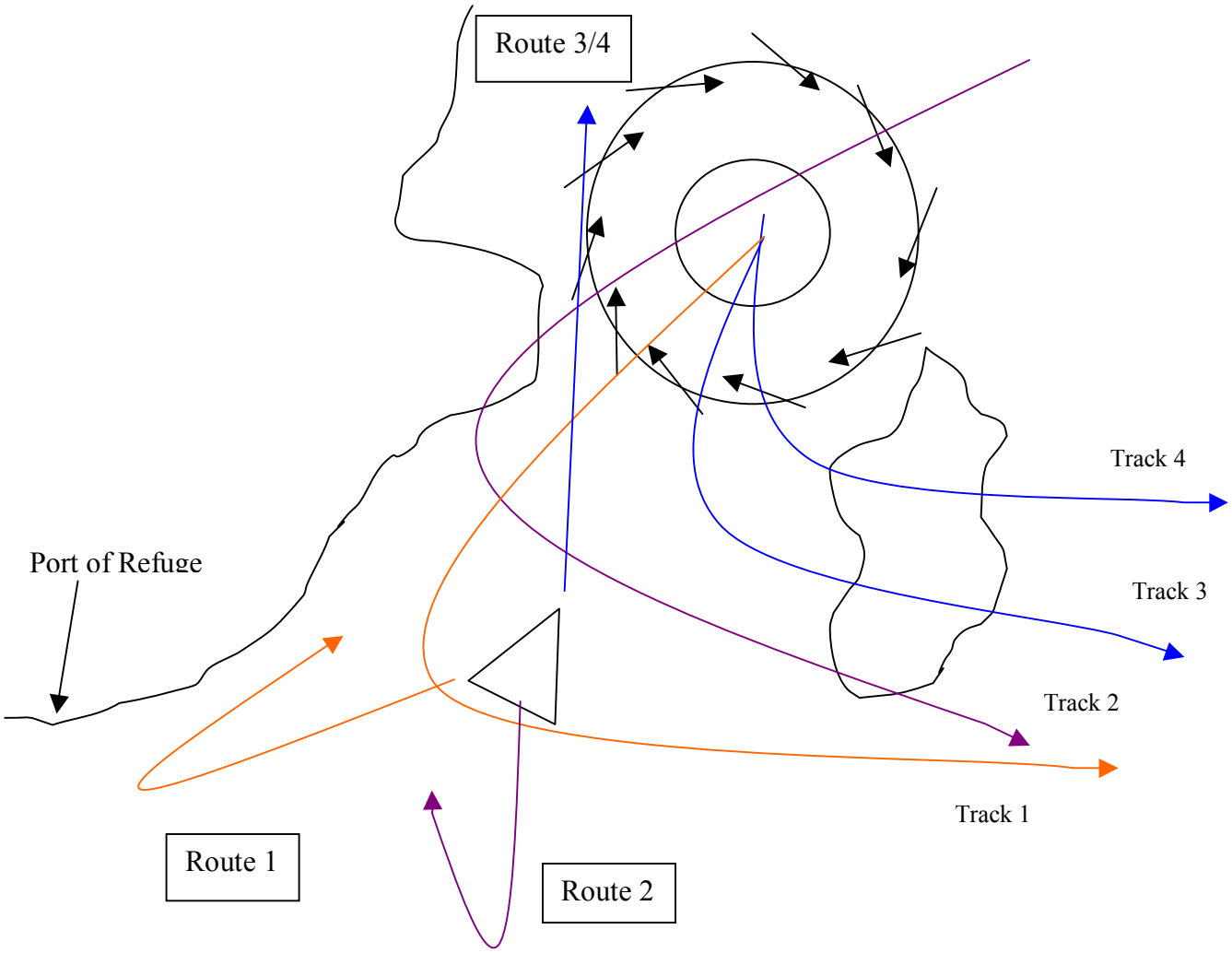
- The best route for the above situation is for the vessel to proceed on route 2.
- The storm has to be continuously monitored and a minimum distance of not less than 300 nm maintained from the storm centre
- Once the storm has passed and well clear the vessel can resume her course. Ensure that vessel will be only in the navigable semicircle at all times.
- This will avoid any danger to the lives and environment (Pollution).
- Commercially a delay in the vessel's schedule is much preferred than a loss of vessel or lives.

In the open ocean, free from intervening islands and shoals, there is usually one phenomenon which becomes visible from all others, indicating the probability of a tropical cyclone in the vicinity. State this phenomenon, explaining its significance.

- In open sea the earliest and probably the first and indication of a TRS is the long swell from the direction of the storm.
- Since the swell travels at a greater speed than the storm itself an early warning and an approximation of the location of the storm centre with respect to vessels position is possible.

March 2004:

Vessel in the Mozambique Channel from Durban to Mombassa, Kenya,Vessel position: 25˚S 38'E
TRS position: 15˚S 45'E



Southern Indian Ocean current, Ice berg limits, Gales, East moving depression

Comparison of the different tracks chosen for the avoiding the storm

- The Various tracks chosen for the storm movement are Route 1, 2, 3, 4 for corresponding tracks 1, 2, 3, 4 of the storm
- The movement of the TRS is as predicted in the Routeing chart for the month concerned and the general tracks of TRS as given in Meteorology for mariners
- While the tracks/paths may be for the past the TRS movement is highly erratic and therefore should be continuously monitored by shore and onboard observation.
- It might be required to alter or combine 1 or more of the routes predicted so as to counteract the TRS movement.
- Some of the storms are quite large and devastating effects can be caused by gale force winds up to 500 nm from the centre.
- The most serious consideration which ought to be in the mind of the Master deciding on the best course of action is
    1. A maximum passing distance from the storm centre (at least 250 nm from the storm centre)
    2. The vessel has to be kept in the Navigable semicircle of the TRS always as far as is practicable where navigation permits.
    3. Other navigational constraints like the proximity of land, Islands and also the endurance of the vessel by way of Bunkers, provisions, water supply, nature of cargo etc.
    4. Vessels speed if needed to out run the storm
    5. Presence of lee shore and loss of engine power or steering
    6. Possible recurvature of the TRS and change in her movement thereby standing the vessel in to serious damage and putting lives at risk and causing serious environmental.
    7. The commercial advantage gained by less distance steamed by passing closer to the storm centre attains a miniscule value when comparing the cost involved with a pollution cleanup or other environmental damages and loss of lives and cargo or the total constructive loss of the vessel.

Factors	Route 1	Route 2	Route 3	Route 4
Passing distance from the storm centre	Maximum	Maximum	Less	Less
Vessel position with respect to the storm	Proceeding to a safe anchorage and well away from storm	Proceeding south and away from storm effects	Navigable semi circle	Navigable semi circle
Distance	Additional distance involved is high	Additional distance involved is high	No change in distance or minimal change	No change in distance or minimal change
Weather during the passage	Sheltered weather as vessel will be heading in to the Agulas current and will be in a sheltered anchorage	Vessel will be away from the coast and in the open ocean but heading to more southerly latitudes and might not be favourable weather	Although weather will be better in the Navigable semi circle compared to the dangerous semi circle this still is gale force winds and high swells.	Although weather will be better in the Navigable semi circle compared to the dangerous semi circle this still is gale force winds and high swells.
Wind	Force 4-5	Force 4-5	Force 6	Force 6
Risk factor if the TRS changes her path	None	None	High	High
Factors	Route 1	Route 2	Route 3	Route 4
Navigational Constraints	None and vessel will be coasting	Vessel will be moving towards higher latitudes with associated weather.	Possibility of vessel being close to shore.	Possibility of vessel being close to shore

		Prudent to keep well clear of iceberg limits and gale force areas and drift well clear off the coast		
Ice berg limits	None	If vessel continues to steam to higher latitudes - Yes	None	None
Currents	Favourable	Variable	Not favourable	Not favourable
Damage	Least	Possible	Greatest	Greatest
Steaming time	High	High	Least	Least

The track to be chosen by the master

- The master has a choice of either route 1 or 2.
- In Route 1 the vessel can continue to proceed in to a safe anchorage until the storm has passed away
- In route 2 the vessel has to proceed up to around 35˚ S and drift well off the course and then return to her normal course once the storm has passed away.
- In both the cases the storm has to be continuously monitored to ensure that vessel does not steam extra distance unnecessarily and returns to her normal course at the earliest possible time when it is safe to do so.

November 2003

(a) Onboard observation to determine vessels position in relation to the direction of the storms path

The vessels position in relation to the direction of the storms path can be approximated by the following on board observation:

- Direction of swell
- Wind direction and application of Buys Ballot's law
- Wind behaviour (Veering or Backing) / (freshening or moderating)
- Wind force (distance from the storm centre)
- Pressure trend (rate of fall and the value) approximate distance off the storm centre

Direction of Swell:

- This gives the earliest indication of the storm location. Swell can be felt as far as 1000 nm and gives an idea of where the storm is or where it recently was.

Buys Ballot's Law:

- In the northern hemisphere when facing the wind the storm centre lies approximately 9-12 poins to the right hand side of the observer
- In the Southern hemisphere when facing the wind the storm centre lies approximately 9-12 points to the left hand side of the observer
- So far a Wind ENE in the northern hemisphere the storm centre lies between S/E – SSW (9-12 points).

The path of the storm can also be determined by the above observation with an interval of 2 hours between every observation and allowing for the vessels movement.

Vessels position with in the Storm Area – Dangerous semi circle or Navigable semi circle:

By observing the behaviour of the wind vessel's position with in the storm area with respect to its movement can be arrived at.

Northern Hemisphere

- If the wind is veering the vessel is in the Dangerous semi circle
- If the wind is backing the wind is in the Navigable semi circle.
- If the wind is steady then vessel in the path of the storm

Also

- If the wind is freshening vessel is ahead of the trough line
- If the wind is moderating then vessel is behind the trough line

Southern Hemisphere

- If the wind is backing the vessel is in the Dangerous semi circle
- If the wind is Veering the wind is in the Navigable semi circle.
- If the wind is steady then vessel in the path of the storm

Also

- If the wind is freshening vessel is ahead of the trough line
- If the wind is moderating then vessel is behind the trough line

Wind force

The wind force can also give an idea of approximate distance from the storm centre:

Force 6	-	about 150	nm
Force 8	-	about 125	nm
Force 11	-	about 50	nm
Force 12	-	about 35	nm

Pressure trend

- If the pressure is falling the vessel is ahead of the trough line
- If the pressure is rising the vessel is behind the trough line
- Slow fall of the pressure – 500 – 120 nm
- A more marked fall – 120 – 60 nm
- Rapid fall – 60 – 10 nm

(b) Reasons why the Dangerous quadrant is so named

- This is the forward half of the dangerous semi circle
- The path of the TRS is likely to turn in this direction once attaining the latitude of recurvature and thus placing the vessel forward of the trough line.

- The winds are strongest in this quadrant because of the steep pressure gradient due to the closing up of the isobars just prior to recurvature on the polar side
- The direction of he wind is so as to move the vessel towards the storm centre and closer to more violent weather.

(C) Action for the master when in the Dangerous semicircle

Northern hemisphere

- Proceed with all available speed and with the wind 1-4 points on the starboard bow
- As the wind veers (clockwise movement) continue to alter to starboard so as to keep the wind always 1-4 points on the starboard bow
- The above action will take the vessel away from the storm centre

(d) Wind steadies and then begins to back with the pressure still falling

Vessel was in the path and moved in to the navigable semi circle. The action to take will be same as that for the vessel in navigable semi circle in the northern hemisphere

Action for the master when in the Navigable semicircle

Northern hemisphere

- Proceed with all available speed and with the wind 1-4 points on the starboard quarter
- As the wind backs (anti clockwise movement) continue to alter to port so as to keep the wind always 1-4 points on the starboard quarter.
- The above action will take the vessel away from the storm centre

March 2001

(a) Swell is the 1st visible sign to alert the master of the presence of a TRS (see above notes on swell)

(b) See notes above

(C) Action for the master when in the Dangerous semicircle

Southern Hemisphere

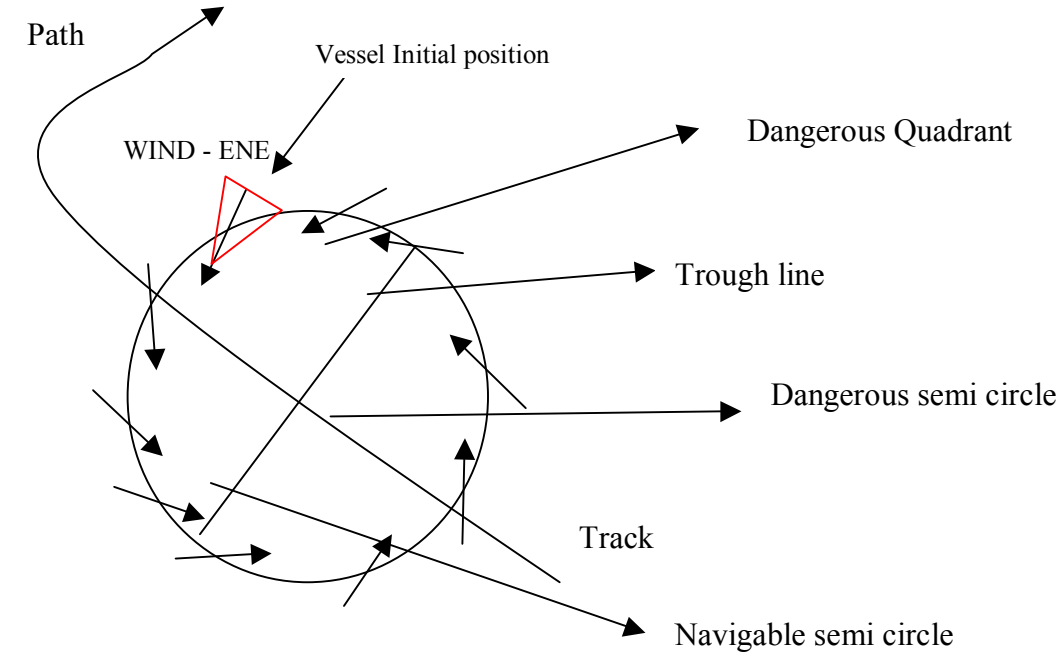
- Proceed with all available speed with the wind 1-4 points on the port bow
- As the wind backs (anti clockwise movement) continue to alter to port so as to keep the wind always 1-4 points on the port bow
- The above action will take the vessel away from the storm centre

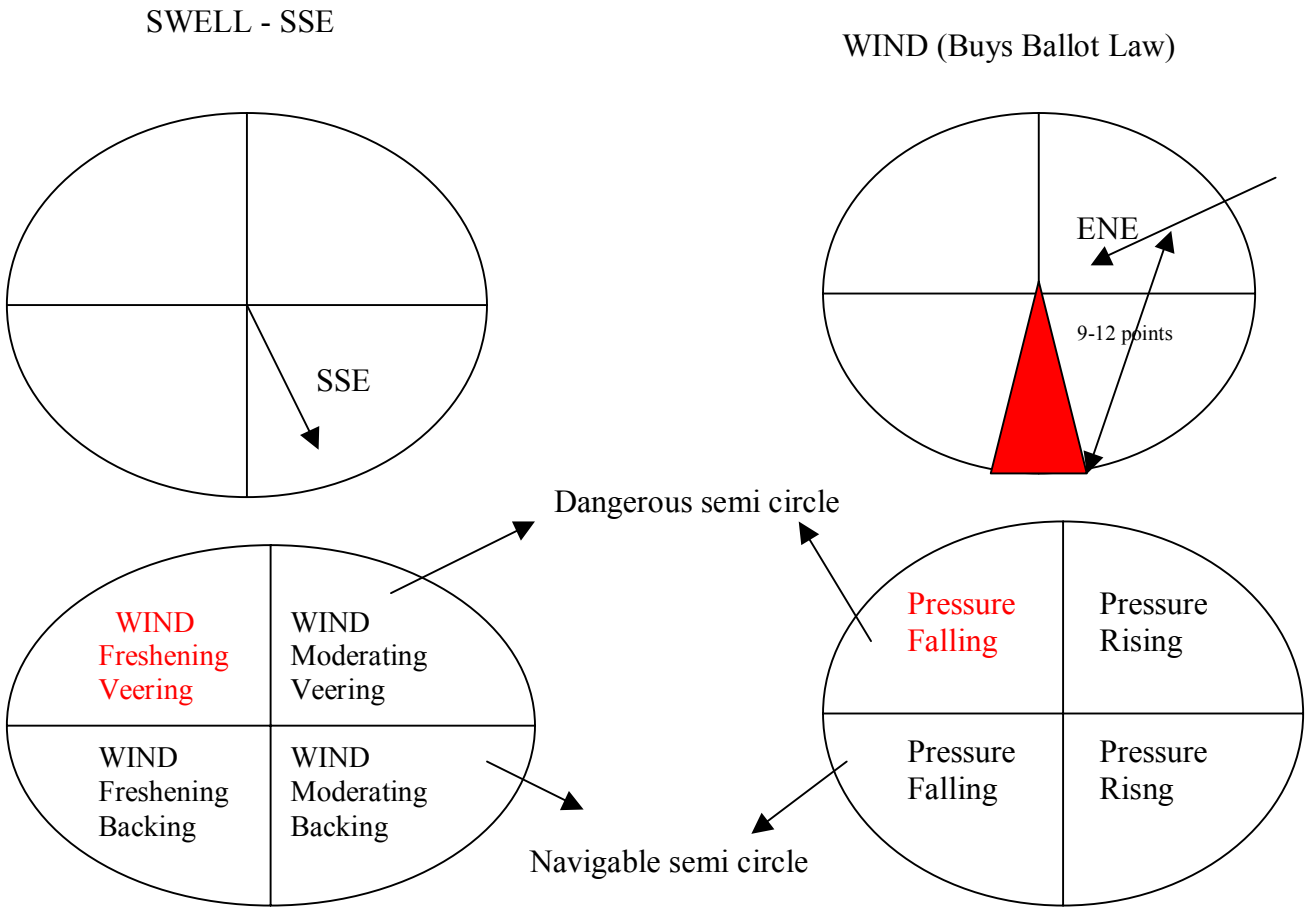
(d) Action for the master when in the Navigable semicircle

Southern Hemisphere

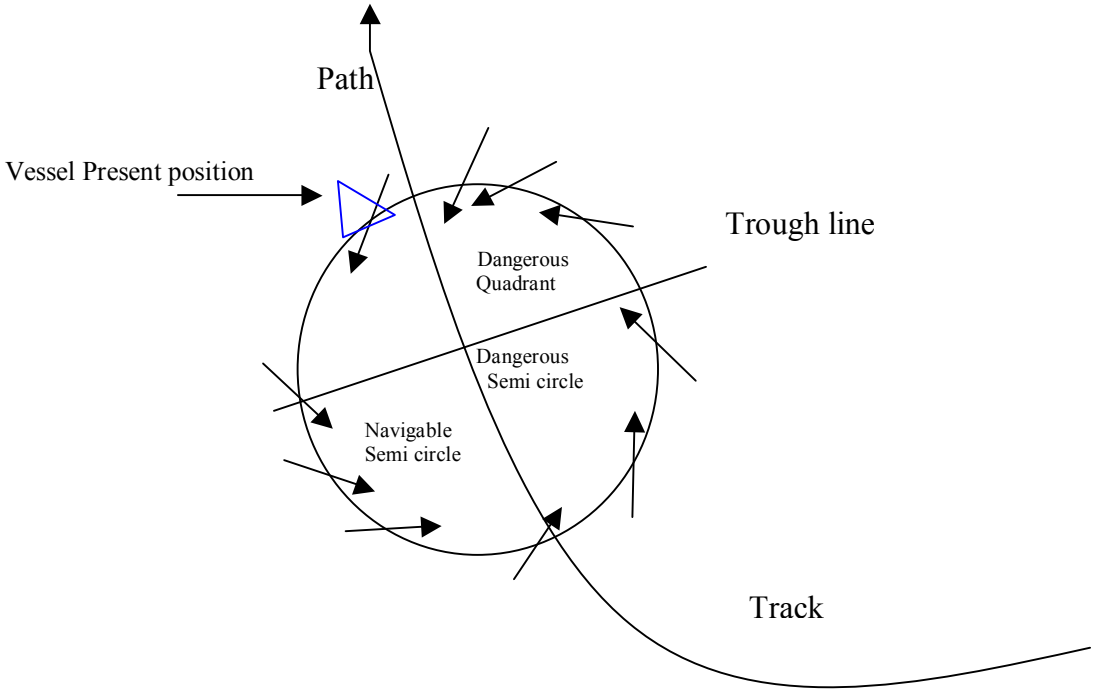
- Proceed with all available speed with the wind 1-4 points on the port quarter
- As the wind veers (clockwise movement) continue to alter to starboard so as to keep the wind always 1-4 points on the port quarter.
- The above action will take the vessel away from the storm centre

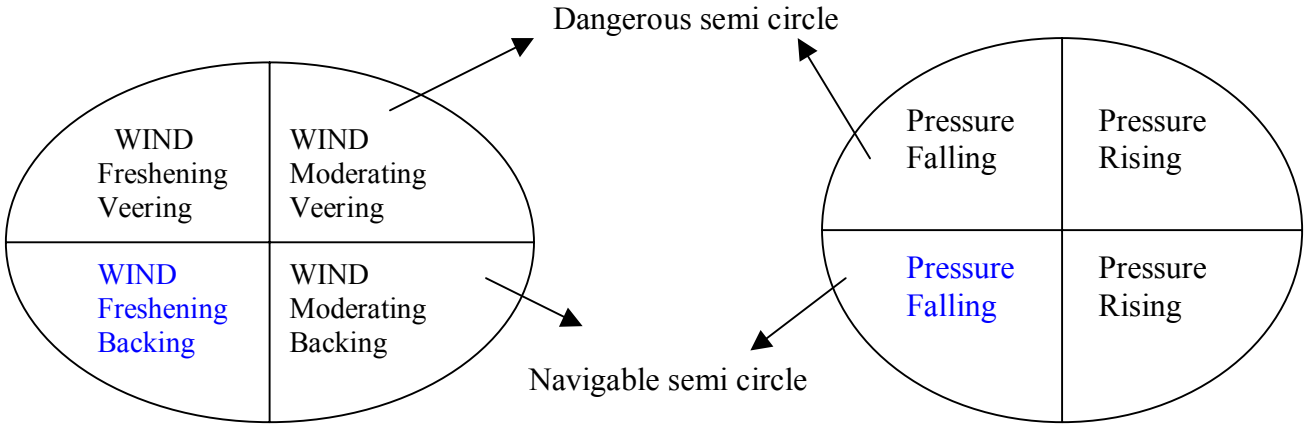
November 2003
Vessel in the North Atlantic, Heavy swell from the SSE, Rapidly falling barometer pressure, Wind E.N.E, freshening and slowly veering.
Vessel in Dangerous semi circle (action as explained above)



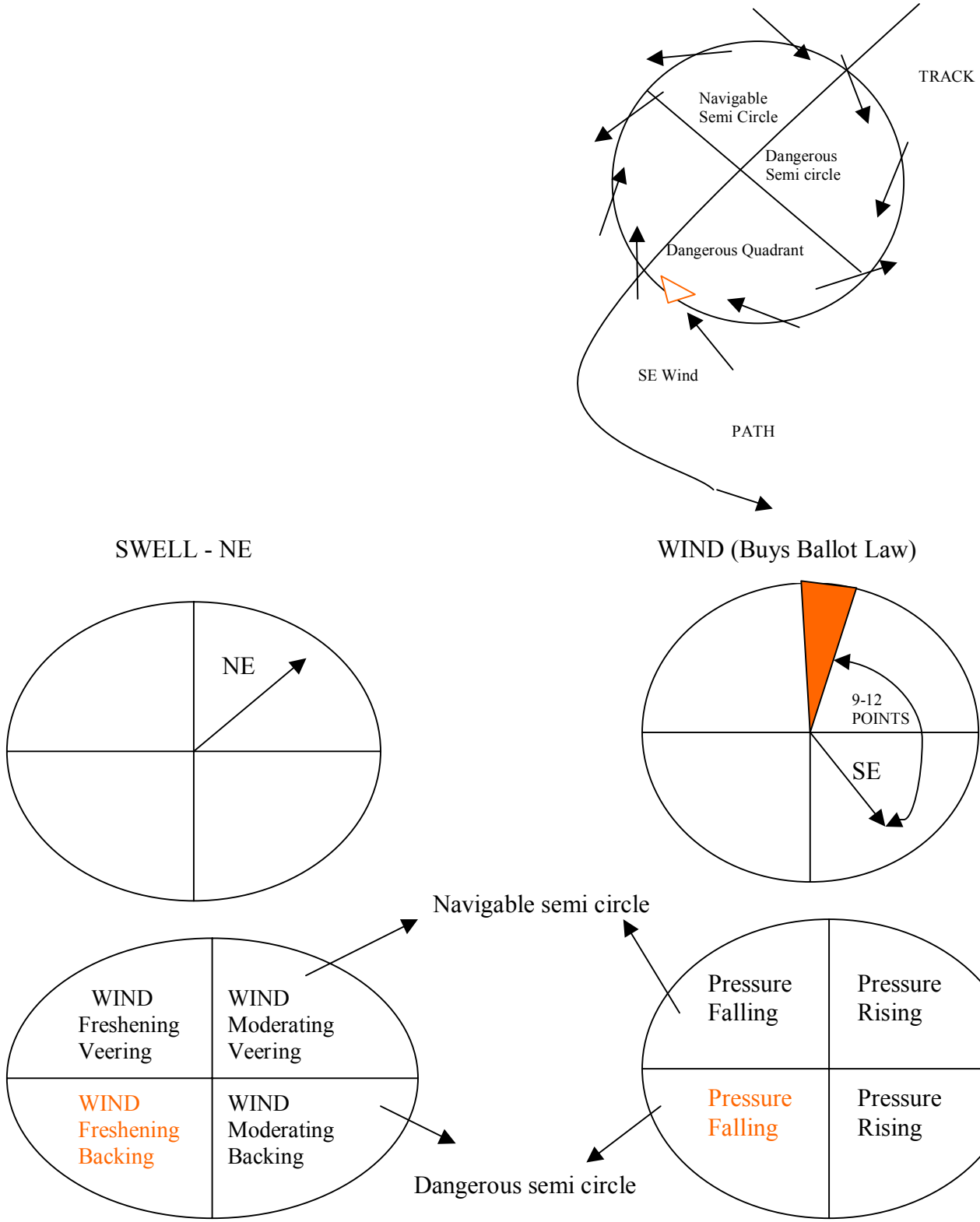


Situation B:
The wind has now steadied and then began to back and the pressure is still falling.
Vessel in navigable semi circle action as explained above



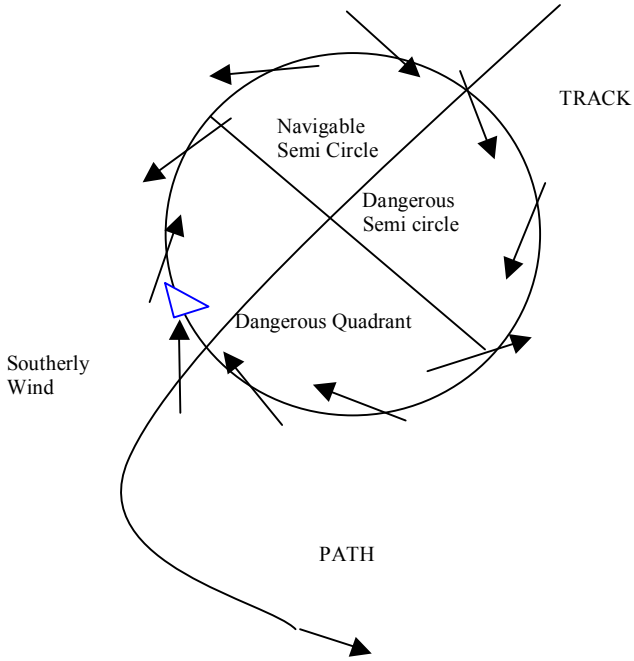


March 2001
(C) Heavy NE'ly swell, Rapidly falling Barometer, Wind SE, freshening and slowly backing.
Vessel in the Dangerous semi circle and close to the path of the storm and in the dangerous quadrant

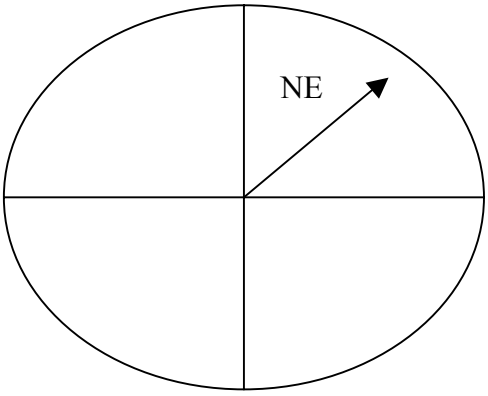


(d) The wind now steadies from SSE and then begins to veer towards the south and Barometer still falling

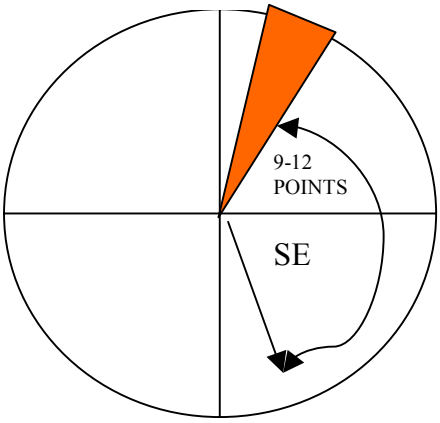
The vessel is now in the Navigable semi circle.



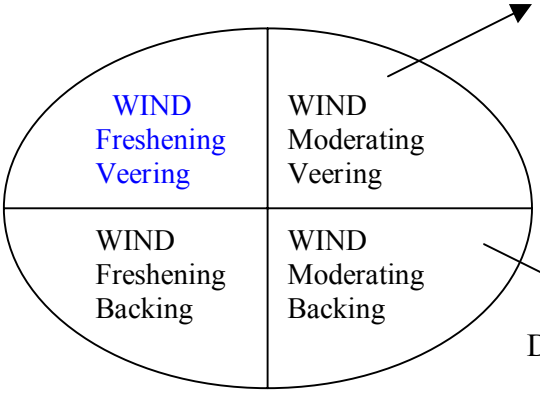
SWELL - NE

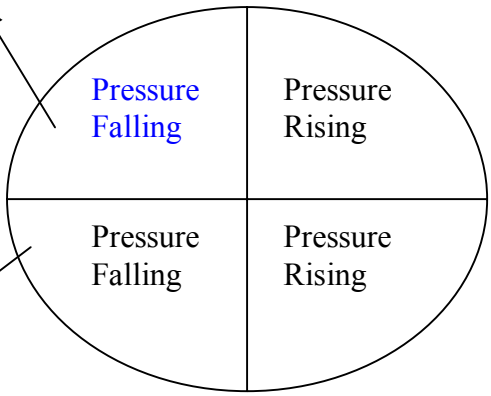


WIND (Buys Ballot Law)



Navigable semi circle





Dangerous semi circle

Outline the precautions to ensure that the vessel does not become unexpectedly involved with TRS

- All weather monitoring equipments like weather fax, EGC and Navtex should be continuously monitored to receive any warning of TRS for the area where vessel is sailing
- The above equipments need to be tuned in to the appropriate stations for receiving the above said broadcasts
- The routeing charts, admiralty sailing directions, weather atlas etc to be consulted so as to have an awareness of the TRS activity in the area
- The barometric readings should be very frequently monitored on the bridge and recorded and any fall in barometer below 3 mb than the normal value given for that time of the year corrected for the height, temperature, latitude and index error and also for diurnal variation. If the fall is below 5 mb there is little doubt as to the presence of the TRS
- The direction and strength of the wind should be monitored continuously for any change
- The direction and the strength of the swell is to be monitored as it gives the earliest indication of a TRS activity
- Radar can also be put to good use. TRS can show up on Radar as far as 100 nm. Also rain on radar is a good precursory sign as to TRS activity
- The cloud patterns associated with TRS are extensive cirrus clouds, followed as the storm approaches by altostratus and then broken cumulus or scud.
- When the presence of TRS is confirmed the master shall take avoiding action in ample time to keep a maximum distance from the storm centre.

Vessel is in port and weather warning message is received for a TRS in the vicinity. Options available to the master

High powered vessel – speed in excess of 15 kts and warned plenty in advance hence having enough time to outride the storm

- The best option is for the master to proceed at the earliest time with all available speed to open waters. it is better to encounter the storm at sea than in the harbour
- If there are storm anchorages available the vessel can proceed to the same and be sheltered in them
- Vessel should endeavour to obtain a lee if available by way of island and well clear of the dangerous semicircle.

Low powered vessel – speed less than 15 kts which can not out run the storm or vessel which do not have enough time to out run the storm

- The best option available to these vessels is to take a lee of an island if available or a sheltered anchorage if available
- Even if sufficient time is not available it is better to face the storm in open waters than inside the harbour with other vessels around especially if the harbour does not provide sufficient shelter.
- The vessel can proceed to sea and keep a maximum distance as is possible from the dangerous semi circle.

Vessel in navigable semi circle but close to the proximity of island or land and not much sea room to manoeuvre

Northern Hemisphere

- Caught in the lee side with land in proximity the best thing the vessel can do is to heave to the wind lying 1-4 points on her starboard bow so that the vessel is not pushed towards the land.

Southern Hemisphere

- Caught in the lee side with land in proximity the best thing the vessel can do is to heave to the wind lying 1-4 points on her port bow so that the vessel is not pushed towards the land.

VESSEL IN PORT RIDING OUT A TRS

- Investigate the possibility of a storm anchorage.
- If in port Vessel to use additional storm moorings.
- Ensure that adequate fenders are used on the ships sides
- Ensure that vessel is well ballasted also taking in to consideration the reduced under keel clearance
- Ensure all shore side cranes and other protrusions are well clear of the ships structure
- Ensure the vessels stability is at its maximum values, reduce all free surface moments etc to ride out the storm in her best behaviour
- Ensure all unnecessary personnel away from the vessel
- Ensure the water tight integrity of the vessel is achieved (hatches, mast house, water tight door and all openings on deck closed)
- Ensure adequate members of crew to tend moorings as required and use engines if needed to ease the stress on moorings.
- Continue to plot the position of the TRS.
- Cargo work stopped and tugs arranged to be on standby if needed.

In the open ocean, free from intervening islands and shoals, there is usually one phenomenon which becomes visible before all others, indicating the probability of a tropical cyclone in the vicinity.
State this phenomenon, explaining its significance.
Ahead of the tropical revolving storm there is sometimes a storm tide. The water begins to rise on a coast two days before the arrival of the tropical cyclone. The waves originated by storm pass on ahead as swell.
The swell direction gives general indication of where the storm was most recently. An uninterrupted swell gives the earliest sign of the probability of the storm in the area.

Precursory signs of a TRS:

- Large swell from the direction of the storm.
- A day prior to the storm, usually very clear visibility followed by extensive V-shaped cirrus clouds bringing lurid colourings at sunset and sunrise.
- Later the above clouds becomes reinforced with alto-cumulus, fracto-stratus and scud rain squalls.
- An appreciable change in the direction and strength of the wind.
- Falling barometer pressure lower then 3hpa below the average allowing for diurnal range.
- A fall below 5hpa leaves us in no doubt.
- Rain on radar.

In the absence of information transmitted by coast radio stations, state how the Master can, by on board observation, determine his position in relation to the direction of the storm's path.
Pressure, Swell and Wind.

PRESSURE:

- Fall of baro over 3hpa allowing for diurnal range, the storm is probably in the area.
- Fall over 5hpa allowing for diurnal range, the storm is definitely in the area.
- Falling baro – Storm approaching
- Rising baro – Storm receding
- Steady baro – Vessel is on the trough line
- The tendency of a falling baro can give a rough distance of the storm from the vessel
- A slow fall – Storm 500 – 120 nm away
- A more marked fall – Storm 120 – 60 nm away
- Rapid fall – Storm 60 – 10 nm away

SWELL:
- The swell direction gives general indication of where the storm was most recently.
- An uninterrupted swell gives the earliest sign of the probability of the storm in the area.

WIND:
- Freshening wind – Storm approaching
- Moderating wind – Storm receding
- Force 6 – 150 nm from storm
- Force 11 – 50 nm from storm
- Force 12 – 35 nm from storm

IN NORTHERN HEMISPHERE:
- Veering wind – Vessel is in RHS (Dangerous semi circle)
- Backing wind – Vessel is in LHS (Navigable semi circle)
- Apply Buy Ballot's law – Face wind, storm lies 9-12° to the observer's RHS.

SOUTHERN HEMISPHERE:
- Veering wind – Vessel is in LHS (Dangerous semi circle)
- Backing wind – Vessel is in RHS (Navigable semi circle)
- Apply Buy Ballot's law – Face wind, storm lies 9-12° to the observer's LHS.

State three reasons why the dangerous quadrant is so named.
- The wind circulation inside the DSC pushes the vessel towards the centre of the storm and towards more violent weather.
- The TRS re-curve at 20-25° lat towards the direction of the DSC.
- A vessel in DSC will find the TRS on its path and forward of the trough line.
- The isobars on the polar side of the TRS bunch together before recurvature of TRS.
- This tendency generates stronger winds and associated weather in DSC, than in NSC.

Describe the AIS system.

- Automatic Identification System
- By 01/07/2008 all ships (over 300 grt), including those engaged on non-international voyages will be equipped with the AIS.
- This system continuously transmits the ships details and receives details of other ships in vicinity thereby assisting in +ve identification of all vessels in the vicinity fitted with an AIS.
- This system monitors and tracks the ships in the vicinity fitted with an AIS.
- The range of AIS is typical VHF range which is dependent on various factors.
- This system also exchanges data with shore based system (VTS, TSS, COASTGUARD ETC.)
- Displays data in ECDIS/Radar (if connected).

COMPONENTS OF AIS:

- GPS
- VHF Transceiver
- Controller (VDU , Database , VHF Computer interface)
- Power unit

DATA TYPE	INFORMATION TRANSMITTED
STATIC DATA	MMSI number Call sign and Name IMO number Length and beam Type of ship Location of GPS antenna
DYNAMIC DATA	Ship's position Indication of the accuracy of the fix Time of position in UTC Course over ground Speed over ground Heading Navigational status (Moored, Underway, NUC etc.) Rate of turn
VOYAGE DATA	Ship's draught Type of cargo Destination and ETA Route plan

INFORMATION INPUT TO AIS BY OOW:

- Voyage information: The OOW shall regularly check and update vessel's voyage data (Draught, cargo etc.)
- Counter-check dynamic data (Nav equip info) with other vessel's / shore stations on a regular basis.

LIMITATIONS OF AIS:

- Limited to VHF range.
- Has to be prudently used in piracy prone areas under master's authority.
- All information required by shore authorities may not be available on all models, hence additional reporting is required to made by the OOW.
- Small boats, war-ships may not be fitted with AIS, hence may not be tracked. (As with vessels switched off AIS or having an equipment breakdown).
- The datum used by the position fixing system might result in not coinciding with the radar target.
- Faulty AIS inputs results in faulty information.
- Due to above limitations the actual situation may not be same as indicated on the AIS.

Describe the ECDIS system.

- It is an Electronic Chart Display System.
- It uses ENC (Electronic Navigation Charts – Compiled from a database of information, hence presents a seamless vector chart) or RNC (Raster Navigation Charts – which are digital scan of paper charts) on a VDU (Visual Display Unit).
- ECDIS forms part of Integrated Bridge System.
- The charts are updated/corrected by means of compact disc correction.
- When GPS/ARPA/COMPASS inputs are given as a part of IBS there is a real-time display of navigational charts (without any borders).
- It required two independent position fixing systems.
- Combined with an AIS can give an overall picture of all vessels in the area which are fitted with an AIS.
- When used in RCDS (Raster Chart Display System) mode it shall done in conjunction with an appropriate portfolio of paper charts.

HAZARDS ASSOCIATED WITH AN ECDIS:

- Next RNC chart not available.
- Planned passage may cross or enter designated areas
- Vessels position between charts may not be the same.
- Accuracy of the nav information doubtful.
- Datum shift
- Hardware failure
- Software failure
- Power failure
- Failure to update charts
- Input information failure (Position, Course, Speed)
- Virus infection of computer files
- Competency of the ECDIS operator/OOW
- Complacency/over reliance by the OOW

Points to consider when making a landfall.

- Passage plan in place for this leg of the voyage
- Large scale charts for the area
- All details marked on the large scale coastal chart as to:
    - UKC
    - Distance to keep off dangers
    - No go areas
    - Radar conspicuous objects
    - Racons / Lanbys
    - Radar conspicuous coastal features
    - Rising and dipping distances of lights
- Areas with engine status to be marked (Speed reduction)
- Areas of additional manning marked (Lookouts, Helmsman, Extra mate, Master)
- Frequency of fix to be increased and intervals specified
- Two methods of position fixing to be used – Radar range & Brg, Visual bearings (transits, leading lights, sectored lights etc...), GPS fix.
- Echo sounder to be extensively used well in advance.
- One radar on long range to pick up the land features at the earliest.
- Extensive and competent use of radar is very essential for making a safe and successful landfall.
- Consultation of relevant publications (Sailing directions, tidal stream atlases, tide tables) to be made, to have complete understanding of the set and drift near the coast.
- Tidal diamonds marked on chart might differ from the actual set and drift experienced when approaching coastal features.
- Exercise extreme caution!!!! In above areas.
- Positive identification of all coastal features / nav marks must be made at the earliest.

- Follow international colregs and give wide berth to all passing traffic.
- Take avoiding action well in time, keeping in mind the effects of tide, squat, interaction when in coastal waters.
- All navigation equipment errors have to be ascertained and allowances made for Gyro/Compass errors (Local magnetic anomalies).
- Consider advantages/disadvantages of day-time over night-time approaches when making a landfall.
- Consider visibility conditions and decide upon continuing or to abort passage and proceed to a contingency anchorage and wait until weather/visibility improves.

A vessel trading across N.Atlantic is fitted with a radio facsimile receiver.
Describe how a least time track may be constructed using information from the receiver.

- Fax weather reports are received for the concerned passage – Surface analysis, Prognosis, Sea state charts, Wave height charts.
- The weather conditions for the passage are carefully studied and areas of concern identified.
- The course is plotted from the departure point along with 5 or 6 additional tracks approx 10-15° on either side of the original track for the next 12 hours.
- The tracks are drawn on a transparent overlay and are placed over a prognosis chart to analyse the conditions which will be encountered by the vessel during the voyage on above tracks.
- Vessel's ETA is plotted on each track for the next 12 hours, based on the ship's performance curve and the weather analysis.
- These ETA points are joined together to form a contour line, known as the time front.
- From the best point on the time front (favourable weather, least time) the above procedure is repeated for the next 12 hours and subsequently up to 48 hours.
- On the 48 hours contour line, the point closest to the ship's destination is chosen as the point to which the vessel is advised to proceed.
- The above procedure can be repeated for the voyage using info available from the weather fax with regard to Fog, Ice, Storm, Winds, Currents, Wave heights and Swell.

List the information that the Master of a vessel which is to be routed by Met route should supply to the routeing officer for each of the following:

i) Prior to sailing

- Ship's particulars (Name, Call sign, Contact details)
- Port of departure and
- Port of destination
- Date and time of departure
- Condition of the vessel (loaded/Ballast, Draught, Freeboard, Summer displacement)
- Type of cargo (Weather Sensitive/dangerous – Angle of repose, high density cargo etc...)
- Vessel's required ETA if any
- Vessel's speed – C/P requirement
- Weather and sea conditions to be avoided
- Other requirements – Maintenance, passenger comfort.
- Vessel's met equipment (Whether vessel is met observation station or not)

ii) **While on passage**

- Noon position reports are sent from the vessel with the following details:
- Date / Time UTC
- Name of vessel / Call sign
- Position
- Course and speed (Daily average and present speed)
- Average and Present meteorological conditions (Baro pressure, wind, swell)
- Est ETA based on present / predicted average

State the function and usage of ship's performance curves in the above routeing systems.

- The performance curve is a ship's estimated speed for 12/24 hours on various courses.
- It is plotted against weather conditions (for a given wave height and head/beam/following sea etc.) estimated for the given voyage.
- The above data is obtained from the vessel's present stability information (Draught, Displacement, GM, Roll period, pitch period) and weather info available from met obs stations.
- The performance enables the estimation of vessel's optimum speed of advance.

With reference to the ICS Bridge Procedures Guide:

a) State the main purpose of the guide

This publication is produced by the International Chamber of Shipping designed to make mariners aware of good operating practice and efficient bridge organisation. The following information is contained within:

- Bridge organisation
- Passage planning
- Duties of the officer of the watch
- Operation and maintenance of navigational equipment
- Check lists for routine operations
- Check lists for emergencies

b) Outline procedures for operating in the vicinity of restricted visibility

- Commence appropriate sound signalling as per international Colregs
- Display nav lights
- Commence systematic radar plot
- Inform E/R to reduce to safe speed
- Switch on second steering motor
- Engage vessel on hand steering (Helmsman)
- Post additional lookouts
- Plot vessel's position
- Inform master
- Ensure bridge doors are open
- Stop all noisy work on deck
- Make appropriate entries in ship's log book

c) List the procedures / checks and tests that should be carried out when preparing for arrival in port.

- Carryout 48/24/12 hour's checks as required by the coast guard authorities of the respective administration where the vessel is proceeding to.
- Transmit the reports required by the above authorities under various regulations (ISPS, Marpol, Port state/Flag state) – 96/48/24/12 hours prior arrival
- Transmit reports required for Pilots and Harbour authorities, Quarantine and Agents.
- Observe mandatory/voluntary reporting requirements to VTS/TSS.

BRIDGE PREPARATION:

- Passage plan in place for arrival (Large scale charts, No GO areas marked, Reporting points marked, Contingency procedures and contingency anchorage, abort points)
- Appropriate manning schedule planned and executed for various legs of the passage (Coastal, Pilotage, Berthing)
- Equipments to be tested:
- Main/Auxiliary and Emergency steering
- Gyro, Magnetic compasses (Align repeaters and check errors)
- Auto pilot
- Radars and ARPA
- VHF
- AIS

- GPS
- ECDIS
- Echo sounder (including remote displays and alarms)
- Inmarsat equipment
- GMDSS equipment (DSC / SAT)
- Navtex / EGC
- Sound and Light signalling apparatus
- Navigation lights – Main and Emergency
- Bridge controls with all indicators (RPM, Helm, ROT, Heel, Repeaters)
- Internal communication with E/R ad Em. Steering gear room, Forecastle, Poop deck.
- PA system
- Required Flags checked and ready for hoisting as required
- Binoculars
- Illumination of compass, repeaters, remote displays
- Course recorder
- Clocks synchronised with engine room
- Pilot card filled and ready to hand over to Pilot
- Bridge order book ready for use and entries made chronologically
- Engines to be tried out Astern well in advance

DECK PREPARATION:

- Forward and Aft mooring stations adequately and safely manned
- All mooring equipment tried out and ready for use (Ensure brakes tested)
- Mooring ropes flaked out with rope/wire stoppers etc.
- Fenders
- Rat guards
- Messenger ropes (Gant lines)
- Heaving lines
- Windlasses checked
- Anchor lashings removed / cleared as advised by bridge
- Check communications with bridge
- Access ways prepared and stand by for use (Gangway)
- Pilot ladder and Illumination prepared as per regulations (Lifebuoy with light, Heaving line, Illumination)

ENGINE ROOM PREPARATION:

- Engine room safely manned
- Pre arrival checks to be carried out as per chief engineer's instructions
- Engines to be prepared for manoeuvring

List the factors which could determine the drift rate of the rafts.

- Estimated surface movements of the raft depend upon the drift.
- The drift has two components: leeway and total water current
- Drift direction and speed is the vector sum of leeway and total water current.
- Other factors which would affect drift rate would include whether the raft has a canopy or not.
- The number of persons in the raft.
- Whether drogue is attached to the raft and lowered in water.

Under GMDSS regulations, equipment must be carried in survival craft to facilitate rescue.
List these items and explain their use.

- EPRIB: The Emergency Position Indicating Radio Beacon (EPIRB) uses the frequency 406 Mhz/121.5Mhz. This signal is picked up the COSPAS/SARSAT satellites and is relayed to the LUTs which fixes the position of the EPIRB and relays this information to the Maritime Rescue Co-ordination Centre (MRCC)

- HANDHELD VHF TRANSCEIVERS: These are designed to transmit on the International Distress, Urgency and Safety communication frequencies (Ch 70, 16) and Intership frequency (Ch-06) and Search and Rescue communications with aircraft (Ch-13). These sets must have a spare battery which can be used exclusively in a case of emergency.
- SART: The Search and Rescue Radar Transponder is designed to go on stand-by mode as soon as it is switched ON and starts transmitting the identification signal upon being activated by radar pulse signals received from ships in vicinity of 12 miles. At 12 miles these signals are received by the ships as 12 dots. These dots change into arcs at 6 miles and circles at 1 mile range.

List the factors to be taken into account when determining which Master should assume the role of on scene co-ordinator (OSC).

- Proximity of the vessel in distress and her ETA
- Communication facilities available on board (Terrestrial / Satellite equip)
- Proficiency of Master and his team in Common international language for communications (ENGLISH)
- Experience/Competence of the Master and his team
- Endurance and Type of the vessel (Bunkers) and her suitability to present scenario.
- Time available from the vessel for carrying out the SAR ops.
- Availability of Specialised trained personnel to carry out the operations, including Master and Crews previous SAR experience / Training (Rescue tugs, War ships, Coast Guard vessels)

The OOW of a vessel in apparently deep water obtains an unexpected shallow water sounding.

i) State the authority to which a report should be made.

Dangerous shoal sounding, Uncharted dangers and navigational aids out of order should be reported by the obligatory report procedure by Radio or any other available means (Telex, Fax, Telephone) to :-

- The nearest coast station
- United Kingdom Hydro graphic Office (UKHO), Radio Navigational Warnings
- Such reports should always be followed by a completed H102 form and sent to UKHO.
- In instances which require urgent charting action, these reports should be copied to the Hydrographer of the navy by most appropriate means.
- Also advise shipping in vicinity by appropriate message and record same in log books.

ii) List the information which should accompany the report.

The form to be used is H102 and contains the following details:

- Name of the ship or sender
- Sender's address
- Communication details of the sender
- General locality
- Subject
- Position lat and long
- BA chart affected
- Edition of the chart
- Position fixing system used
- Datum of the position fixing system
- Latest edition of Weekly notice to mariners on board
- Publications affected

iii) State the publications from which a report form may be obtained.

- Mariner's handbook (NP100)
- Admiralty weekly notice to mariners

List the items that should be included in the Master's standing orders to his officers of the watch, when operating in, or near an area of restricted visibility.

- Observe international Collision regulations
- Do not leave the bridge unattended at any time
- Call me if visibility reduces
- Inform Engine room to have engines ready for manoeuvring and advise engine room to be continuously manned until further notice
- Maintain safe speed at all times
- Post extra lookouts (Helmsman is NOT to be considered a lookout)
- Helmsman on wheel and vessel to be on hand steering
- Employ both steering motors
- Sound appropriate signals prior entering areas of restricted visibility
- Keep both radars ON and plot all targets and closely monitor the situation
- Make good use of AIS / VHF with prudent seamanship, bearing in mind these aids have resulted in collisions / close quarter's situation.
- Maintain a minimum CPA of 2 nm from all targets
- Switch ON navigation lights
- Continuously monitor all bridge equipment
- Increase position plotting frequency
- Counter-check positions with alternative position fixing methods (Make appropriate use of Radar, GPS, Echo sounder)
- Keep bridge doors open and stop all noisy work on deck

- Follow bridge manning procedures as per my instructions

State the specific responsibilities of EACH of the following when a vessel has a pilot on the bridge, when entering a port where pilotage is compulsory.

i) The vessel's master

- In command of the vessel and overall in-charge
- Safe navigation of the vessel at all times including under keel clearance
- Decide the manning arrangements for the entire operations
- Ensure all personnel are well rested / fit for performing their duties safely including the Pilot
- Ensure all nav-aids and machinery is operational/safe/ free of defects
- Ascertain credentials of the Pilot
- Discuss and agree upon the passage plan with the pilot
- Ensure that the pilot is well informed of all essential and critical data regarding the vessel manoeuvring and her machinery/equipment.
- To appraise the pilot
- Monitor the actions of the Pilot and over ride his actions (if required) to ensure vessel's safety.

ii) The vessel's OOW

- Assist the Master and the Pilot with the safe navigation of the vessel
- The OOW is the Master's representative and shall continuously the vessel's position as per the agreed passage plan
- Ensure Pilot's instructions carried out safely, any doubts shall be immediately clarified with the Pilot/Master.
- Monitor the performance of the Helmsman, Bridge equipment and engine status is in accordance with Pilot's advice.
- Liaise with deck and engine room personnel to arrange for relief's
- Supervise pilot boarding/disembarkation of Pilot
- Keep the engine room and the deck team informed of progress of pilotage
- Report to appropriate authorities as required by VTS/TSS.
- Continuously monitor vessel's position and ensure vessel is proceeding in safe waters at all times, any deviation should be immediately brought to Master's attention.

iii) The Pilot

- Identify himself to the Master on boarding by his documents identity card
- Obtain from the master the vessel's course and engine status and ensure the vessel is on safe track
- Discuss and agree on the passage plan (Tugs, Ropes, Berthing to, Berth number etc.)
- Obtain all essential and critical data regarding the vessel manoeuvring and her machinery/equipment.
- Ensure the pilot card is received and familiarise at the earliest with the vessel's behaviour
- Provide the master with all info regarding the pilotage period
- Advise the master of any special requirements as per the local laws/harbour authorities affecting navigation
- Appraise the master of the local weather and tidal conditions and possible effects on navigation

When proceeding up-river towards the berth, list the five most important items of information that:

i) The Master should give to the Pilot

- Pilot card containing the manoeuvring information
- Ship's particulars
- Intended passage plan to the berth
- Defects if any, with relation to any bridge equipment / any machinery
- Vessel's draught and displacement
- Vessel's air draught
- Vessel's manoeuvring speed
- Location of Life saving equipment intended for Pilot's use in case of any emergency
- Vessel's course and present speed
- Bulbous bow / bow thrusters
- Type of anchors and no. of shackles on each

ii) The Pilot should give to the Master

- His identity
- His passage plan, including mooring plan
- Any navigational hazards effecting navigation (UKC, Shoals, New wrecks, Special operations being carried out – Dredging, cable laying, maintenance of buoys etc)
- Tide/current information
- Weather conditions
- Berthing details as to number of tugs, estimated time of deployment of tugs, berthing to (Port or Stbd side)
- Any on-coming traffic likely to be encountered especially Dredgers, RAM vessels etc...
- Areas where speed alterations may be required
- Any local regulations/laws effecting the vessel
- Any reporting requirements

State with reasons, the action that the Master should take, if the Pilot becomes incapacitated whilst the vessel is in compulsory pilotage waters.

- Master relieves the Pilot and takes on the pilotage duty
- Since it is a compulsory area the vessel shall not proceed any further
- Master shall investigate safe anchorage option and anchor the vessel
- Master shall request for another pilot and hold vessel's position until relieving pilot arrives
- Make relevant entries in the log book.
- Keep the relevant authorities informed of the events and seek advice for further action.

A vessel trades regularly to the Baltic, where, in the winter months, sea ice and ice accretion may be experienced.
Describe the additional problems that the above winter conditions may cause with regard to EACH of the following:

i) the maintenance of navigational accuracy

- Celestial navigation can not be relied upon and is hampered as a result of clouds tending to hide the sun during the day time
- Fog, low cloud, ice conditions generally pose continual navigational problems
- Sights when only the sun is available have to be used with the method of transferred position line and the accuracy of this position is not reliable.
- Celestial observations less than 10° altitude have to be used and corrections to these altitudes are to be applied as found in the nautical almanac together with the temperature and pressure allowances.
- The margin of error for celestial observation in ice areas is very high.
- The use of Echo sounder is very essential but the soundings can change abruptly and its reliability in high latitude regions is reduced
- Since the weather conditions may change abruptly the position fixing frequencies can not be adhered to.
- Radar, GPS and other navigation have to be used with good seamanship practices and with a thorough understanding of their limitations in their capabilities.
- Difficult to identify geographical features on radar due to icing.

ii) the performance of nav instruments and electronic nav-aids

- Radar scanners may become frozen up.
- There is a possibility of ice accretion on aerials which will reduce the range of the transmitters and weak signal reception/transmission.
- Any equipment using aerials will function with reduced efficiency and is to be treated with caution and observance of good seamanship.
- Magnetic compass becomes unreliable, unless it has been swung in the particular area to obtain the deviation card.
- The gyro compass loses its directive capability.
- The Inmarsat equipment is close to their limits and hence there will be frequent loss of signal.
- GPS positions must be treated with high caution.
- Echo sounder readings may not be accurate as a result of high dense sea layer below keel.
- Radar use as a naviad is limited due to icing on coastal features (Topography changes).
- The radar efficiency as a collision avoidance aid is further aid is further reduced by poor reflection properties of ice; hence most targets will show up only at very close range.
- Sextant as a nav-aid is practically useless with clouds, fog and horizon being obscured with ice.

iii) the use of floating nav marks

- Many of these marks are removed during the ice season to avoid their loss or damage.
- Even available buoys are too low at water level due to ice accretion and are of little use as a navaid.
- Ice accretion makes them a poor radar reflecting target.
- Icing causes discoloration and the marks might appear out of colour and shape.

iv) the use of sectored lights

- Most of these lights fail under icing conditions (They blow-up)
- The ice build-up covers the light if they are working, thereby reducing their range considerably.
- Due to effects of reflection/refraction sectors become unreliable.

- Coloured light sometimes tend to appear white.
- The width of the sector light is diffused at the boundaries and it becomes difficult demarcate the different sectors.
- Errors when used for position fixing.

Draw up a set of Master's standing orders for handing over a watch at sea

- Arrive for watch well rested and at least 15 minutes prior to commencement of watch.
- Read and sign master's bridge order book.
- Check vessel's position on chart and compare course laid out on chart and that on auto pilot.
- Compare compass and gyro courses and ascertain errors.
- Check the vessel's track for the next four hours and ensure it is safe.
- Check all nav equipments are in good working order:
- Radar – Properly tuned and picking up targets.
- Appropriate day/night signals displayed
- Nav lights / Sound signals ON
- VHF equipments on watch-keeping frequencies
- GMDSS equipment on their watch-keeping frequencies.
- Weather messages available on EGC/Navtex.
- Confirm with the out-going OOW, the weather during previous watch and any particular information effecting navigation including tide, current any course alterations etc.
- Hand over of watch shall not be carried out:
- Until the vision is adjusted to darkness during the night.
- During the course of any manoeuvring and until its completion.
- If the fitness of the relieving officer is suspected (Fatigue, Alcoholism, Drugs)
- Until the relieving officer completely satisfied with the traffic situation.
- The relieving officer shall handover
- The position, speed and the course (Magnetic and Gyro) and same shall be verbally acknowledged by the taking over officer.
- Any course alterations due
- Any reporting points due
- Traffic situation and any targets requiring particular concern
- Any no go areas or passing distances off dangers
- After handing over the watch the relieving officer shall make fire safety rounds of the vessel and report to bridge.

A new port has been opened up for trade:

i) List the information which a mariner should report

The form H102a shall be forwarded together with form H102, which contains the following details:

- Name of the port
- General remarks:
- Principal activities and trade
- Latest population figures and date
- Number of ships or tonnage handled per year
- Copy of port handbook, if available
- Anchorages: Designation, depth, holding ground and shelter afforded
- Pilotage: Authority for request, embarkation position, regulations.
- Directions: Entry and berthing information, tidal streams, nav-aids
- Tugs: Number of tugs available, max HP (Bollard Pull)
- Wharves: Name, number, or position, length, depth, ht. above chart datum, facilities available.
- Cargo handling: Containers, lighters, Ro Ro etc.
- Cranes: Brief details and maximum capacity.
- Repairs: Hull, machinery and under water. Docking or slipping facilities, Size of vessels handled.

- Rescue and distress: Salvage, lifeboat, coast guard etc.
- Supplies: Fuel, fresh water, provisions.
- Services: Medical, deratting, consuls, ship chandlers etc.
- Communications: Road, rail, air services, nearest airport, Port radio and info service with frequencies and hours of operating.
- Port authority
- Small craft facilities
- Views with photographs

ii) State the name of the agency to which the report should be sent
Hydrographer of the Navy, United Kingdom Hydro graphic Office.
Or to the respective administration / hydrograhic office by whom the charts are published.

List the major items of information that are to be recorded in the Pilot card.
SHIP'S PARTICULARS:
- Name
- Call sign
- DWT
- Draught
- Displacement
- Year built
- LOA
- Breadth
- Anchor chain Port and Stbd; number of shackles
- Bulbous bow
- Air draught
- Bow to bridge distance
- Bridge to astern distance

ENGINE PARTICULARS:
- Type of engines
- Max power
- Speed
- Manoeuvring characteristics for each rpm from full ahead to full astern for loaded and ballast condition
- Time limit astern
- Full ahead to full astern
- Maximum number of consecutive starts
- Minimum rpm and speed
- Critical rpm
- Astern power

STEERING PARTICULARS:
- Type of rudder
- Maximum angle
- Time for hard over to hard over
- Rudder angle for neutral effects
- Thrusters – Bow and Stern – KW and HP

CHECKLIST FOR BRIDGE EQUIPMENT:
- A list of all bridge equipments
- Number of steering motors in operation
- Gyro error

A container vessel has, in addition to the Master, three navigating officers, six GP seamen and Bridge Engine controls.
State the desirable Bridge Manning scale for EACH of the following situations:

i) clear visibility in open ocean, at night
- OOW + 1 G/P on lookout duty

ii) clear visibility whilst coasting, with dense traffic
- Master + OOW + 1 G/P on hand steering + 2nd G/P on lookout duty

iii) restricted visibility whilst coasting with dense traffic
- Master + OOW + Extra Mate + 1 G/P on hand steering + 2nd G/P on lookout duty

List the information found on an Admiralty routeing chart.
- Shipping routes and their great circle distances
- Load line zones
- Date line information
- Predominant Ocean currents
- Wind roses
- Ice information – Iceberg limits and Pack ice limits
- TRS tracks for the month
- Percentage frequency of wind force beaufort force 7 and above
- Percentage frequency of visibility less than 5 nm.
- Percentage frequency of visibility less than 1 nm.
- Mean sea temperature
- Dew point temperature
- Mean air temperature
- Mean air pressure

Compare the uses of each of the following:

i) Vector mean current chart
- Used to find average drift of objects (E.g. Liferaft) over a long period of time. E.g. For search and rescue purposes especially when the actual set and drift is known.
- Used to find the overall movement of water over a period. E.g. Speed of current in miles per day.

ii) Predominant current chart
- These are used for passage planning, routeing.
- They are used to obtain the direction of most frequent currents in an area (approximate only).
- These are used to obtain current values in knots or miles per day.

iii) Current rose chart
- These are also used for passage planning, routeing purposes.

A vessel is engaged in a liner trade to the St. Lawrence in Eastern Canada, where ice can be a major hazard

a) State each of the following:

i) the generally accepted geographical limits of iceberg off New Found land

The generally accepted geographical iceberg limits off Newfoundland are 40˚N and 40˚W.
They are seldom found S of 40˚N and E of 40˚W.

ii) the dates between which navigation is generally suspended in the St. Lawrence, and in the straits identified in the datasheets N and S of Newfoundland.

In the St. Lawrence navigation is generally suspended between early December and mid April.
In the Cabot strait navigation is generally suspended between February to April.
In the Grand banks navigation is suspended between January and June.
In the Strait of Belle Isle is not navigable between December and June.

b) Compile a specific set of Master's Standing Orders when his vessel is operating in or near ice in the St. Lawrence area.

- Navigate with extreme caution when in or around areas of ice.
- Comply at all times with Company's and Master's general standing orders.
- Observe international Collision regulations
- Ensure bridge is manned at all times in accordance with manning regulations for navigation in ice areas.
- Inform Engine room to have engines ready for manoeuvring and advise engine room to be continuously manned until further notice
- Maintain safe speed at all times
- Post extra lookouts (Helmsman is NOT to be considered a lookout) at strategic points and continuously rotate them to prevent fatigue.
- The visible range of icebergs could be as low as 1-2 miles; hence the lookouts and the radar operator should be very alert at all times.
- Helmsman on wheel and vessel to be on hand steering
- Employ both steering motors
- The OOW shall not hesitate to take avoiding action by way of further reduction of speed/alteration of course to keep vessel safe on sudden encounter with ice.
- Call me immediately if I am not already on bridge, after taking appropriate action.
- In poor visibility sound appropriate signals prior entering areas of restricted visibility.
- Make optimum use of radars to obtain echoes of weak targets.
- Keep both radars ON (One radar to be on low range) and plot all targets and closely monitor the situation
- C/O to ensure vessel has adequate stern trim to enable complete propeller immersion at all times to prevent damage to propeller.
- Fog is very prevalent in these areas and suitable precautions to be taken in accordance with practices of good seamanship.
- Due to unreliability of compasses, vessel should be on hand steering at all times.
- Gyro bearings should not be relied upon, but magnetic compass bearings (if has been specially swung for these areas can be relied better on).
- Make good use of AIS / VHF with prudent seamanship, bearing in mind these aids have resulted in collisions / close quarter's situation.
- Maintain a minimum CPA of 2 nm from all targets and call me in case of any difficulty in this regard.
- Navigation lights to remain ON throughout.
- Continuously monitor all bridge equipment
- Increase position plotting frequency
- Counter-check positions with alternative position fixing methods (Make appropriate use of Radar, GPS, Echo sounder)
- Keep bridge doors open and stop all noisy work on deck (For sounds of any ice activity, smell)
- Ensure echo sounder is continuously ON to warn of approaching shoal waters.
- The best positions obtained are from star observations during twilight, try and obtain same.
- Radar positions are to be treated with caution, unless the coastal feature in use is positively identified.
- C/O to ensure ballast and fresh water tanks should be kept less than 90% full to avoid risk of damage due to expansion.
- Search lights to be tested during each watch and available for use.
- DO NOT HESITATE TO CALL ME AT ANY TIME IN DOUBT OR WHEN REQUIRED.

c) List the data to be transmitted by the Master of a vessel on encountering any kind of dangerous ice.

- Type of ice
- Position of ice
- GMT and date of observation
- Additionally the direction of drift

Outline the type of information contained in EACH of the three categories of Marine Notices currently in use.

MERCHANT SHIPPING NOTICES (MSNs):

- These are related to the UK legislation and contain information to comply with the same.
- They contain technical details related to statutory instruments and regulations.
- They are numbered in sequence with a prefix MSN.
- The examples of MSNs are COSWP, LSA regs, SOLAS.

MARINE GUIDANCE NOTES (MGNs):

- These provide guidance and advice to improve safety of shipping, Safety of life at sea and pollution prevention.
- They are sequentially numbered with a prefix numbered MGN.
- Examples are navigation in Dover Strait, Navigation in Fog, Standards of Training and Certification, Marpol, etc.

MARINE INFORMATION NOTICES (MINs):

- These provide information regarding training establishments, equipment manufacturers.
- These are valid for a limited period of time.
- Examples are list of Training establishments, Equipment manufacturers.

Define low powered vessels as given in the Ocean Passages.

Low powered vessels are those which are unable to maintain a sea-going speed in excess of 15 knots. These are vessels which are hampered by damage or towing and hence are unable to exceed 15 knots.

Define high powered vessels as given in the Ocean Passages.

High powered vessels are those which can maintain a sea-going speed in excess of 15 knots.

The SOLAS convention requires the Master of any vessel to report having encountered certain weather conditions.
State the conditions that are to be reported, and to which authority.

- The master of every ship which meets with any of the following shall make a report by all available means to the nearest coast radio station or signal station in English.
- These messages shall be sent on DSC, R/T, and Inmarsat.
- These messages shall be preceded by SECURITE or PAN PAN.
- Tropical storms or wind of force 10 and above of which there has been no warning.
- Air temperatures below freezing, associated with gale force wind causing severe icing.
- Dangerous ice

Outline the AMVER system and list the messages that should be transmitted under this system.

- The Automated Mutual assistance Vessel Rescue system is operated by the USCG.
- Vessels of all nationalities can participate in it although it is mandatory for U.S national vessels.
- Vessels over 1000 GT, which are engaged on voyages 24 hours or more contribute on a voluntary basis.
- These vessels transmit their position o a regular basis through designated AMVER radio stations, forming a part of world-wide network.
- These reports can be transmitted free of charge on Satellite network by use of code 43 and through designated radio stations.
- Each vessel's position is plotted along with her intended route and her eta and a continuous plot is maintained of presence and movement of vessels in any given area all over the world's oceans.
- In the event of a distress vessel's in vicinity are easily identified and requested to proceed for help.
- The overdue of the position report itself results in enquiries being made and subsequent initiation of search and rescue procedures.

TYPES OF MESSAGES UNDER AMVER:

- Sailing plan, transmitted prior to vessel's departure
- Departure report
- Position report
- Deviation report
- Arrival report

List three other reporting systems.

- AUSREP – Australian ship reporting system
- CHILREP – Chilean ship reporting system
- INSPIRES – Indian national ship position information reporting system

List three publications in which information may be obtained about the AMVER system.

- ALRS Volume 1
- ALRS Volume 6
- Annual summary of Admiralty notices to mariners
- United states coast guard Code of federal regulations

Describe the use of chart 5500 specially with regard to deep draught vessels.

PASSAGE PLANNING:

- This chart is of very critical importance for all vessels transiting the English channel and proceeding to and from continental ports of Europe, like France, U.K., Germany, Netherlands and Denmark.
- This chart contains all required details to assist with the passage planning and to ensure a safe passage through the channel.
- Advise is given on appraisal, planning, execution and monitoring.
- Pilot boarding areas are marked specially for deep draught vessels where the pilot board by means of a helicopter.

Passage planning for special classes of vessels:

- Deep draught vessels and vessels bound for Europort are given specific instructions regarding the routes to be followed by them, reporting points, pilot boarding points and alteration points for joining and leaving the TSS.
- For vessels constrained by their draught, information is given regarding the need for adequate under keel clearances.

ROUTEING:

- Routes used by ferries and passenger vessels are marked.

General recommendation:

- The Dover strait is an area of highly traffic congestion and the details of the TSS in use and master's legal obligation under colregs are discussed in detail.

Specific regulation:

- The special regulations which apply to the TSS scheme are summarised within the passage plan chart.

Recommendations for vessels of over 300grt with regard to the electronic position fixing equipment to be fitted on board to improve the navigation methods are given.

- The limits of the chart and their numbers which will be used for the passage are printed.

RADIO REPORTING SYSTEM:

- All vessels transiting the English channel are required to report at various points to the UK and France maritime authorities while using the TSS off Ouessant, Cape Gris-Nez and Dover coast guard.
- Guidance regarding Special reporting arrangements and reporting points for vessels carrying oil and dangerous cargo are mentioned in detail.
- Radio reporting procedures to the port of destination along with complete details of cargo and vessel's navigation capabilities are mentioned.
- Tanker checklist and documents to be produced to the various authorities are listed in detail.

MARITIME RADIO SERVICE:

- Details of stations operating in the area together with their times of transmission, types of messages (Nav wngs, weather messages, storm wngs) are given.
- Details of Navtex service are also given.

RADIO BEACON SERVICE:

TIDAL INFORMATION AND SERVICES:

- Offshore tidal data with an illustration/example of the use of co-tidal, co-range lines are explained.
- Maximum tidal stream rate in relation to HW Dover are included in this section.

PILOTAGE SERVICES:

- Details of request for deep sea pilots for respective ports and the relevant communications required are available.
- Rendezvous points for helicopter/pilot transfer and procedural action.

Describe the NAVTEX system.

- NAVTEX is a navigational telex system, using Narrow Band Direct Printing (NBDP) principle.
- It enables the automatic reception of maritime safety information (MSI) on 518 kHz.
- Approx range is 200 nm.

- Forms an integral part of the GMDSS system for the promulgation of Navigational, meteorological and safety messages (Forming part of WWNWS).
- Transmitters are located along the coast of the 16 navareas under WWNWS.
- The station required can be selected by choosing the appropriate alphabetical identity on the Navtex receiver.

Describe the NAVTEX subject indicators that cannot be deleted by the Navtex operator.

- Navigational warnings (A)
- Meteorological warnings (B) and
- Search and Rescue messages (D)
- Navarea warnings (L); in addition to (A)

The MCA has stipulated that passage-planning should be berth-to-berth and not simply between pilot stations.
State reasons for this recommendation.

- On departure from the berth to departure at the pilot station, the vessel is transiting an area of very high traffic density, very low under keel clearances, environmentally sensitive/dangerous and expensive installations etc.
- The manoeuvring area available to the vessel is severely restrained or restricted due to limited width available for navigation, presence of other vessels, no go areas etc.
- Due to the above mentioned reasons the vessel passage plan has to extend from berth to berth and not just between the pilot stations as the passage from and to the pilot station and berth is very critical.
- Even though the pilot brings with him his experience and his own passage plan it is essential that the ship's officers have complete knowledge of the vessel's passage from the pilot to berth and vice versa.
- It helps in the following ways:
  - the vessel's passage plan can be compared with the pilot's plan and a final plan can be agreed upon for the safe navigation of the vessel.
  - This plan can now be monitored not only by the pilot but the whole bridge team, thus eliminating the complete dependence upon the pilot's expertise.
  - In the unfortunate event of pilot incapacitation, the master has immediate command of the vessel and her safe passage.
  - Thus this passage plan from berth to berth plays a very vital role in enhancing the safety of navigation, safety of life and safety of environment.

1) List the sources from which a master may gain information about ice conditions in the Baltic.

- Ice report received by means of weather facsimile, (Ice Analysis and Ice Prognosis charts),Navtex, EGC and Radio Warnings from designated coast stations/ice patrol services
- Routeing charts and Ice limits obtainable for the particular season concerned.
- Information from vessels navigating in the area.
- Mariners handbook
- Baltic pilot Vols. 1,2,&3
- Admiralty List of radio signals – Vol.3

2) Navigational accuracy while operating in Baltic in winter months

3) Factors to be considered when establishing the search datum:

- Reported position and time of the incident
- Any supplementary information as to bearings and sightings
- Time interval between the incident and the arrival of search and rescue facilities
- Estimated surface movement of the distressed craft or survival craft depending on the drift

- Availability of accurate weather and sea conditions at the position of the incident
- Possibility of facilities available to the person in distress (engines available to stem the tide or reduce drift or availability of drogues/sea anchors to reduce drift)
- Type of the craft which will further influence the leeway experienced

WORLDWIDE NAVIGATIONAL WARNING SERVICE:

- This service is provided by IMO & International Hydro graphic Office.
- It is a Global Navigational Hazard Warning System for mariners.
- These messages are transmitted in ENGLISH language.
- Messages are transmitted by radio and Notices to Mariners.
- There are three types of warnings:
  (i) Navarea warnings
  (ii) Coastal warnings
  (iii) Local warnings

NAVAREA WARNINGS:

- The world is divided into 16 Navareas.
- Warnings are issued when information regarding new dangers or changes in nav-aids to be broadcasted.
- The area co-ordinator will publish the information through WWNWS.
- Examples: Search and Rescue or Anti-pollution, newly discovered wrecks or hazards, position of mobile drilling rigs.

COASTAL WARNINGS:

- Information specific to a particular region to assist a navigator in coastal waters up to the harbour entrance.
- These warnings are issued by national co-ordinator of the country of origin.
- The messages are in English, may also be in the local language.
- Examples: Casualties to major lights, large tows in densely congested waters, cable operations.

LOCAL WARNINGS:

- These supplement Coastal warnings.
- They provide information which relates directly to inshore waters.
- These messages are issued by Port, Pilotage or Coast Guard authorities.

FIVE EXAMPLES OF WWNWS MESSAGES:

- Navigational hazard (wrecks etc.) warnings
- Search and Rescue information
- Failure/malfunction/changes to navigational lights
- Movements/position of mobile rigs
- Cable operations / large tows in congested waters
- Anti-pollution

DIFFERENTIATE BETWEEN ADOPTED AND NON-ADOPTED ROUTEING SCHEMES.

ADOPTED SCHEMES:

- These are routeing schemes adopted by IMO.
- Are intended for use by all vessels, by day, by night, in all weather, in ice free waters or under light Ice conditions where no extraordinary manoeuvres or assistance by ice-breakers is required.
- All routeing systems adopted by IMO are in accordance with Rule 10 of Colregs.

NON-ADOPTED SCHEMES:

- These are routeing schemes established by national governments or local authorities and are not adopted by the IMO.

- The rules and regulations are laid out by these authorities and may not conform to Rule 10 always and they may modify Rule 10 as well as other rules of the Colregs.

FIVE PRECISE OBJECTIVES OF THE IMO ROUTEING.

1. Separation of opposing streams of traffic to reduce head-on incidents.
2. reduce danger of collision between crossing traffic in established shipping lanes.
3. Simplify pattern of flow in converging areas.
4. Organise safe traffic in areas of offshore exploration.
5. Organise of traffic flow around areas where navigation by all ships or classes of ships is dangerous and undesirable.
6. Organisation of traffic flow in or clear of environmentally sensitive areas.
7. Reduce risk of grounding where depths are critical.
8. Guidance of traffic clear of fishing grounds or through fishing grounds.

STATE WHERE INFORMATION ON TSS CAN BE OBTAINED.

1. IMO Ship's routeing
2. Annual notice to mariners No.17
3. Weekly edition of Admiralty Notices to Mariners
4. Navigational charts for the concerned area
5. Sailing directions
6. Rule 10 of Colregs
7. MSN 1642
8. ALRS volumes 6/7

PENALTY FOR NOT COMPLYING WITH THE TSS.

Non-compliance with the TSS is considered a serious maritime offence, on summary conviction is liable to a fine of maximum £ 50,000/-

MAIN ENGINE FAILURE

- Inform Master
- Change-over to hand steering and manoeuvre vessel away from the danger.
- Display appropriate day/night signals
- Commence sound signalling
- Plot vessel's position
- Inform shipping in vicinity by appropriate message (Securite or Urgency)
- Calculate the set and drift and ensure vessel clear of any hazards, accordingly take avoiding action.
- Monitor weather reports to take any preventive action.
- Warn department heads of the possibility of vessel rolling/pitching, if weather is bad.
- If in restricted visibility, commence appropriate sound signal.
- Ensure radar on long range to give early warning of approaching vessels.
- If in shallow waters consider the possibility of anchoring.

GYRO COMPASS FAILURE

- Engage manual steering
- Steer magnetic compass course applying the variation/deviation for the required heading
- Inform Master
- Consider the effect of Gyro failure on other navigational equipment; such as Radar, ECDIS, AIS and GPS.
- Continuously monitor the vessel's position

MAIN STEERING FAILURE

- Switch over to hand steering
- Steady the course
- Change over to auxiliary steering gear (Try 2nd steering motor / Telemotor / Non-Follow up)
- Inform Master
- Inform Engine room
- If situation not improved and vessel unable to steer from bridge, consider steering the vessel from the Steering flat on Emergency steering mode.
- If both Auxiliary and Emergency steering has failed, vessel cannot be steered and she will be not under command, if so exhibit appropriate day time / night time signals and sound signalling should be commenced.
- Inform shipping in vicinity by appropriate Securite or urgency message.
- Warn other vessels if likely to come close by means of Aldis lamp, VHF.

MAN OVERBOARD

- Raise the alarm as soon as possible
- Apply hard-over helm towards the side on which the casualty has fallen
- Release the MOB marker
- Inform E/Room and place engines on stand-by.
- Call Master, if not already on Bridge
- Mark datum point on GPS
- Reduce speed
- Display OSCAR flag
- Post lookouts at strategic points

- Transmit emergency message to all stations in vicinity
- Continue to execute Williamson turn
- Prepare rescue boat and crew for picking up casualty
- Continuously monitor vessel's position and other vessel's movements and accordingly manoeuvre vessel safely
- Device and execute a search pattern as per prevailing weather conditions

MAIN ELECTRICAL GENERATOR FAILURE

- As soon as the main power supply fails, the emergency generator or Emergency power supply will take-over.
- Change-over to auxiliary steering system.
- Engage manual steering
- Inform Master
- Check all critical equipment are running on Emergency supply which shall include; Nav. Lights, GMDSS equipment, GPS, Radar, Emergency lighting, Lifeboat embarkation lights.
- If situation is not under control and the critical equipment are not functioning, exhibit appropriate day/night time signals and commence appropriate sound signalling.
- Warn other shipping in vicinity.

PIRACY

- METHODS OF ATTACK:
  - Attack while ship is at anchor or alongside.
  - Attack while underway

- PRECAUTIONS AT ANCHOR OR ALONGSIDE:
  - Strict access control maintained at all gangways and access.
  - Rat guards placed on mooring ropes
  - Fairleads and hawse pipes should be sealed
  - At night all upper deck lights should be on and extra lights should be rigged near the ship's stern and the sides to illuminate dark areas. Use of powerful search lights preferable.
  - All upper deck lockers should be locked; also any access to accommodation or technical areas should be locked.
  - Upper deck patrols armed with night sticks should be maintained during dark hours.

- PRECAUTIONS WHEN UNDERWAY:
  - Passage through pirate prone areas should be made in daylight.
  - Vessel to proceed at maximum safe speed.
  - A good radar and visual watch should be maintained.
  - Give a wide berth small stationary objects or boats, especially if they are unlit at night.
  - At night all upper deck lights should be on and extra lights should be rigged near the ship's stern and the sides to illuminate dark areas. Use of powerful search lights preferable.
  - All upper deck lockers should be locked; also any access to accommodation or technical areas should be locked.
  - Upper deck patrols armed with night sticks should be maintained during dark hours.

- Prior entering piracy area ensure following preparations have been made on board:
  - Debrief all crew procedure to be followed in an event of piracy
  - Seal all entrances and areas as per ISPS recommendation
  - Ensure all communication (internal and external) facilities are tested and readily available for use
  - Ensure all decks and areas are well lit
  - Search light and Aldis lamp tested and ready for use

- Fire hoses rigged up and charged around the vessel
- Anti piracy patrol maintained with portable VHF sets
- E/room manned and engines on standby and on full speed and ready for manoeuvring
- Bridge watches doubled and additional lookouts posted to continuously monitor vessel's position
- Maintain good listening watch on radio for any piracy reporting
- If any suspected craft approaches vessel, immediately inform Master and carry-out evasive manoeuvre and inform shore authorities and other shipping in vicinity.

MASTER'S STANDING ORDERS:

- Standing orders are formulated by the Master based on the Safety management System and Shipboard operational procedures of the company.
- Master's standing orders should be written to reflect the master's own particular requirements and adopted to the particular type of ship, her trade and the experience of the bridge team employed at that point in time.
- Standing orders and instructions should operate without conflict within the ship's safety management system.
- The standing orders provide the watch keepers a general standard required by the master of the bridge team.
- The master shall explain the contents of the standing orders and there shall be no ambiguity in the understanding by the bridge team.
- Standing orders should be read by all officers before the commencement of the voyage and signed accordingly.
- A copy of the orders should be available on the bridge for reference and a copy sent to owners.
- The standing order reinforces the safe practices to be followed under various situations.
- The standing instructions shall clearly specify when the master expects to be called and also explain actions to be taken by the OOW prior to master's arrival on the bridge during any event of emergency.
- The standing instructions shall specify procedures expected for keeping a safe navigational watch in coastal/ocean passage, various conditions of weather and visibility and various shipboard operations which shall include Arrival, Departure, Anchoring, Pilotage and cargo operations in adherence to practice of good seamanship.
- This shall also specify procedures expected for monitoring of weather messages and communication procedures and efficient operation of navigational and communication equipment etc.
- The standing instructions serve as a barrier against a single mistake by one person running the vessel into danger. Also, officers have a guidance to verify their own work against the standard procedure.

BRIDGE (NIGHT) ORDER BOOK:

The night orders are supplementary to standing orders and give specific instructions to bridge watch keeping officers relating to the hours when the master is either asleep or is off the bridge during the night. Usual entries shall include:

- Course to steer
- Alteration of course (if any) during the night
- Time to call master
- Any communications to be made with pilots and Port control
- Any preparations to be made prior arrival/anchorage/pilotage
- Time to send these messages
- Times of engine room stand-by
- Speed reduction times
- Instructions relating to heavy weather navigation/weather messages
- Any specific instructions regarding keeping a safe navigational watch (fishing traffic, derelicts, shoals etc.)
- Instructions to call the master if in any doubt.
- The night order book shall be signed by each officer of the watch prior to commencing his/her watch.
- The Bridge (Night) order book is a legal document and serves as evidence in the court of law.

CHARTS REQUIRED FOR THE VOYAGE:

- Chart catalogue
- Routeing charts
- Gnomonic charts
- Navigational charts
- Load line charts

PUBLICATIONS TO BE CARRIED:

1. Full set of navigational charts fully corrected and latest edition; including chart catalogue.
2. Notices to mariners
3. International Code of Signals.
4. IAMSAR Volume 3
5. Mariners handbook
6. Sailing directions
7. ALRS Volumes 1-6
8. ALLS
9. Admiralty Tide tables
10. Tidal stream atlases
11. MSN (Merchant Shipping Notices)
12. MIN (Marine Information Notices)
13. MGN (Marine Guidance Notices)
14. Nautical Almanac
15. Operating and maintenance instructions for ship's navigational equipment.

In addition other publications that can be carried are as follows:

1. Guide to Port entry
2. Admiralty distance tables
3. Ocean passages for the world
4. ICS Bridge procedures guide
5. IMO Ship's routeing

LIST DATA TO BE SHOWN ON COASTAL AND OCEAN CHARTS.

OCEAN CHARTS:

- Departure and arrival waypoints along with DTG
- GC or RL tracks with three degree course notations and distance
- Wheel over positions
- Alter course positions
- Next chart to be used to be marked well in time.
- Latest corrections to be plotted on the chart and entries made

COASTAL CHARTS:

Along with information mentioned in the ocean charts following information are also essential on the coastal charts:

- Bearing and distance at waypoints from fixed landmarks.
- No go areas to be marked
- Tidal information to be marked (Set, Drift, Leeway)
- Clearing distances to be marked
- Frequency of plotting positions to be marked
- Primary and secondary means of plotting positions to be marked

- Areas where use of additional lookouts/doubling of watches to be marked
- Areas where master to be called marked
- Areas where use of echo sounder and additional navigational equipment to be marked
- Reporting points to shore authorities to be marked (TSS / Pilots Etc...)
- Manual steering positions to be marked
- Speed reductions/engine status to be marked
- Radar conspicuous objects to be marked (Racons / Coastal features)
- Rising and dipping distances of navigational lights
- Bearings of Sector lights/areas
- Areas of reduced Under keel clearances shown
- Minimum distance to be maintained from coast marked
- Areas where parallel indexing used to be marked
- Contingency anchorages to be marked
- Pilot embarkation points
- Abort line shown prior entering restricted areas
- Contingency plans are shown on the chart

POSITION FIXING METHODS AND CHOICE OF WAY-POINTS

The primary and secondary methods of position fixing shall be clearly mentioned over the various legs of the passage.

OCEAN PASSAGES:

- GPS will be the primary system of position fixing with Loran-C as secondary or back-up system.
- Echo-sounder can still be used to check crossing contour lines which are within the range of the echo sounder.
- Position fixing using celestial bodies will be used to counter check the GPS position once every watch.
- The choice of waypoint should be such that the intended track is clear of any navigational hazards.
- Plotting interval hourly or such that the vessel will not run into danger between fixes.

COASTAL PASSAGES:

- As the vessel approaches coast Radar fix using multiple Ranges/Bearings of radar conspicuous objects (Islands/Shore features/Racons/Light houses) along with visual bearings becomes primary position fixing method. At any one given time minimum of three position lines should be used as mentioned above.
- GPS becomes secondary position fixing method.
- Sector lights can be efficiently used for position fixing, navigating in a channel and making an approach.
- Visual bearings from charted lights / transits.
- Echo sounder can be used to counter check when vessel passes contour lines.

CONTENTS OF ICS BRIDGE PROCEDURES GUIDE:

PART – A:

Guidance to masters and navigating officers on following:

- Bridge resource and bridge team management
- Notes on passage planning in ocean waters, in restricted waters, pilotage, ship's routeing and ship's reporting systems and vessel traffic services.
- Duties of the OOW with regards to watch-keeping, navigation, communication, pollution prevention and emergency situations.
- Operation and maintenance of bridge equipment.
- Annexes containing various formats used for Pilotage, distress frequencies, guidance on steering gear test routines.

PART – B:

Bridge checklists for routine bridge procedures for following:

- Familiarisation with bridge equipment

- Preparation for sea
- Preparation for arrival in port
- Pilotage
- Passage plan appraisal
- Navigation in coastal waters
- Navigation in ocean waters
- Anchoring and anchor watch
- Navigation in restricted visibility
- Navigation in heavy weather or in tropical storm areas
- Navigation in ice
- Changing over watch
- Calling the master

PART – C:
Emergency Checklists

- Main engine or steering failure
- Collision
- Stranding or grounding
- Man overboard
- Fire
- Flooding
- Search and rescue
- Abandoning ship

CONTENTS OF NAUTICAL ALMANAC:

1. Table for correction of altitudes of Sun, Stars and Planets.
2. Table for additional refraction corrections for non standard temperatures and pressures.
3. List of contents of nautical almanac
4. Calendar of phases of moon
5. Calendar for the year
6. Planet note and planet diagram for the year showing LMT of meridian passage of Sun and the five planets (Mercury, Venus, Mars, Jupiter, Saturn)
7. Ephemeris for the entire year tabulated against GMT and date for Aries, Planets, Stars, Sun and Moon for 3 days.
8. After ephemeris explanations are provided giving the principle and arrangement of the nautical almanac, along with examples to show correct use of information provided in it. Also, explanations are given for the procedure to use the current almanac for the following year.
9. The table of standard times for different countries.
10. star charts for Northern and Southern and Equatorial stars.
11. Table of 173 stars with constellation name and proper name are listed. (Even though 57 selected stars along with their SHA and declination are included in the daily pages).
12. The Polaris table provides the correction to be applied to true altitude of Polaris to obtained latitude. It also gives the table for obtaining the azimuth of Polaris.
13. Table for conversion of arc to time.
14. Increment table for GHA of Sun, Planets, Aries and Moon along with the v and d corrections.
15. Table for interpolating Sunrise, Moonrise etc.
16. Altitude correction table for Moon.

CONTENTS OF MARINERS HANDBOOK:

1. Charts, books, system of names, IHO, IMO.
2. The use of charts and other nav aids
3. Operational info and regulations
4. The sea (Includes various phenomena)

5. Meteorology
6. Ice
7. Operation in polar regions
8. Observing and reporting
9. IALA maritime buoyage system
10. Annexes

CONTENTS OF THE OCEAN PASSAGES FOR THE WORLD:
These are used in planning deep sea voyages. It contains notes on weather and other factors affecting passages, directions for a number of selected commonly used routes and distances and dangers affecting these routes.

Chapters 2-7 describe climatic conditions and give routes recommended for full powered vessels within the areas described.

Chapters 8-10 give the usual routes which were used by sailing vessels and by low powered and hampered vessels.

Evening Twilight is the period between Sunset till the sun is 18˚ below the rational horizon and
Morning twilight is the period before Sunrise and when the sun is 18˚ below the rational horizon.

The twilight is divided into three:
ASTRONOMICAL TWILIGHT:
In the morning this commences when the sun's centre is 18˚ below the rational horizon and lasts until visible sunrise is when sun's upper limb is visible above the visible horizon.
In the evening this commences at sunset i.e. when the sun's upper limb disappears below the visible horizon and lasts till the centre is 18˚ below the rational horizon.

NAUTICAL TWILIGHT:
In the morning this commences when the sun's centre is 12˚ below the rational horizon and lasts until visible sunrise is when sun's upper limb is visible above the visible horizon.
In the evening this commences at sunset i.e. when the sun's upper limb disappears below the visible horizon and lasts till the centre is 12˚ below the rational horizon.

CIVIL TWILIGHT:
In the morning this commences when the sun's centre is 6˚ below the rational horizon and lasts until visible sunrise is when sun's upper limb is visible above the visible horizon.
In the evening this commences at sunset i.e. when the sun's upper limb disappears below the visible horizon and lasts till the centre is 6˚ below the rational horizon.

The period for stellar observations when the sun is 6˚ and 12˚ below the horizon the sky is dark enough for the bright stars to be seen and the horizon is clear enough for stellar observations. Star sights are therefore best obtained during this period i.e. between Civil and nautical twilights. In the evening stellar observations are made after civil twilight and before nautical twilight and in the morning stellar observations are made after nautical twilight and before civil twilight.
When the sun is between 12˚ and 18˚ below the horizon most stars are visible but the horizon is too dark for stellar observations.

STATE WHY NO TIME IS GIVEN FOR NAUTICAL TWILIGHT IN HIGH LATITUDES.
Twilight is possible only when the sun I below the rational horizon. For an observer to have a twilight therefore he must have some night, if not the sun would be continually above the rational horizon and the observer would have continuous daylight and no twilight.

PLANNING A STAR SIGHT:

1. Calculate the time interval between civil twilight and sunset. Divide this by 2. This interval applied before and after the civil twilight time is the ideal period for taking the star sight.
2. Same applies for AM twilight. Calculate the time interval between civil twilight and sunrise. Divide this by 2. This interval applied before and after civil twilight is the ideal period for taking a star sight.
3. In the morning the Easterly horizon will be the first to light up, hence select the dim star in the Eastern horizon first and then the bright star.
4. In the evening twilight choose the bright stars in the Eastern horizon as this horizon will darken first.
5. Select at least 4 stars (recommended) with 120˚ interval between them and between altitude of 30˚ and 60˚.

PRECAUTIONS TO BE TAKEN WHEN PLOTTING A STAR SIGHT DUE TO EFFECTS OF ABNORMAL REFRACTION:

The refraction error is maximum for stellar observations made at low altitudes. Hence, to minimize this error choose stars at higher altitude (The correction for refraction is maximum when the altitude is nil and minimum when the altitude is overhead).

If low altitude stars are used altitude corrections are to be applied from the tables for 0˚-10˚.Apply the additional refraction correction for non-standard conditions given in the first page of the nautical almanac.

Passage through Magellan Straits (Points for consideration)

- An alternative route between E and W coast of S. America.
- There are extreme difficulties and dangers when both E and W bound.
- The dangers are those associated with narrow channels and harbour accentuated by the prevalence of bad weather and generally foul and rocky character of the anchorage.
- Extreme manoeuvrability of the vessel is important, especially in those parts of the straits where the cross tidal streams are strong or where there is heavy traffic combined with violent and unpredictable squalls.
- West bound vessels avoid adverse current, gale and head seas by using this strait to Cabot de Harnos.
- A risk of encountering icebergs is avoided and a considerable saving in distance.
- A poor landfall position.

A vessel trades throughout the year between the east coast of the USA and the Gulf of Mexico and the Caribbean Sea.
List the hazards to be considered when preparing a passage plan in this area.

A vessel trades regularly to the West Indies and Gulf of Mexico.
i) State the hazards that may be experienced in this area, throughout the year
ii) The specific hazards found in limited periods of the year

- In coastal waters strong northerly winds may reach at times over the gulf.
- During June to November hurricanes effect the area specially N of Cuba but are rare S of 15˚N.
- During May to December there is a likelihood of heavy rain and thunderstorm and squalls reducing the visibility drastically.
- The height of the swell is large around the area 13˚N 77˚W off the Caribbean Sea especially in June/July when the frequency of the swell >4m is 20%.
- Charts are based on old surveys
- Reduced visibility in squalls
- Strong currents in Florida straits, galleon passage and yuacatan channel
- While the average current in most of the Caribbean sea are of about 1 knot increasing on the west side of Yucatan channel to about 4 knots
- The area involves intense off shore operations especially in Gulf of Mexico. There is a dense traffic by supply vessels mobile rigs etc

- Hazards associated with submarine laying, numerous well heads, safety fairways, unlit Racons, towing vessels and bright flares reducing visibility
- Coral growth is dense and charted depths are difficult to rely upon and also existence of banks which are steep to.
- Cruise vessel / pleasure vessel movements in narrow lanes can cause concern
- In the eastern passages of the Caribbean sea there exists strong eddies making manoeuvring difficult.

A vessel trades regularly between Japan and New Zealand, list the hazards associated with trading in this area.

There are a number of risks associated with passage Between Japan and New Zealand and they are listed below:

- The vessel will be passing through archipelagic sea lanes where the area available for navigation is narrow and hence maintaining vessels position is of prime concern.
- Off the Eastern archipelagos there are plenty of huge Floatsam (Uprooted trees floating)
- A number of small islands will be encountered restricting regular great circle sailings
- Most of the islands are so low that it is impossible see them at night as they could also be poor radar targets and this presents the danger of the ships being driven on to the barrier or fringing reef.
- The above reefs have very deep water adjacent to them and sufficient warning by the echo sounder may not be available to take avoiding action early.
- Deep draft vessels are to navigate with extreme care around these reef areas.
- Current among the island is very strong and not of defined direction.
- Very little of the Pacific ocean has been thoroughly surveyed. Hence charted depths have to be treated with utmost care.
- May areas exist where volcanic activity might result in the formation of new shoals in to areas which have been well surveyed.
- Vessel will be passing through TRS prone area
- Off the coast of Japan there is a very dense fishing traffic as well as normal traffic and associated hazards.
- During the spring / summer there is also the possibility of encountering Fog and associated poor weather.
- During winter the Northern latitudes above 35˚ and also the area of around Japan is associated with gale force winds and associated hazards
- Choice of routes around this islands are dictated by the prevailing monsoons and associated wind direction.

A vessel is to make a passage from Hong Kong to New Zealand (in October) and every appropriate track entails passing close to numerous islands and shoals.
The vessel is fitted with all modern aids to navigation.

a) Describe the risks associated with maintaining navigational accuracy whilst on passage.
b) Discuss the availability and accuracy of position fixing on a modern well equipped vessel.
c) Discuss the changed situation facing the navigator of the vessel is fitted with a GPS receiver.

(a)

- The vessel passes around numerous low lying islands which are poor radar targets and their visibility at night is also severely reduced.
- The vessel's position has to be accurately maintained off these area and vessel's position fixing methods have an accuracy of 10 – 100 metres depending on their type and the quality of service available at that time (selective availability)

- Off these island exist reefs and adjacent to the reefs is deep water. So there could be a sudden loss of depth and which could well be within the accuracy of our position fixing methods and there is a real danger of running in to the reefs.
- Continuous use of Echo sounder readings with associated alarms set for drop in soundings may mitigate the above situation but the steep drop in soundings means time available is limited to take corrective action.
- Poorly surveyed areas and charted depths can not be relied upon.
- Area of volcanic activity results in formation of shoals even over surveyed areas questioning the navigational accuracy and vessels fix.
- Old charts are available for the area and can not be relied upon entirely
- The navigational aids available are limited. Hence difficulty in maintaining position by way of transits or terrestrial bearing and navigational techniques
- The competency and complacence of the crew involved in navigating in these areas has a direct bearing on the maintenance of navigational accuracy.
- Intense currents resulting in sets which require skilled steering and navigation techniques.

(b)

A modern well equipped vessel shall be expected to be provided with the following equipment for fixing the vessels position

1. GPS
2. DGPS
3. GLONASS
4. Radars
5. Sextant
6. Compass for visual bearing.
7. ECDIS combined with GPS and Radar and Auto pilot inputs.

GPS:

- Position accuracy is 33 metres (95% of the time) depending on the quality of the signal available
- The datum used is also very important (WGS 84) when transferring the positions on to the chart
- Off isolated islands or charts of great antiquity charted positions may be several miles discrepant from the positions arrived from the GPS
- Alternative source of position must be utilised to check when navigating in close proximity to islands, reefs etc.

DGPS:

- Position accuracy is 1 – 5 metres depending on the availability of the DGPS land station
- Requires special network of radio stations to negate the errors of the GPS to enhance the accuracy.
- The above system is not available all over the world and coverage is limited.
- Also subject to equipment errors and to be carefully used along with other position fixing system.

GLONASS:

- Position accuracy is 5 – 15 metres. (when GLONASS datum PZ90 is referenced with WGS 84 and plotted on charts) depending on the availability of the signal and its quality
- They can not be plotted directly on major admiralty charts which are referred to horizontal datums
- Also subject to equipment errors and to be carefully used along with other position fixing system.
- The datum used is also very important (PZ90 / WGS 84)) when transferring the positions on to the chart

- Off isolated islands or charts of great antiquity charted positions may be several miles discrepant from the positions arrived from the GLONASS
- Alternative source of position must be utilised to check when navigating in close proximity to islands, reefs etc.

Radar:

- Position accuracy dependant on the condition of the equipment, associated errors in bearing and range scale and the skill of the operator in obtaining the targets in areas where the targets are not well defined.
- Availability of well defined radar targets (dependant on weather / visibility conditions)
-

Sextant: The position accuracy depends on the skills and experience of the operator

- In order to maintain the utmost navigational accuracy The means of position fixing here during the day time will have to be a combination well tuned radar on short ranges, a good visual look out, GPS with a good DOP and also an echo sounder with associated alarms.

Tides:

Spring tides:

These is the state of tide caused twice every month owing to the moon being in line with the sun (In conjunction) in relation to the earth surface and resultant combined gravitational forces acting on the water.

The resultant height of high tides will be more than average and that of low tides will be lower than average.

Neap tides:

These is the state of tide caused twice every month owing to the moon not being in line with the sun (In opposition) in relation to the earth surface and resultant opposing gravitational forces acting on the water.

The resultant height of high tides will be less than average and that of low tides will be higher than average.

Chart datum:

This is the reference point to which all soundings, drying heights on the chart is referred to.
Height of tide given in the tide table is above the chart datum. The level of the chart datum is usually the mean low water springs or in certain ports is the same value as the lowest astronomical tide.
The chart datum is also the lowest level to which the height of low tide can be expected to fall to under average meteorological conditions and under any combination of astronomical conditions.

Charted depth:
This is the vertical downward distance between the chart datum to the seabed

Drying height:

This is the vertical upward distance between the chart datum and any surface whose vertical height lies between the chart datum and the mean high water springs.

The drying height on the chart is represented by $\underline{2}_4$ **means a drying height of 2.4 metres.**