MARITIME CAREER TRAINING

# Personal Safety & Social Responsibilities Workbook

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## How to use this workbook

The purpose of this workbook is to provide a permanent source of reference to the subject matter of Personal Safety & Social Responsibilities (PSSR) following the successful completion of the online part of your PSSR training.

All the essential elements of the training have been provided on these pages.

As you progress through the online learning part of the course you can write additional comments and descriptions in the spaces provided within each section.

These additional comments will then be in a form that I can refer to during your maritime career.

# Module 1: PSSR Course – Comply with emergency procedures

## Section 1 - Emergencies

An emergency exists when I am in grave and imminent danger of -

- Loss of life
- Injury
- Loss of or damage to property
- Damage to environment
- Any other incident which threatens the safety of the vessel or the crew
- Immediate action by all the crew is essential when there is an emergency

First Aid –

- Raise the alarm
- Apply DRABC first aid steps
- Apply CPR/EAR as required

Collision, Flooding, Running Aground –

- Raise the alarm
- Evacuate personnel from the damaged part of the ship
- Ensure watertight doors are shut
- Operate pumps
- Don lifejacket, follow orders
- Make repairs if possible

Person Overboard (MOB) –

- Raise the alarm
- Point
- Mark the spot with anything that floats
- Use RADAR marking (turn on SART & throw overboard)
- Press MOB button on GPS if fitted
- Deploy flotation equipment
- Perform Williamson Turn or other turn to return ship to MOB position
- On a large vessel a Rescue Boat will be launched
- Recover MOB ASAP to enhance survival chances

Fire and Explosion –

- Raise the alarm
- Put out a small fire immediately if I can
- Close watertight and fire rated doors to contain a large fire
- Shut down ventilation to the area
- Fight the fire under instructions from the Master

Pollution of the Marine Environment –

- Raise the alarm
- Shut down pumps/valves to limit pollution
- Clean up immediately
- Advise authorities

The ship's Safety Management System (SMS) contains –

- Contingency plans for all types of emergencies
- Instructions on the operation of emergency equipment (SOLAS Training Manual)

Contingency plans for fire on a passenger ship –

- A) Alarm is raised either manually (Manual Call Point) or automatically by a detector
- B) If a crew member raised the alarm, that crew member contacts the Bridge to convey all known information about the fire
- C) The Master assembles the fire response team & prepares a fire attack plan
- D) The Master might decide to sound the General Alarm
- E) On a large passenger ship the Master might make a coded announcement on the Public Address System to alert the crew only to the fire emergency

Contingency plans for fire on other vessels -

- Steps A) through D) are followed
- The Master might then sound a particular fire alarm sound (usually continuous sounding of the general alarm bell) and make an announcement on the PA

On all vessels –

- The area of the fire is pinpointed by the alarm system
- Crew assemble at their Muster Station and Head Count ensures that everyone is accounted for
- Fire response team go to their fire stations
- Fire pumps are started
- Fire response team don PPE & fight & extinguish the fire under the Master's instructions from the Bridge
- If in port shore authorities are notified
- Master decides on best fire fighting strategies
- Master directs fire fighting from the Bridge using radio transceivers & any other available means

Master uses the ship's Fire Control Plans to identify –

- Fire affected areas
- Emergency exits
- Alternative access routes to fight the fire
- The classes of bulkheads surrounding the fire affected space
- The potential fire risks in adjoining spaces

The Fire response team leader reports progress of fire fighting to the Master. The Master might order –

- Boundary cooling to bulkheads around the fire affected area
- Closure of ventilation to the fire affected space
- Movement of flammable materials away from the boundaries adjoining the fire affected space
- The use of any available means to fight the fire including fire hoses, nozzles, pumps, hydrants; Fixed installations such as high expansion foam, CO2 gas dump etc.

Collision, Grounding, Foundering, Ingress of Water -

- The General Alarm will be sounded
- All crew report to Muster Stations wearing a lifejacket
- Crew members determine the nature of the emergency
- A headcount is conducted
- The senior officer at the Muster Station might direct crew to search for any missing persons
- Further actions will be ordered by the Master

Further actions might include –

- Ensuring watertight doors are shut
- Crew members establish the extent of the damage
- Attempts to reduce flooding through emergency repairs
- Abandon ship procedure if the Master considers this necessary

MOB –

- Actions will depend on the ship's design and facilities
- MOB reported to the Bridge
- Bridge wing quick release lifebuoys are deployed
- GPS MOB Button is pressed
- RADAR marking of the location might be performed (deploy a SART into the water after turning it on)
- Williamson or other turn is immediately executed
- General alarm sounded
- Details announced over the PA
- Rescue boat prepared for launching
- Radio broadcast "Pan Pan" message to other ships if in a busy shipping lane
- Positioning the ship to make a lee and launching of the rescue boat to retrieve the MOB

If MOB cannot be immediately found –

- Request assistance from other vessels in the area through a Mayday radio broadcast
- Standard SAR procedures to be followed as per MERSAR if other ships are involved
- Visibility & sea state greatly affect the outcome

Person injured –

- Raise the alarm
- Provide first aid immediately
- Seek professional assistance
- A medical evacuation might be possible

Heavy weather predicted –

- Rig lifelines on weather deck
- Limit crew exposure to the weather deck
- Check all cargo lashings
- Special precautions if required to work on deck during heavy weather
- Reflective clothing to be worn when on the weather deck
- Work in pairs or teams
- Under the command of an experienced senior officer
- All movable items inside the ship secured

Oil spill –

- Larger vessels are required under MARPOL to carry appropriate clean-up equipment
- Have oil spill equipment and fire extinguishers at hand when bunkering

Emergency alarm signals –

- General Alarm – 7 or more short blasts followed by one long blast on the general alarm system
- Prepare to Abandon Ship – one short blast followed by one long blast of the general alarm system, sounded three times
- Abandon Ship – normally given verbally by the Master or Senior surviving Officer
- Fire Stations Alarm – a special alarm which might be the continuous sounding of the general alarm system

Other alarms –

- Monitoring alarms
- Unmanned Machinery Space (UMS) alarms
- CO2 alarm

Crew Induction immediately upon joining a new ship –

- SMS 'Crew Induction Form'
- Find meanings of alarm signals
- Emergency duties
- Location & use of life-saving equipment including survival craft & launching devices
- Location & use of fire fighting equipment
- Location of Emergency Exits
- Be ready to take immediate and correct action in any emergency

Notes

## Module 1: PSSR Course – Comply with emergency procedures – (cont.)
## Section 2 – Drills & Muster

Muster Lists can be found –

- Behind cabin doors
- Prominently displayed throughout the vessel

Muster Lists provide –

- The meanings of the emergency signals
- Emergency duties
- Location of my Muster Station

Examples of emergency duties –

- Membership of Fire Response Team
- Survival craft boarding, launching & operation
- Membership of the Damage Control Team
- Assisting passengers to don lifejackets and guidance to Muster Station
- Reassure others in an emergency

On hearing the General Alarm –

- If time permits, put on extra clothing
- Don lifejacket or Immersion Suit as appropriate
- Go directly to my Muster Station
- Obey any instructions given on the PA
- Find out the nature of the emergency
- Prepare to perform emergency duties as appropriate

On hearing the Prepare to Abandon Ship Alarm –

- Perform emergency duties
- Lifeboats are lowered to the embarkation deck and boarded
- Liferafts are launched and inflated

On hearing the Abandon Ship Command –

- Abandon ship immediately
- Avoid getting wet if possible
- If the survival craft must be boarded from the sea, use a ladder instead of jumping into the water if possible & step into the survival craft from the ship if possible
- Keep warm & turn on my lifejacket light & put the whistle in my mouth before my fingers go numb
- If I must enter the water, board a survival craft as soon as possible to avoid hypothermia

Notes

The Value & Need of drills & training –

- Required under Marine Orders, SOLAS, MARPOL, STCW & the ISM Code
- Enables me to replace panic with a logical & pre-programmed sequence of events to follow

The International Safety Management (ISM) Code –

- Empowered by Marine Orders Part 58
- Provides international safety standards for ships
- Procedures for Pollution prevention
- Details the responsibilities of the Company, The Ship and the Individual
- Document of Compliance issued by AMSA is valid for up to 5 years
- Subject to cancellation following AMSA inspection
- Master must not take the ship to sea without a Document of Compliance
- Penal provisions for non-compliance
- AMSA can detain a vessel for non-compliance

Notes

## Module 1: PSSR Course – Comply with emergency procedures – (cont.)
## Section 3 – Internal Communications

Various means of communications on board ship –

- Telephone
- Public Address system
- Emergency loud hailer
- Lifeboat VHF Radio
- Mobile radio transceivers
- Emergency alarms
- Intercoms

Emergency Escape Routes –

- Usually found in spaces where there is only one other route to the deck from the space
- Infrequently used in normal ship operations
- Might be accessible through a hatch which is normally closed
- Locations can be found on the ship's Fire Control Plan

Citadel –

- A secure place where the crew can seek protection from imminent boarding by pirates
- Location difficult for pirates to find
- Fully secured from all entrances including hatches & vents
- Should enable crew to deny pirates' access to propulsion & other essential systems
- Should enable the crew to navigate the ship
- Adequate ventilation and space for the size of the crew
- The six sides of the Citadel should be able to withstand a fire in an adjoining space

Notes

# Module 2: PSSR Course – Prevent pollution of the marine environment

## Section 1 – What is pollution?

Pollution is caused by human activities & nature. Sources of Marine Pollution –

- Strandings & collisions
- Lightening operations (de-ballasting, jettisoning unwanted materials overboard to improve vessel stability etc.)
- Unchecked garbage & sewage disposal
- Tank cleaning & line flushing
- Unchecked chemical disposal

In general, pollutants are discharged or likely to be discharged by ships due to operational or accidental causes. The main categories of pollution are -

- Oil
- Plastics
- Air
- Water
- Sewage
- Chemical

Common causes of pollution –

- Spillages when bunkering or transferring fuel oil, diesel fuel or petrol
- Bilge water contamination – contaminant discharged when bilges are emptied
- Larger vessels now carry 15 ppm oily water separation equipment
- Ballast water – traces of oil & other cargo previously carried in the ballast water tank – newer vessels now have dedicated ballast water tanks
- Ballast water – introduction of foreign species – can be eliminated by chemical treatment & avoided by discharge at a distance to sea from the destination port
- Garbage – under new legislation this is not severely limited
- Sewage – strict regulations now minimise this for of pollution
- Hazardous waste – agreements are now in place to prevent this form of pollution

Notes

Impact of Pollution on marine life & food chain –

- Even small oil spills can have a devastating affect on marine life
- Hazardous & toxic chemicals can intoxicate marine life, severely threatening their survival
- Plastic bags affect many species including turtles who see them as jelly fish. Air trapped in plastic bags prevents turtles from diving to the normal feeding places on the sea bed
- The food chain – if the smallest creatures in the sea die, the whole food chain is affected
- Sensitive areas are nominated where discharges from ships are severely limited or banned to enable the marine environment to recover from the abuses experienced in previous times
- Traces of damage to the environment can remain for many years
- Nuisance to beach goers and water transport
- Fire & safety hazards
- Costly to clean-up
- Economic devastation to fishing community and local tourism

Notes

## Module 2: PSSR Course – Prevent pollution of the marine environment (cont.)
## Section 2 – Effect of shipping & offshore installations on the marine environment

Offshore Oil & Gas exploration and operation –

- Disturbance to seabed during seismic operations
- Accidental & routine spills
- Combustion
- Disturbance to organisms living on the seabed
- Acoustic & light emissions
- A large number of installations are coming to the end of their life in the North Sea and will require dismantling
- Production water & cuttings are major factors

Shipping operations –

- Direct discharges of oil
- Illegal discharges from ships

The BP Oil Spill in the Gulf of Mexico –

- April 20, 2010 an offshore oil rig exploded
- 41 miles from the land
- Oil leaked for 3 months at up to 60,000 barrels per day (about 10,000,000 litres per day)
- The biggest offshore oil spill in history
- $20 billion US fund setup for compensation
- Long term affects yet to be realised

Notes

## Module 2: PSSR Course – Prevent pollution of the marine environment (cont.)
## Section 3 – Measures for prevention, avoidance & containment of pollution

MARPOL

General -
- Empowered by Australian law and Marine Orders
- International convention aimed at preventing & minimising pollution from ships
- Created in 1978

Six Annexes –
- Annex I – Oil
- Annex II –Noxious liquid substances in bulk
- Annex III – Harmful substances in packaged form
- Annex IV – Sewage
- Annex V – Garbage
- Annex VI – Air pollution

Segregated Ballast Tanks (SBT) –
- Introduced in new Oil Tankers from 1982
- Only clean ballast sea water can be pumped into & out of these tanks
- Prevents pollution by liquid cargo residues

Double Hull Design –
- Prevents loss of fuel oil or cargo oil in the event of a low impact grounding where only the outer skin is damaged
- Advantages – no pollution from low impact grounding; The space between the 2 hulls can be used as SBT
- Disadvantages – increased manufacturing cost; increased maintenance cost; increased vigilance needed to avoid free surface effect

Port reception facilities –
- MARPOL requires that facilities for the discharge of anything that cannot be put overboard at sea can be taken off the ship when in port (for a fee)
- Discharge at the Port reception facility can be by ship or by truck

Record Books & receipts –
- All discharges from the ship, including accidental discharges of Sewage or Garbage, must be recorded and receipts from Port Reception Facilities kept on board for a minimum of 2 years

Sewage –
Is defined as all human bodily waste that would normally be discharged into a toilet on land

Notes

Requirements of MARPOL compliant vessels & platforms –

- Applies to ships of 400GT or more & all ships certified to carry 15 persons or more & fixed & floating platforms
- A sewage treatment plant approved by AMSA

OR

- A sewage macerating & disinfecting system approved by AMSA

OR

- A large holding tank

Sewage Discharge –

- From an approved sewage treatment plant – within 3 NM of land (subject to local laws)
- From a sewage macerating & disinfecting system – greater than 3 NM from land
- A holding tank or originating from spaces carrying live animals – 12 NM & ship proceeding on it's way at a speed of at least 4 knots

Garbage
Is defined as all kinds of food for human consumption excluding uncooked fresh fish and parts.

Garbage disposal at sea –

- Raw fish – less than 3 NM from land
- Macerated food waste – more than 3 NM from land
- All food waste can be discharged into the sea when the ship is more than 12 NM from land
- Animal carcases – at least 100 NM from land

Other requirements under MARPOL –

- Shipboard waste management plan approved by AMSA
- Garbage Record Book to be maintained in accordance with the plan
- Garbage disposal signage summarising what can be thrown overboard, where & under what circumstances

Special Areas –

- Areas where the environment is especially sensitive
- Very limited discharges permitted

SOPEP – Shipboard Oil Pollution Emergency Plan –

- Every vessel subject to MARPOL must maintain a SOPEP
- Details what to do following an Oil Spill or a suspected Oil Spill
- Recording of 'Prescribed Incidents'
- Includes breakdown of the ship that could lead to a pollution emergency
- Forms part of the ship's SMS

Pollution Prevention Team –

- Can be made up of any crew members
- Undergo training and drills to ensure compliance with SOPEP in an emergency

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Oil Spill Equipment –

- Quantity and range of equipment determined by the risks related to the ship's operations
- Absorbent materials include Kitty Litter, Absorbent Pads, & Absorbent Rolls
- Chemical dispersant – surfactants breakdown the viscosity of oil on the surface of the water - Reduces visual affects of an oil spill - Increases the toxicity of the oil spill on the sea bed
- Shovels and storage barrels for disposal at a shore waste facility

Notes

## Module 2: PSSR Course – Prevent pollution of the marine environment (cont.)
## Section 4 – Control Oil Discharge

15 Parts Per Million (PPM) oily water separating & control equipment –

- Usually the actual discharge is more like 10 PPM
- The control system shuts down if the discharge were to exceed 15 PPM
- Allows discharge of up to 30 litres per NM when the ship is underway & more than 50 NM from land
- All discharges are recorded in the ship's Oil Record Book Part I
- Equipment must be approved by AMSA

Oil Record Book Part I –

- All fuel & oil bunkered, transferred and discharged must be recorded
- Designed to ensure that no spillage goes unreported

Oil Record Book Part II –

- Must be maintained by oil tankers in addition to Oil Record Book Part I
- Maintains details of quantities loaded & unloaded, tank washing & use of cargo tanks to hold ballast water in exceptional circumstances
- Must be retained on board for at least 3 years

Notes

## Module 2: PSSR Course – Prevent pollution of the marine environment (cont.)
## Section 5 – Annex VI Air pollution from ships

- Sets limits on emissions of Sulphur Oxides (SOx) and Nitrogen Oxides (NOx) emitted from the ship's internal combustion engines
- Sets minimum standards for Energy Efficiency Design Index (EEDI) for certain new ships
- Sets minimum standards for Ship Energy Efficiency Management Plan (SEEMP) for certain ships
- Specifies the requirement for certain ships to carry an International Energy Efficiency (IEE) Certificate
- Use of cleaner fuel should be an outcome of the EEDI, SEEMP & IEE referred to above
- Intended to reduce greenhouse emissions from ships

Notes

# Module 3: PSSR Course – Observe Safe Working Practices

## Section 1 – Safe Working Practices

The importance of personal safety –

- Small numbers of crew mean that I must be self reliant about my personal safety
- Minimum requirement for seafarers is this course – Certificate of Safety Training (CoST)
- The sinking of the Titanic led to the formation of the IMO
- 1,000 seafarers have been lost at sea in each of the past 5 years

Australian Maritime Safety Authority (AMSA) –

- Regulates the Australian shipping industry
- Is empowered under Australian law to issue legally binding Marine Orders
- AMSA has the authority to detain a non-compliant vessel in Australian waters and to impose severe penalties for non compliance of Marine Orders

Code of Safe Working Practice for Australian Seafarers

Purpose -

- To prevent accidents, diseases & other harmful effects on the health of seafarers
- To ensure that responsibility for Health & Safety is understood by all relevant parties
- To promote health & safety of Australian Seafarers through consultation & co-operation between government agencies, ship owners & unions

Ship familiarisation

Gangway –

- Hazards include falling into the sea
- Seafarers falling into the sea between the ship and the dock should be prevented by a properly erected safety net

Main Deck –

- Rough seas make the weather deck a particularly dangerous place to work
- Wet surfaces increase slip & fall hazards
- MOB is visible for a very short time only
- Immediate actions must be taken by crew to save an MOB from drowning or hypothermia

Hatches & Holds Hazards of Entry –

- Exposure to an unbreathable atmosphere- follow Permit to Work system when entering these spaces
- Falling, tripping, head injuries
- Walking over dunnage (packaging materials, nails etc.)
- Drowning hazard if the space is flooded with a liquid
- Suffocation hazard if the space is filled with grain or similar
- Burn hazard if the cargo in the hold reacts with human skin or is at an extreme temperature

Hatches –

- Hinged or removable (crane to lift)
- Hinged – injuries to limbs and fingers/toes or other parts of the body
- Removable – stay clear during lifting operations
- Danger of personnel being locked in the hold which the hatch covers

Forecastle & Poopdeck –

- Enhanced risk of falling or being washed overboard
- Access is often restricted
- PPE & a lifejacket might be required to be worn by personnel working in these parts of the weather deck

Winches & Windlasses –

- Used to weigh (pull up) or drop an anchor

Anchors –

- Can weigh several tonnes
- Use PPE to protect from injury when working with anchors
- Stay clear of lines and chains under load

Cranes & Derricks –

- Move large items on and off the ship
- Ship stability is an important factor when operating this equipment
- Do not stand under the working shadow of the equipment

Manifold & Deck Pipeline System (on a tanker) –

- Load & unload gases and liquids from shore to cargo tanks
- Leakages in pipes, flanges and valves can result in exposure to toxic gases and liquids
- Can be at an extreme hot or cold temperature
- Increased pollution hazard

Accommodation –

- Fire is the greatest hazard
- Cigarette smoking & electrical appliance faults are common causes

Bridge –

- Fire is the greatest hazard
- Concentration of electrical equipment & wiring
- Fault conditions overloading electrical circuits can lead to fire

Engine Room Hazards –

- Hearing loss
- Burns
- Clothing getting caught in moving machinery
- Slips, trips & falls
- Fire and explosion

Notes

Causes of slips, trips & falls –

- Slippery surfaces
- Obstructions
- Unguarded openings in floor plate

Head injuries –

- Caused by low overhead clearances and falling objects from above

Falls -

- Unfenced 'tween decks'
- Open manholes
- Missing gratings in floor plate

Clothing, fingers getting caught –

- Wearing loose clothing near moving machinery
- Carelessness & lack of awareness

Burns –

- Steam pipes
- Hot machinery
- Welding sparks or other hot work

Eye injuries –

- Chipping
- Welding
- Chemicals
- Dust

Injuries from moving cargo & equipment –

- Need to secure equipment & cargo properly when heavy weather is expected

Extreme heavy weather –

- Wear PPE & follow safety procedures when working on the weather deck to perform essential work
- Must be competent to perform required task
- Must be supervised by experienced crew

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Lack of oxygen & the build up of toxic gases in confined spaces –

- Follow Permit to Work system before entering an enclosed space

Hazards include

- The presence of hydrocarbon gas and toxic gases
- Insufficient oxygen content in the atmosphere (must be 21%)
- Drowning if the space is flooded with liquid
- Suffocation if the space contains grain or similar cargo
- Extreme heat or cold
- Being trapped in the space

Hazards of chemicals used on board –

- Corrosive
- Poisonous
- Toxic vapours
- Asphyxiation hazard
- Exposure can result in long term damage to eyes or the nervous system
- Exposure can result in long term carcinogenic effects.

Fire Hazards –

- Burns
- Suffocation
- Ship abandonment exposes personnel to sea survival hazards

Collision, grounding, flooding & sinking –

- Drowning
- Injury to personnel from violent motion
- Injury to personnel during ship abandonment

Pirates –

- Ship and personnel taken hostage
- Injury or death to personnel
- Financial loss to ship's owner

Hazards of Stowaways -

- Disease
- Injury to personnel
- Damage to safety and other equipment through improper use
- Fire caused by stowaways to heat food or keep warm
- Financial loss to ship's owner

Safeguards to Counter Hazards to Seafarers

Developing a Safety Culture -

- The knowledge I gain in this course could one day prevent injury or death to myself or others.
- A safety culture is required by law.
- People die or are seriously injured when they don't follow safe working practices.
- It is important to take part in safety meetings & to provide a positive and pro-active attitude towards matters of safety.

Safety induction for new crew

All new crew will undergo a ship familiarisation process. This process is usually formalised in writing in the form of checklists and declarations and can take more than 2 days to complete. During this period the new crew becomes familiar with:

- the ship's Safety Management System,
- the meanings of alarms,
- the location of the assigned Muster Station,
- the crew's emergency duties in the event of an emergency,
- the location and use of lifesaving equipment,
- the location and use of fire fighting equipment,
- emergency escape exits,
- safety procedures required prior to performing hazardous work etc.

The Safety Management System (SMS)

The SMS is a vital document for safety on board every ship.
Each ship is different. Many ships are purpose built and the:

- Contingency plans for emergencies contained within the SMS,
- The safety and life saving equipment on board,
- The laIt of the ship and emergency escape routes,
- Hazardous tasks and the safety procedures that must be followed (Permits to Work) when performing those tasks

are unique to every vessel.

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SOLAS Training Manual

The manual contains the location and vessel specific instructions for -

- Muster and Emergency Stations
- Lifejackets
- Personal Survival and Safety
- Immersion Suits and Anti-exposure suits
- Thermal Protective Aids
- Launching
- Area protection and illumination
- Lifeboats
- Rescue Boats
- Liferafts
- Pyrotechnics
- Lifebuoys
- Retrieval and Marine Evacuation Systems
- Any other equipment on board related to safety

A ship's SOLAS Training Manual is part of the ship's Safety Management System or SMS. All crew should have access to the SOLAS Training Manual.

A seafarer must wear PPE provided by the Master for the purpose of performing work on the ship.

Any injuries or death of a seafarer must be reported to local authorities, AMSA and the shipping company.

Job Hazard Analysis (JHA) –

- Must be performed for any work that is considered to be hazardous to seafarers
- The outcome of the JHA is a safer way of performing a given task which mitigates (reduces) the risks to an acceptable level

All PPE must comply with Australian Standards.

Notes

Helmet –

- Should be worn whenever working under a person aloft, during lifting operations, fire fighting, when loading or unloading cargo and whenever it is possible that I could easily hit my head or something could fall on my head due to the operations being performed.
- Proper adjustment of the internal straps is essential for proper protection
- Refer to manufacturer for care instructions
- Must be discarded and replaced after 3 years
- Sweatband must be replaced before another person wears the helmet
- Visual condition check before each use - discolouration or cracking indicates that the helmet must be replaced

Goggles –

- Should be worn when using equipment such as grinders, chipping, chiselling or working with acid or chemicals
- It only takes one hot molten piece of metal or a splash of acid to result in permanent eye damage
- Proper eye protection should be worn at all times, no matter how small the task

Gloves should be worn when –

- Performing battery maintenance to protect against acid burns (long thick rubber gloves)
- When sanding timber to protect against abrasion to skin (cotton gloves)
- When welding to protect against burns (long leather gloves)
- When handling ropes to protect against burns and cuts (leather gloves)
- When administering first aid to protect against cross contamination (thin disposable latex gloves)

Ear muffs & plugs –

- In the engine room or machinery spaces to protect against hearing loss
- When working with noisy tools or doing work that involves high noise levels to protect against hearing loss

Safety Shoes –
Appropriate footwear must be worn to protect against crushing injuries, acid burns, slips etc.

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Respiratory Protection –
Must be worn in any environment where there are airborne particles. Never work in a situation where there could be Asbestos particles in the form of dust or

airborne particles.

SCBA –

- Should never be worn for routine maintenance
- Must be used only in a emergency involving the safety of life or the ship

Protective clothing –
Should be tight fitting to minimise the chance of being caught in moving machinery

Safety Harness –

- Must be worn whenever performing work that has a hazard of falling.
- Must follow the precautions in a Permit work Aloft

Notes

## Module 3: PSSR Course – Observe Safe Working practices (cont.)
## Section 2 – Lifesaving Appliances

The International Life-Saving Appliance (LSA) Code

- Provides international standards for lifesaving appliances
- Is embraced in Chapter III of the SOLAS convention
- Marine Orders Part 25 requires Australian shipping to comply

Lifejackets

Specifications –

- Must be worn whenever there is a danger of falling overboard or drowning
- Remain undamaged when exposed to direct flame for 2 seconds
- Can be put on by most people correctly without training within 1 minute
- Can be worn inside out
- Comfortable to wear
- Sustain a jump of 4.5 metres
- Lift the mouth of an exhausted or unconscious person at least 120 mm clear of the water in less than 5 seconds
- Allow the person wearing it to swim a short distance
- Lifejackets marked with a Child symbol must be provided for persons less than 32kg
- Buoyancy which is not reduced by more than 5% after 24 hours submersion in fresh water
- The buoyancy material for non-inflatable lifejackets is usually a high density foam

Quantity to be Carried on Passenger Vessels -

- 1 for each person the vessel is certified to carry including suitable lifejackets for persons less than 32 Kg in weight and
- oversize lifejackets for exceptionally large people and
- an additional lifejacket for each crew member who might be required to remain on duty in a working space.

Quantity to be Carried on Cargo Vessels -
In addition to the number of lifejackets required to be carried by Passenger vessels, Cargo vessels must carry an additional lifejacket for each person that the vessel is certified to carry and these extra lifejackets are to be kept ready for use in areas where crew normally work.

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Inflatable Lifejackets –

- Comprise at least 2 inflatable compartments
- Filled automatically or manually with CO2 gas from a small disposable cylinder
- Can be topped up with expired air using a tube with a one way valve
- If one compartment is deflated there is sufficient buoyancy in the remaining compartment to keep the wearer afloat

Equipment fitted to lifejackets –

- Whistle
- Self igniting light
- Retro-reflective patches

Personal Flotation Devices (PFD's) –

- Are not SOLAS compliant
- Used in water sport activities
- Not acceptable as a replacement for a SOLAS lifejacket

SOLAS Lifebuoys –

- Must be filled with buoyant material (not air or loose granulated material);
- Can withstand direct flame without burning for more than 2 seconds;
- Must have an outer diameter of no more than 800mm and an inner diameter of no less than 400mm;
- They are fitted with retro-reflective tape and a lifeline attached at 4 points around the circumference of the lifebuoy;
- Have a mass of no less than 2.5 kg;
- Can support 14.5kg of iron in fresh water for a period of at least 24 hours;
- Can sustain a drop into the water from the height it is stowed at or 30 metres whichever is the greater;
- A mass sufficient to operate a quick release arrangement for self-activating smoke and light signal if fitted.
- On large trading vessels one lifebuoy is installed on quick release fittings at each Bridge Wing.

Additional equipment that can be attached to a SOLAS lifebuoy –

- Self-igniting light
- Self-activating smoke signal
- 30 metres of buoyant line

All SOLAS lifebuoys have –

- The name of the ship & the Port of Registration marked on them
- A lifeline becketed at 4 points around the outer circumference of the lifebuoy

Bridge wing quick release lifebuoys –

- Can be instantly deployed from the bridge-wings
- Have no buoyant line but do have a light and a smoke signal attached

Types of survival crafts –

- Lifeboats
- Liferafts

Types of Lifeboats –

- Fully enclosed
- Partially enclosed
- Open

Launching of lifeboats –

- Davits
- Freefall

Types of liferafts –

- Rigid
- Inflatable

Methods of launching liferafts -

- Davit or crane
- Manually over the side of the ship
- Automatically through the use of a Hydrostatic Release Unit (HRU) in the event of the sinking of the ship as a result of a flooding emergency

Line throwing devices

Purpose -

- To transfer a heavier lie from ship to shore or from ship to ship
- To send a line to an MOB for retrieval of the MOB

Types -

- Pistol fired rocket
- Integral rocket & line

Notes

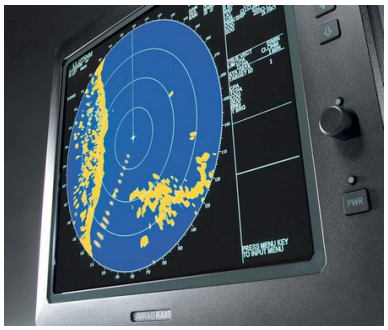
**Emergency Position Indicating Radio Beacon (EPIRB)**

- Sends a unique distress signal via Earth orbiting satellites to a Rescue Co-Ordination Centre (RCC)
- To activate manually, turn it on. It can operate for up to 96 hours
- Tie the lanyard to the survival craft
- Float the EPIRB in the sea for best signal propagation
- Includes a hexadecimal code which is registered to the ship/owner
- Geographic position can be found within 1 hour of activation
- If fitted with a GPS the exact position is also transmitted to the RCC
- Can be activated automatically if submerged to 1.4 to 4 metres in water by a Hydrostatic Release Unit (HRU)
- A search will be initiated within one hour of the signal being received by the RCC
- Change battery/maintain according to manufacturer's specifications
- Heavy fines if deliberately activated when there is no emergency
- If accidentally activated turn it off and contact AMSA

**Search And Rescue Transponder (SART) –**

- Sends a distress signal to a passing vessel transmitting a 3 centimetre (cm) RADAR signal

- To activate, turn it on and mount it as high as possible. It can operate for up to 96 hours in standby
- A red light flashes every 2 seconds
- When the SART receives a 3 cm RADAR signal it broadcasts a RADAR signal which appears on the RADAR screen of the ship as 12 in-line pulses where the pulse nearest to the centre of the RADAR screen indicates the position of the SART



- A beep sounds every 2 seconds while the SART is transmitting

Notes

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Thermal Protective Aid (TPA) –

- Reduce the rate of loss of body heat in cold climates
- Used to assist a hypothermic person to regain body heat - place casualty in dry clothes into the TPA, a healthy person also inside the TPA can slowly transfer body heat to the casualty
- Can be worn in water
- Are inexpensive
- Fold into a small space
- Provided for every person assigned to an open lifeboat who is not issued with an Immersion Suit

Notes

Immersion Suit –

- An immersion suit protects the wearer from loss of body temperature leading to Hypothermia.
- Insulated for use in colder climates
- Rot proof
- Corrosion resistant to oil and seawater
- Must be highly visible in colour with reflective tape
- Suit must cover entire body except face
- Vent to reduce air in legs
- Able to withstand 4.5 metre jump with no injury
- Light, whistle and rescue loop attached
- Prevent a drop of no more than 2 degrees in 6 hours

An immersion suit should be available to every person assigned to crew the rescue boat. On passenger and cargo ships with non-enclosed lifeboats at least three immersion suits are carried for each lifeboat.

Fire-Fighting Appliances

- Fire Hoses – come in various diameters – 24mm, 38mm & 45 mm – lay flat for storage
- Branches & nozzles
- Hydrants
- Fire pumps
- Fire axe

Permanently Installed Fire Extinguishing Systems –

- CO2 gas bank for dumping gas in machinery spaces & engine room following sounding of the CO2 alarm and personnel evacuation
- High expansion foam
- Dry chemical powder
- Water sprinkler system

Manual Call Points (MCPs) –

- Located throughout the vessel
- Break the glass and press the button to raise a fire alarm

Portable extinguishers –

Foam –

- Suitable for small oil fires
- Must not be used on electrically involved Class (E) fires

Carbon Dioxide (CO2) –

- Ideal for electrically involved class (E) fires
- Non-corrosive and leaves no residue

Dry Chemical Powder –

- Suitable for most types of fires including class (E)
- Leaves a damaging, corrosive residue


Water –

- Can be used on class A fires
- Must not be used on class (E) electrically involved fires

Smoke Helmet –

- Emergency Escape Breathing Apparatus (EEBA)
- Provides emergency air supply for a few minutes to enable escape from a smoke filled space
- Usually found in the vessel's engine room

Notes

Medical Equipment –

- Resuscitator – provides a positive pressure of oxygen for a casualty who has difficulty breathing
- Ship's officers are trained in the use of this equipment

Stretcher –

- Folding stretchers are found on ships
- Can carry a casualty through narrow passageways on a ship

Medicines –

- Every ocean going Australian ship carries a sufficient medicine to deal with a wide range of shipboard medical emergencies.

Automated External Defibulator (AED) –

- All crew are trained in the use of this equipment
- Can restore a normal heart beat to a casualty with an abnormal but shockable heart rhythm

Medical instruments –

- All ocean going Australian ships are equipped with a comprehensive range of medical instruments for use in a medical emergency.
- Officers of the ship are trained in simple medical procedures

Notes

## Module 3: PSSR Course – Observe Safe Working practices (cont.)
## Section 3 – Types of ships, cargo handling & mooring operations

The different ways that cargo is loaded & unloaded from ships

General Cargo Vessels –
- Might be equipped with cranes & derricks for loading & unloading her own cargo
- Carry all types of cargo below and on the weather deck

Bulk Carriers –
- Carry bulk cargo including grain, coal, ore & cement
- Have large holds and hatches
- Cargo is loaded & unloaded using conveyor belts

Container ships –
- Carry cargo inside standard sized containers that fit on trucks for road transport
- Specialised container loading and unloading facilities are provided at shipping terminals throughout the World

Ro Ro Vessels –
- Carry all types of wheeled cargo including cars and trucks
- Large interior spaces and ramps at the stern & bow or side of the vessel allow cars & trucks to be driven on and off the vessel's garage decks

Pure Car (and Truck) Carriers (PCC and PCTC Carriers) –
- Mainly used to transport large numbers of new cars & trucks to market countries

Oil Tanker –
- Carries liquid cargo
- Loaded and unloaded by pipelines
- Crew must undergo tanker familiarisation training

Chemical Carrier –
- Carries chemicals in bulk
- Specially coated cargo tanks for different products
- Cargo loaded & unloaded by pipelines

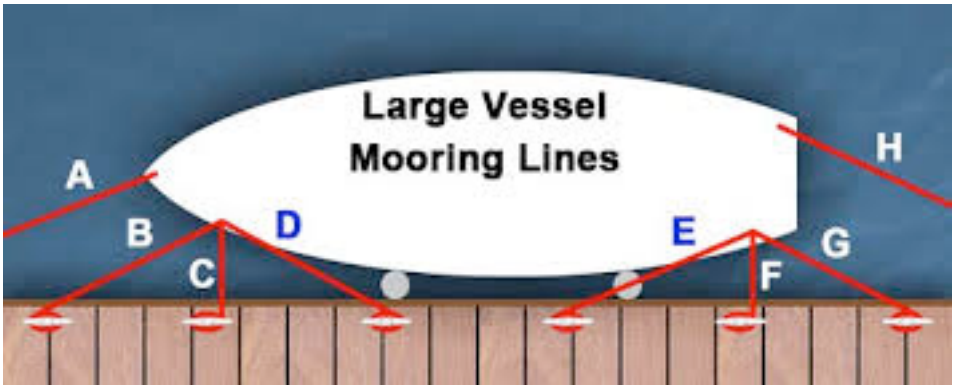
Gas Carriers –
- Carry Liquified Natural Gas (LNG)
- Loaded & unloaded by pipelines
- Stored under pressure to liquefy
- Crew must undergo special safety training

Passenger Ships –
- Carry up to thousands of passengers and crew
- Crew must undertake crowd control training

Note

Mooring & Unmooring –

- Heavy lines are taken ashore with the use of lighter ‘messenger’ lines
- Lines can be synthetic rope or wire and are of large diameter for strength
- Bow & stern lines prevent the ship from moving away from the wharf
- Spring lines prevent movement longitudinally along the wharf
- Breast lines hold the vessel firmly in place at particular points
- Lines must be kept taught
- Require constant adjustment in ports where there is a large difference in height between high and low tide
- I must stay clear of lines under tension
- Never stand in the bight of a line




A and B are Bow lines, C is a Breast line, D is an Aft Spring, E is a Forward Spring, F is a Breast line and G and H are Stern lines.

Notes

## Module 3: PSSR Course – Observe Safe Working practices (cont.)
## Section 4 – Enclosed spaces

Definition –
A space that is not ventilated 24 hours a day

Examples –
- Forepeak tank
- Chain locker
- Cofferdam
- Topside tanks
- Cargo Tanks
- Ballast tank
- Duct keel
- After peak tank
- Bunker tanks
- Under engine room floor plates

Careless entry into such spaces has resulted in accidents, sometimes fatal, because a person is overcome by a lack of breathable atmosphere or is injured and not rescued in time.

Atmospheric hazards –
- Hydrocarbon vapours from fuel and cargo line leakage and tank residues
- Hydrogen Sulphide – explosive and flammable – from rotting organic matter
- Other toxic gases from cargo, ship's stores & ship operations
- Toxic gases are measured in Parts Per Million (ppm)
- Threshold Limit Value (TLV) is the maximum safe level in a breathable atmosphere
- 21% Oxygen is required in a breathable atmosphere
- Air sampling & testing equipment is used to measure the TLV and oxygen content

Spaces can be rendered deficient in Oxygen through chemical actions during –

- rusting
- paint drying
- hydrogen
- electrical cleaning fluids
- solvents, emulsifiers and refrigerants
- burning
- flooding with CO2 to fight a fire
- welding and gas cutting without proper ventilation
- running an internal combustion engine in a confined space
- decay of organic matter, e.g. vegetables, grain, fruits, etc.

**Oxygen deficiency** can result in anoxia. The symptoms commence with giddiness, breathlessness and unconsciousness and progress onto brain damage causing memory loss, mental instability, paralysis, coma or death.

Physical Hazards –

- darkness
- unsecured ladders
- slippery surfaces
- obstructions
- unguarded openings
- unsecured objects left from previous visit
- flooding
- being trapped inside

Before entry into an enclosed space –

Follow the procedures in the Enclosed Space Permit to Enter, including -

- Thoroughly ventilating the space before entry
- Atmosphere testing to ensure that the atmosphere is breathable
- Atmosphere testing throughout the duration of the work
- Wear appropriate PPE
- Use non-sparking tools and lighting
- Heed warning regarding overconfidence
- Tidy up when the work is finished

Notes

## Module 3: PSSR Course – Observe Safe Working practices (cont.)
## Section 5 – Working Aloft

Definition –

- Working at a height above the ground or deck where the primary hazard is falling and consequent injury is referred to as working aloft.
- Working over the side can also be considered to be working aloft.

Examples –
- painting bridge front bulkhead, masts, engine room deck-head
- cleaning or painting funnel
- greasing, maintenance or repair of radar scanner, crane or derrick blocks and wires
- chipping, painting, cleaning or inspecting tanks or holds
- painting the ship side, underside of flying bridge wings, etc.

Hazards of working aloft –
- falling from a height due to loss of balance, failure of ropes, etc.
- injury due to falling material or equipment
- burns due to contact with hot surfaces such as the funnel or steam from the whistle
- emission of carbon dioxide or toxic gases from the funnel due to combustion, incineration, soot blowing, etc.
- exposure to wind and cold
- electric and radiation hazard due to proximity with radar scanners or radio aerials

Prior notice –
- bridge watch keeping officer when working near radar scanners
- bridge watch keeping officer or radio officer when working near radio aerials or satellite communication dome
- chief officer when working on deck
- "man aloft" signs should be posted on bridge equipment such as radars, HF radio equipment and particularly Satellite phone equipment due to the intense radiation from the dome.

Equipment Tagging -
- Equipment whose operation is a hazard to the work is to be locked or tagged with the responsibilities vested in a responsible officer.
- These checks and procedures may be covered by a checklist or a Permit To Work system.

Equipment Used for Working Aloft
- Gantlines - ropes passed through an overhead pulley and used for hoisting.
- Safety lines
- Wooden stages - no longer used on modern vessels - or bosun's chairs
- Hooks and shackles
- Fall arrester – to prevent personnel from falling when on a moving stage or when getting into a Bosun's Chair whilst aloft.
- Ladders, scaffolding, etc.

Precautions -

- A Permit to Work system should be used
- Generally, working aloft should not be permitted if the movement of a ship in a seaway makes the work hazardous
- Strong tidal rips and currents can make working aloft more hazardous due to sudden vessel movement
- Consider the hazards of working aloft near a ship's whistle, funnel, radio aerials, and radar scanners
- Inform Officers of the work aloft so that relevant equipment can be isolated or shut down during the work
- Post warning notices as appropriate
- Inform Officers when the work is completed
- Inexperienced persons or those under 18 years of age should not go aloft unless accompanied by experienced personnel
- All seafarers going aloft to wear safety harnesses and restraints appropriate to the work
- Safety nets to be put in place where necessary
- Persons working over the side or aloft where they could fall overboard must wear a lifejacket or buoyancy vest
- Someone to be in attendance on the deck
- Lifebuoys with a light and a heaving line should be ready for use
- Warning notices that personnel are working aloft should posted on the deck and elsewhere as appropriate
- Tools and stores must not be placed at an edge and must be secured from falling at all times and transferred in a bucket or by rope and never thrown
- Where possible only permanent fixtures to the ship's structure, such as welded eye pads to be used as securing points for all lifting equipment
- A safety net should be rigged whenever possible, especially under a free hanging stage
- Lizards and gantlines (ropes used to lift personnel) should be led away from or protected from sharp edges and hot surfaces
- There should be no cargo handling operations in the vicinity
- A competent person to continuously supervise personnel aloft or over the side
- Knots, hitches and turns should be correctly and carefully made to prevent slipping, especially when synthetic ropes are used
- Stages or Bosun's Chairs should not be hoisted or lowered by a winch in case the winch fails and the load is suddenly released
- Stages should be secured against ship movement, especially if they are free hanging
- Ladders should be used for climbing onto or from a stage and not the ropes that suspend the stage
- Rigid ladders should be placed on a firm base and lashed in position at both the top and the bottom of the ladder
- Work over the side should not be carried out while the ship is under way and work at heights should not be carried out when the ship is subjected to violent movement in a seaway
- Tools & materials should be passed in a sealed container by hand or a rope and never thrown
- Lifebuoys with heaving line and light should be made ready when a person is working over the side

## Module 3: PSSR Course – Observe Safe Working practices (cont.)
## Section 6 – Hot work

Definition –

Any work that generates heat or sparks including –

- Welding
- Cutting
- Burning
- Heating
- Chipping
- Use of power tools that generate heat

Hazards –

- Fire
- Explosion
- Burns
- Eye injury
- Shock

Hot work is frequently carried out in –

- engineer's workshop,
- engine room,
- poopdeck and accommodation
- cargo area.

Before performing hot work always ensure that the procedures in the Permit to Perform Hot Work have been followed including –

- The work area has been checked with a combustible gas indicator for hydrocarbon vapours
- The surrounding area has been made safe – especially the other side of any bulkheads about to be subjected to Hot Work
- Additional fire protection is available
- The equipment or pipeline has been purged
- The equipment or pipeline has been blanked
- The equipment or pipeline is free of liquid
- Combustible materials have been removed from the work area or made safe
- Tanks, valves, vents and pipelines have been blanked off or effectively isolated
- Ventilation is adequate
- Leaks from valve and pump glands, flanges and the like have been controlled
- Have pressure relief valves been vented to safe areas

- Is the fire equipment checked and laid out ready for use
- Is the fire pump or fire team on standby
- Is a fire-watch required
- If required, has a fire-watch been organised
- Is the wind direction satisfactory for hot work to be done
- Has product movement been stopped in the area of hot work
- Has the site of the hot work been isolated and roped off
- Fire Extinguisher is to be on standby at all times.
- Hoses, Electrical Leads and all equipment are to be in good working condition and comply with Australian Safety standards
- Bunkering Points, Fuel Lines and Fuel Shut Off points
- The location of fire hoses, mains and water outlets
- The location of the UHF radio communications to Port Communications and alarm sirens
- The equipment is isolated electrically
- Appropriate approvals have been obtained if work is to be carried out in or above tanks or spaces
- Permit Authoriser (PA) is to be advised of the start & stop of works
- Special conditions / precautions (e.g. for other work being conducted)

Notes

## Module 3: PSSR Course – Observe Safe Working practices (cont.)
## Section 7 – Engine room watch-keeping & maintenance

Machinery located in the engine room -

- main engines
- generators or alternators
- boilers
- compressors
- pumps
- motors
- electrical equipment

Other equipment which may be located in the engine room -

- steering gear (however, steering gear is normally located in a space called the Steering Flat)
- refrigeration machinery
- hydraulic or pneumatic equipment
- two-way portable VHF
- lead-acid batteries

Injuries suffered in the engine room -

- burns through contact with steam pipes, hot surfaces, welding sparks, etc.
- head injuries through overhead obstructions or falling objects
- slips, trips or falls on companion ways, from open floor plates, protruding parts or incautious haste
- hearing loss through constant exposure to high decibel noise
- contact with moving parts of machinery such as grinder wheels, flywheels, propeller shaft

PPE –

- Headphones and ear plugs to avoid hearing loss
- Tight fitting clothes to avoid getting caught in unguarded moving machinery
- Helmet to protect my head from objects falling from above & areas of low head clearance
- Work boots – steel capped toes & good sole grip – to avoid foot injuries caused by heavy objects falling and slips

Immediate actions to prevent accidents -

- oil or water leaks should be immediately attended to
- oil spills should be immediately cleaned and oil stained lagging replaced
- oily rags or cotton waste should be properly disposed of in a closed container and not left lying around to ignite spontaneously
- tools should be attended to during work, so that they do not fall off ledges or platforms, and be properly collected and stowed after work
- guards for moving parts of machinery should be in position and in good condition
- equipment, stores and parts of opened-up machinery should be lashed and secured against movement
- all parts of the engine-room should be adequately lit
- bilges should be kept clean and dry
- bottom platform gratings should never be left open unless the area is fenced and warning signs are posted

- access to fire-fighting equipment, escape routes and emergency exits should not be obstructed by stores or equipment
- proper locking and tagging of machinery under repair to prevent inadvertent starting
- proper checks of equipment used for lifting or other purposes prior to use
- proper calibration of test equipment
- proper tests of enclosed spaces prior to entry
- use of proper tools for the job and in the proper way

Safe working practices should include:

- Job Hazard Analysis (JHA) meetings prior to any task being undertaken
- Proper locking & tagging of machinery under repair to prevent inadvertent starting
- Proper checks of equipment used for lifting or other purposes & proper calibration of test equipment prior to use
- Using the correct tools & PPE for the task & in the correct manner

Notes

# Module 4: PSSR Course – Contribute to effective communications

## Section 1 – Fundamentals & methods of communications

Methods of communication - The basic elements are -

- The sender and the receiver
- Modes of transmission
- Methods of transmission
- The barriers to communication
- Feedback

The *methods* of communication on board are -

- Verbal, e.g. reading, speaking, writing and any communication using words
- Non-verbal, e.g. body language, sounds, gestures
- Iconic, e.g. signs, figures, diagrams, pictures and photographs

Notes

## Module 4: PSSR Course – Contribute to effective communications (cont.)
## Section 2 – Barriers in communications

There are barriers in each step of the basic communication process including -

- Sender's conceptualisation stage
- Sender's capability
- Mode of transmission
- Media of transmission
- Receiver's capability
- Receiver's understanding of the concept
- Feedback stage
- Receipt of feedback by Sender
- Cultural differences

Sender's conceptualisation stage barriers include -
- The wrong choice of time, place and person
- The Sender might not have a good command of maritime english
- The Sender might not organise the communication in a logical way
- The Sender might not choose the correct mode or method of transmission to overcome physical (external) barriers such as noise

Sender's capability barriers include -
- Failing to transmit by voice with sufficient volume to overcome noise in the environment
- Failing to initiate the transmission by prefacing the purpose and context of it
- Insufficient use of body language, pictures, gestures, facial and verbal expression
- Speaking impediment

Mode & Media of transmission barriers include -
- Unpredicted noise from an external source
- Inability of the selected Mode & Media to attract the attention of the Receiver

Receiver barriers include -
- Able to hear but failing to listen due to disinterest or distraction (internal barrier);
- Lack of understanding of maritime english;
- Hearing impairment.

Feedback from Receiver to Sender barriers include -
- The Receiver repeating the message but not understanding it (internal barrier);
- The Receiver not including in his/her feedback assumed actions to be taken which were not intended (internal barrier)
- The Receiver not transmitting with sufficient volume or clarity.

Sender's receipt of feedback from the Receiver barriers include -
- The Sender suffering from a hearing impairment;
- The Sender failing to cease transmission during feedback;
- Failing to validate the feedback. (internal barrier)

Cultural differences -

- In some cultures it is rude to question the validity of a communication, especially when it comes from a superior.
- In some cases it might also be culturally difficult for a person to question what was meant by the communication.
- As a result, the receiver could indicate understanding of a communication when he or she has not properly understood what was required by the communication.
- The result could be catastrophic.

Notes

## Module 4: PSSR Course – Contribute to effective communications (cont.)
## Section 3 – Effective communications skills

- The effectiveness of communication lies primarily with the sender
- The sender should define the purpose of the particular communication
- The sender's selection of time, place and person addressed in the context of initiating the communication determines the quality of the outcome of the communication
- Use Grammatically correct English Maritime Language
- Understanding the different kinds of barriers in communication helps to improve the sender's transmission

External Barriers - Verbal communication in a noisy engine room would be nearly impossible. Often verbal communication on the Weather Deck could be very limited also by the noise from heavy wind.

Internal Barriers: - It is really important to ensure that the Receiver is not only hearing I but also listening for effective communication. A distracted or dis-interested person can hear the words but not necessarily process the meaning of them. When a message is transmitted in a very angry and loud voice sometime the body language and the ferocity of the words can block the meaning of the words.

The sender must be capable of effectively Transmitting the message -

- For effective communication the Sender must be capable of effectively speaking, writing, acting, drawing and using available sound signalling apparatus.
- Use of combined methods of communications enhances the outcome of the transmission.

How can the Sender check the Effectiveness of a transmission?

- The effectiveness of a transmission can be checked by careful analysis of the feedback from the receiver.
- It is the sender's responsibility to ensure effective communications.

Notes

Effective Listening Skills -

- Listening is the responsibility of the receiver
- Hearing should not be confused with listening

The Rates at which we can Listen and Speak -

- Human beings are capable of speaking at a rate of 150 words per minute whereas
- we can listen at a rate of about 1000 wpm, resulting in idle time of 850 wpm, during which the mind can wander.
- Ideally this idle time should be used for paraphrasing the body language and other signals from the speaker.

Incorrect communications can affect the safety of life, property and the environment.
For example -

- An order is given to take charge of a watch.
- The person giving the order does not state the order clearly.
- The Receiver assumes that this was a passing comment of no importance.
- The Receiver does not take over the watch.
- The vessel is now ploughing through the sea at 20 knots with no one keeping a proper lookout.
- The result could be catastrophic. – In the absence of constant geographic hazards there could be another vessel that is also not maintaining a proper watch or a shipping container floating in the sea.
- The Sender must on every occasion when transmitting an important message obtain feedback from the Receiver to ensure that the message is understood and will be acted upon.

Cause human problems and problems in relationships on board
For example -

- A crew member passes a humorous comment in a group of listeners about another crew member.
- The intent was to create some entertainment but the personal comment was taken by the other crew member as further evidence of an attempt to belittle him.
- Later there is an opportunity for "payback" when the offending crew makes a mistake in his work.
- The offended crew then makes a major scene about the other crew's incompetence. Animosity breeds contempt and a major rift occurs among the crew.
- Instead of working together as a team they are now looking at each other to try to take advantage of the other's shortcomings.
- A very unworkable team is the result.

Stress, loss of time, loss of resources and even ship's profitability -

- Animosity creates stress.
- Stress is a diversion to positive efforts.
- Less time is spent on productivity, it takes longer to do a particular task and more mistakes are made.
- This can affect the ship's profitability.
- If the shipping company can't make a profit then there is no longer a need to pay crew and people end up out of a job.

Notes

# Module 5: PSSR Course – Contribute to effective human relationships

## Section 1 – Inter-Personal Relationships (IPR)

Good relationships make the life of all seafarers more comfortable, healthy and less prone to accidents –

- Human beings are naturally social creatures
- Our work is more enjoyable when we have good relationships with those around us
- People are more likely to go along with changes that we want to implement
- We are more innovative and creative
- Having good relationships with our fellow seafarers builds trust and cooperation
- A safer workplace results from this trust and cooperation

The Elements which Help in Better Relationships –

- Good company policies
- Good shipboard management
- Good technical competencies & IPR of all crew & officers

Structure and flow of authority -

- The Merchant Navy in Australia follows the traditions of the Royal Australian Navy in terms of the flow of authority and the concept of ranks to identify where a particular employee fits in the structure of the management of the vessel.
- At sea it is essential that the orders given by Officers and the Master are carried out exactly as required by the order.
- There is no room on board a ship for any attitude from a seafarer other than one which performs work in a dignified, timely and safe manner.
- It is the Master's responsibilities to ensure that the seafarer receiving an order to perform work is properly trained, provided with all appropriate safety equipment and is competent to do the work. The Master must also ensure that adequate periods of rest are provided to the seafarer and that he or she is not under the influence of drugs or alcohol.

The needs of the individual on board a ship include -

- Receiving sufficient rest periods to ensure that the individual is properly rested between work periods
- Eating nourishing and sufficient food and water
- Exercising in the ship's Gym or Swimming Pool to maintain physical fitness
- Respect of one's self and respect for fellow seafarers

The needs of the ship include -

- The appointment of Masters, Officers and other seafarers with appropriate qualifications, certification and experience for the voyages and operations that the ship undertakes
- Proper passage planning and navigation to avoid collisions at sea
- Accurate weather forecasting to ensure safe passage
- Continuous watch keeping when at sea in relation to both the navigation of the vessel and engineering
- Maintenance of vessel stability during loading and unloading operations and bunkering
- On passenger vessels, avoidance of panic amongst the passengers in an emergency situation

The needs of the company -

- The primary purpose of the company is to generate income
- This function is optimised through efficient operations
- A good and dedicated work ethic on the part of Seafarers
- A management style on the part of the Officers and Master that engenders enthusiasm and motivation in the seafarers and safe work practices

The needs of other seafarers on board -

- Everyone is different
- On a ship today the crew can come from any nationality and background
- There can be a great variety of customs practised
- A high degree of tolerance & effort to get along with people is required by all seafarers to ensure harmony on board

Social needs -

- The crew, Officers and the Master form a society of individuals on board the ship. In all human societies humans are drawn together and react to each other.
- Much pleasure for an individual can be derived from good relationships with the other members of the shipboard society.
- If we want to be treated with respect then we must start earning that respect by treating others with dignity, respect and truthfulness.
- For harmonious relationships on board we must also ensure that we minimise noise in accommodation areas and keep our selves clean through showering and dressing in clean clothes after performing sweaty work.

Respect for each other

- Every person is an individual and one of the great aspects of this fact is that each individual has experience and a set of skills different to everyone else.
- If we take an interest in getting to know the other seafarers on board then we can identify their individual attributes.
- We can then value each individual's differences and make use of their skills to compliment our own.
- We can always learn from each other.
- A mutual respect of these differences leads to a more enjoyable and safe time on board the ship.

Open communication will enhance interpersonal relationships (IPR) -

- For example, a crew member passes a remark about us which was intended to humour those present.
- We are offended by the remark.
- An example of Open Communication would be to ask the fellow crew member to clarify whether the remark made was intended to offend.
- Most likely the offence was not intended, that will be explained and that will then be the end of the matter.
- However, if this was not handled this way then animosity could build between us and the crew member who passed the humorous remark.

Note

Shipboard environments demand better IPR from seafarers during both on-duty and off-duty hours -

- On board a ship we are working together, sleeping in possibly shared cabins, eating together, exercising together and enjoying shore leave together.
- It is essential when on leave together that we maintain the same level of respect for each other that we have when working together.
- Otherwise bad feelings can result from careless actions or comments that occur on shore because the experiences are taken back on board the ship.

Methods to improve IPR on board result from -

- introducing and understanding each other
- commitment of senior officers
- valuing of individual differences rather than maximising weakness
- fairness in dealing with personnel
- true appraisals and reporting
- discipline on board
- recognising and adjusting to cultural differences

Notes

## Module 5: PSSR Course – Contribute to effective human relationships (cont.)
## Section 2 – Team building

Effective and safe shipboard operation is achieved from team work -

- The effectiveness of it depends on the contributions of each member of the team.
- An effective team that works well together helps in better decision making through achieving team goals, aims and objectives together.
- The role of each individual member of the team is essential if the team is to function in a cohesive manner.

Principles of team resource management -

- During everyday operations on board a ship, technical and non-technical skills are integrated into each other and both skills are needed to perform tasks as safely and efficiently as possible.
- The technical skills are related to a specific department, job, function, rank or task. These are the skills that are traditionally focused on in the maritime industry.
- Team resource management is human factors training. This kind of training is sometimes referred to as soft skills training or non-technical training and was introduced through the Manila Amendments to the STCW. As opposed to technical training, non-technical training is generic, i.e. applicable to all. While most technical training has to be carried out with groups kept apart – divided into, for example, deck and engine, the non-technical training may be carried out with no separation of people at all.
- The aim is to tear down barriers between people, departments, ship and shore, develop efficient communication and establish a genuine safety culture within the vessel.

Deterrents to team operation include -

- *Distortion of aims* through poor communication or personal benefit – e.g. using shipboard safety as an excuse to obtain a personal advantage.
- *Inflexible behaviour* of members and intolerance between the members of the crew – e.g. discounting another crew member's comments because we do not agree with their customs or beliefs. There is no room for this type of bias on board a ship at sea!
- *Groupism* (the forming of cliques) and social exclusion of particular members of the crew – e.g. groups formed by use of a common language which is not spoken by the minority of the crew will result in social isolation for the minority crew members. This could result in a lack of trust and tolerance on behalf of the minority crew members.
- *Status and ego problems* – e.g. if a crew member feels left out then it might be difficult for that crew member to risk making a mistake when reporting problems on board ship.
- *Hidden agendas* where individuals are seeking a personal benefit instead of putting the ship's interests first – similar to 'distortion of aims' above.
- *Communication problems* through language barriers, prejudice or sexism or racism – e.g. this can result in orders not being understood or not being properly carried out thus affecting the safety of the ship at sea.
- *Physical and environmental problems* including insufficient personal space and time – e.g. frustrated crew can easily misunderstand orders or turn a blind eye to the detail of safety matters.
- *Poor handling of grievances* and lack of proper counselling – e.g. employee dissatisfaction on board a ship at sea can lead to a lazy attitude towards matters of safety.

## Module 5: PSSR Course – Contribute to effective human relationships (cont.)
## Section 3 – Team work

Team work is essential -

- Team work is essential on board because the shipping company comprises a number of small mobile industrial units (the ship) which may at any particular moment be distributed over large distances throughout the world.
- When making a voyage, the ship can undergo considerable climatic changes, which may adversely affect personnel.

Ships are operational for 24 hours each day and the crew must be organised in regulated shift system such that the people on board are well rested and fit for duty at all times -

- The personnel on the ship must be organised to operate the ship safely and effectively with numerous operations being performed simultaneously, e.g.
- Watch-keeping at sea and in port (navigation and machinery operation)
- cargo operations
- maintenance of hull, machinery and equipment
- safety checks and drills, emergency actions
- repair/dry-docking
- stocking provisions, cooking food, housekeeping
- communication ship - shore - ship
- the crew must be able to operate with a high degree of responsibility and flexibility

Notes

## Module 5: PSSR Course – Contribute to effective human relationships (cont.)
## Section 4 – Social Responsibilities

Each crew member bears a social responsibility to -

- Himself - In a shipboard environment every crew member should conduct himself in a dignified manner. The respect of the other crew members is earned by the way each person does his best to contribute to the team effort.
- His colleagues - Treat others as I would have them treat me. In that way I can expect to be treated with the same level of esteem.
- The company - In return for payment by the company the crew is expected to apply the best efforts to achieve the most favourable outcomes for the company.
- The environment - The world can only recover from past neglect and stay clean if every individual respects the environment that we all must share.

Crew Rights

Every crew has a right to -

- His convictions - We are all entitled to our beliefs but we must all ensure that others have the right to their own beliefs even if they are different to ours.
- Express his convictions - This particularly applies to honesty, truthfulness and loyalty to others.
- Make a request of another as long as he can appreciate that the other has a right to say no.
- Clarify communications to enhance interpersonal relationships.

Crew Duties -

- Be loyal to my employer
- Accept that for ships involved in commercial operations making a profit is part of the operation
- Perform duties in a responsible & dignified manner at all times
- Carry out orders respectfully & adhere to all regulations and laws of the ship, the flag state, international laws & those of the host country.

These responsibilities are expressed by –

- my obedience, respect, discipline and willingness to follow the orders of my superiors.
- I must abide by company's policies as laid down in the safety manuals and rules and regulations of the flag State requirements and other mandatory legislation.
- I must adhere to the safety and environment protection policies at all times and to assist fellow seafarers in distress, search and rescue operations and oil pollution mitigation operations.

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Commercial realities -

- I must accept that if the vessel is used for commercial gain then it is my duty to protect the profitability of the business in which I am employed. E.g. it would be contrary to this requirement for me to slander or criticise my employer or the Master in front of paying passengers to the detriment of the employer.
- I must discharge my duties sincerely & to the best of my abilities
- Like any other employment, the employer expects the best efforts from me.
- Responsibility towards the company, government and the individual
- I must express responsibility towards the three elements of the shipping operation, namely, company, government and the individual.

Dignity in labour -

- There is dignity in labour.
- I should carry out my duties in a dignified manner in accordance with the instructions given to me by my supervisor or the Master.

There are responsibilities towards -

- Obedience, respect, discipline and following orders of superiors;
- Abiding by the company's policies as laid down in the safety manuals as well as rules and regulations governing flag state requirements and other mandatory legislation;
- Adhering to the safety and environment protection policy at all times and to assist fellow seafarers in distress, search and rescue operations and oil pollution mitigation operations.

Right to make a complaint

- All crew members have the right to make a complaint regarding a breach of seafarer rights on board the ship without the fear of victimisation or reprisal.

Contracts, rights, national & international requirements

Marine Orders Part 11

AMSA Marine Orders Part 11, issued 16/5/2013, determines the minimum living and working conditions that must be provided for Australian Seafarers.

Summary –

- The Marine Labour Convention, 2006 is an international convention developed under the International Labour Organization that came into force internationally on 20 August 2013.
- Australia is a signatory to the MLC, 2006 which consolidates existing labour conventions, while introducing modern standards relating to the working and living conditions of seafarers.
- The MLC, 2006 provides working and living standards for the world’s 1.4 million seafarers and sits alongside the following Conventions – SOLAS, STCW and MARPOL.

Provisions -
In Australia, the MLC, 2006 has been implemented primarily through the Navigation Act 2012 and associated delegated legislation, such as Marine Order 11 (Living and working conditions on vessels) 2015.

Note

Marine Order 11 contains regulations that address the following components -

- Maritime labour certificates
- Interim maritime labour certificates
- Recruitment and placement
- Complaints
- Engagement and working conditions of seafarers
- Provisions
- Health
- Accommodation – use and vessel plans / design and construction / working spaces
- Welfare of seafarers
- Accommodation – sanitary and laundry facilities / hospital facilities
- Repatriation

AMSA Work Agreement (Form AMSA351)

The AMSA Work Agreement (Form identification AMSA351) prescribes the minimum details of employment conditions that must be agreed in writing between an Australian Seafarer and his/her employer.

Summary
This form includes the following information:

- Name and address of Seafarer's Employer
- Name, address and personal details of Seafarer
- Capacity in which the Seafarer is to be employed
- Place of work
- Reference to any relevant Collective Bargaining or other Enterprise Agreement
- Wages
- Overtime
- Leave entitlement
- Period of Work Agreement
- Conditions under which the Work Agreement can be terminated
- Notice period for termination
- Repatriation (to ensure I am not left stranded in a foreign port)
- Repatriation for Seafarers under 18 years of age
- Health and Social Security entitlements
- Dispute resolution
- Right to seek advice
- Signatures

Mental wellbeing of seafarers

The Maritime Labour Convention includes concern for the mental wellbeing of seafarers, especially -

- the issue of poor mental health and the associated risks that can arise as a result from a life at sea;
- the need for an understanding of the social, emotional, physical, intellectual and spiritual wellness of the seafarer whilst on board a ship and whilst ashore.

Note

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Social Responsibilities

Drugs & Alcohol, Health & Hygiene

**National & international regulations**

The crew of a vessel must abide by the laws and regulations concerning the use of drugs and alcohol which are contained in the Ship's Safety Management System, the laws of Australia, the STCW convention and the laws of the country in which the vessel is operating.

**Punishment**

The punishment for infringing the above laws and regulation can be extremely severe, especially relating to the possession, consumption or selling of illicit drugs. The death penalty is imposed by many countries on those who are found to be involved in drugs.

**Recent cases**

Please refer to recent cases including:

- Schapelle Corby,
- the so called Bali Nine and
- other cases in Indonesia;

An Australian citizen, Van Tuong Nguyen, was executed in Singapore for drug trafficking in recent years.

**Drug and Alcohol Abuse**

Drug Addiction and Alcoholism are DISEASES. Alcohol is the most frequently abused drug. It puts the Central Nervous System and the mind to “Sleep”. Abuse can lead to increased brain, liver and blood vessel damage. There is a high risk of diabetes, high blood pressure, vision disturbances, neurological and psychological problems. Each year alcohol is responsible for a large percentage of

- At Sea Accidents
- Road Fatalities
- Assaults
- Rape Cases
- Suicides
- Fire Deaths

**Illicit Drugs - The consumption of non-prescription drugs is an illegal activity. Drugs result in:**

- Discipline Problems
- Possible Vessel arrested
- Possible Crew arrested or worse
- Trauma Associated with Withdrawal Often Severe

**PROFESSIONAL HELP IS A MUST!**

**How authorities detect drug & alcohol consumption**

- Most waterways authorities in the world will perform mandatory drug and alcohol testing following a marine casualty or serious marine incident in their waters.
- The typical blood/alcohol limit is 0.04% (approximately 2 drinks); however this does vary for each country I might visit during my maritime career.
- Waterways authorities throughout the world can conduct random drug and alcohol tests.
- I can expect to be tested following any serious marine incident.
- The Australian Navigation Act 1912 details Australian law relating to the behaviour and responsibilities of crew, ships Masters, Shipping Companies etc. and includes penalties for breaches of the law. The act specifies the limits of consumption for crew on Australian registered ships.

**Australian Law**

- Marine orders are issued by AMSA.
- They provide specific instructions on how the Navigation Act 1912 is to be applied in the Australian marine industry.
- These orders are many in number and are issued as required by AMSA to fulfil it's role as the regulator of the Australian Marine Industry under Australian law.
- Technology is constantly developing and as new problems arise as a result of technology as well as developing social standards and other developments in our changing world, new orders are needed to clarify the application of the Navigation act 1912.

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**Occupational Health and Safety (Maritime Industry) Act 1993**

- An Act to promote the occupational health and safety of persons employed in the maritime industry and for related purposes.
- It sets standards, obligations and requirements of operators within the Australian Maritime Industry.
- Copies of the above Acts and Marine Orders are available from the Commonwealth Government Attorney General's website at http://www.comlaw.gov.au/.

**Don't Tolerate Drug Takers**

If I suspect that a crew mate is taking drugs, it is my responsibility and obligation to report my suspicions as drug taking on the part of any crew member is a serious risk to the ship and the lives of everyone on board. Signs of drug taking include:

- Sudden changes of mood
- Unusual irritability
- Loss of appetite
- Loss of interest in work, hobbies or social life
- Bouts of drowsiness or sleepiness
- Strange behaviour or evidence of telling lies
- Petty theft and unexplained loss of money and personal possessions
- Unusual smells, stains or marks on the body, on clothing or in cabin

Penalties can be severe for drug users and crew found to exceed the blood/alcohol limit. In US waters, the US Coast Guard require any person found to exceed the maximum blood/alcohol limit or to have traces of illicit drugs in the samples taken to attend the Employee Assistance Program (EAP) in addition to the penalties or imprisonment involved with the offence.

Alcohol and drug addiction must be treated as an illness. However, a patient must assume responsibility for his actions!

**Health and hygiene on board**

**Moral responsibility to keep clean & healthy**

- It is essential for harmonious relationships on board that everyone is considerate of other crew members by limiting noise in accommodation areas, showering every day and after completing a sweaty job, changing sweaty or dirty clothes, taking good care of health, exercising daily and eating well.
- Modern ocean going ships of medium to large size are capable of making more fresh water every day than the crew can use to meet an acceptable standard of hygiene and cleanliness.
- Stay healthy by performing regular exercise and eating well.

Notes

**Ship's personnel must be highly motivated**

- We all excel when we are doing something that we like doing and we are motivated to do it well. Even if we are very capable of doing a thorough job of a particular task but we are disinterested, we will not do as good a job in the shortest time that we could if we were interested in it.
- We must be motivated positively to achieve a result in any job but if we are truly interested in what we are doing and we are positively motivated to do the job well then the result will always be superior.
- One way of motivating crew under our supervision is to delegate responsibility to them. In reality we are still responsible for their actions but they feel a sense of ownership in a task that is given to them to complete without close supervision. This is how inexperienced crew who have previously demonstrated their skills in a particular job become masters of that task. If we delegate work and the crew completes that work satisfactorily then a little positive feedback to them will highly motivate them to strive to achieve that same sense of satisfaction the next time I give them a job to do. Positive motivation grows on itself.

**Summary**

- The importance of interpersonal relationships on board a vessel at sea cannot be overstated. The crew I work with are present and near I around the clock.
- We can either treat each other as we would family members or suffer constant friction.
- Good delegation builds trust which results in good relations which motivate the crew to work together in a positive, safe, co-operative and productive environment.
- Drug and alcohol abuse can be very costly and may lead to prosecution of ship and the individual and may also result in dismissal and permanent loss of a sea career.

Notes

**Health and hygiene on board**

**Moral responsibility to keep clean & healthy**

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**Cleanliness and good housekeeping is fundamental to good health**

Cleaning up after myself is very important on board a ship. It takes no effort at all to make a space untidy by what I do in that space. To keep the space neat and clean takes just a little effort and yet makes a big difference to how other people feel. If I make a cup of coffee the worst thing I could do is to leave the dirty cup and utensils in the sink or on a table for someone else to clean up after me. My attitude is reflected in the way I leave a space after I have occupied it and other people will judge me by my behaviour.
Leaving food scraps on a plate or spillage of food on a table is also an invitation to vermin to feed and reproduce, which could lead to an unhealthy living environment.

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Notes

# Module 6: PSSR Course – Understand & take actions to control fatigue

## Section 1 – Causes of fatigue

Introduction -

- Sleep is an essential physiological process for humans. When deprived of sleep, we function less effectively, feel tired and irritable, make more mistakes, are less creative and ultimately can lead to death.
- In the same way as a feeling of hunger reminds us of the basic human need to eat, a feeling of sleepiness reminds us of our essential need to sleep.
- A night's sleep consists of several repeating sleep cycles, each composed of different sleep stages.
- During these sleep cycles the body secretes hormones which control various bodily functions, repair and rejuvenate the body.
- As a general rule, the average adult needs around 8 hours of sleep a night but in practice actually gets little more than 7 to 7.5 hours.
- 6 to 10% of the adult population appears to need substantially more sleep than the average (9 or 10 hours or more a night), while about 5% can get by quite well on less than 6 hours a day.
- In a few extremely rare cases, as little as 3 hours may be enough for certain individuals to function without excessive daytime sleepiness or impaired performance.

Reduced sleep quantity & quality - Reduced sleep quantity and quality results in –

- the sleep cycles not being completed,
- drowsiness during waking hours,
- reduced ability to concentrate on complex tasks and
- a general reduction in work performance.

Sleep debt -

- The effects of repeated sleep depravation are cumulative.
- Over a period of say several weeks of sleep depravation, a person's work performance continues to deteriorate.
- Sleep debt can be 'repaid' by taking extra sleep following a period of sleep depravation.

Changing schedules -

- An ocean going vessel is operational 24 hours a day and crew are required to be alert and fully functional during what would be normal hours for sleep if they were working on land instead.
- It takes more than one day for people to adapt to sleeping when they would otherwise be active during the hours of daylight.
- Changing schedules results in a reduced alertness and functionality in crew members and should therefore be avoided if possible.

Workload -

- Increased workload has a detrimental effect on the quality of sleep.
- The performance of a person who is already in *sleep debt* will deteriorate significantly with an increased workload.

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Time spent awake -

- In assessing sleep time it is important to take into account the time that a seafarer is awake during rest periods.
- For example, rest time and the opportunity for sleep can be seriously reduced by interruptions caused by ship inspections, drills, emergencies and operational interruptions caused by inexperienced crew on watch requiring assistance with the running of the ship.

Individual health status -

- Poor pre-existing health can also affect the quantity and quality of sleep.
- Inadequate sleep can also result in ill health and a reduction in immunity to disease.
- Continued long-term sleep depravation can contribute to severe health issues.

**The effects of physical, mental & environmental stressors in & outside of the ship & their impact on seafarers' levels of fatigue.**

The effect of noise, vibration, lighting & ventilation -

- These days ships are getting faster and are crewed by less people. The opportunity for working a continuous repeating cycle of hours is reduced by the shorter voyage times.
- When in port there is significant financial pressure on the Master to turn the ship around quickly. This can result in noise & vibration caused by continuous cargo loading and unloading when in port. Sharp, loud noises & vibrations can result in interruptions to a person's sleep cycles.
- Cargo movements at night also require bright lighting for safety reasons and this is yet another factor that can make it hard for an off-watch crew to sleep.
- In some cases all crew are required for the loading and unloading of cargo and this can result in significant *sleep debt* caused by sleep depravation.

Stress -

- Stress can result from a lack of sleep.
- An inability to go off to sleep can also result from stress.
- Stress can arise when fatigued and performing complex tasks and especially when there is a need for speed.
- Stress is sometimes expressed in a seafarer's apparently abrupt or unfriendly manner when communicating with other people. A person being spoken to in a rough way might respond in a similar way and further stress is the result.

Notes

## Module 6: PSSR Course – Understand & take actions to control fatigue (cont.)
## Section 2 – Circadian rhythms & the importance of sleep

Circadian rhythm

- All humans have a built-in Circadian Rhythm, which is synchronised with our Biological Clock.
- A person's Biological Clock is adjusted by external environmental cues, the most important of which is daylight.
- A person's Biological Clock uses these cues to naturally synchronise or reset itself each day to within just a few minutes of the Earth's 24-hour rotation cycle.
- The Circadian Rhythm regulates sleeping and feeding patterns, alertness, core body temperature, brain wave activity, hormone production, regulation of glucose and insulin levels, urine production, cell regeneration and many other biological activities.
- Some of these hormones create drowsiness and lower body temperature.
- Other hormones are used to form glucose or blood sugar to enable anti-stress and anti-inflammatory functions in the body.
- Growth hormone is essential to the repair and restoration processes of the body, particularly during deep non-REM (Random Eye Movement) sleep.

Notes

**The importance of sleep**

Sleep is essential for a person's health and wellbeing. Yet millions of people do not get enough sleep and many suffer from lack of sleep.

The importance of having sufficient and uninterrupted deep sleep in a shipboard environment is essential for a safe and efficient operation of the vessel.

Some of the on-board factors that can detract from both the quantity and quality of sleep are:

- Noise from continuing shipboard operations;
- The need for bright lighting to continue shipboard operations such as cargo loading and unloading, fishing and packaging;
- Interruptions by less experienced crew seeking operational advice;
- Extremes of cold or heat;
- Rough weather;
- Changing work schedules resulting from the need for fast turnarounds in port;
- Shorter passage times due to faster ship speeds;
- Emergencies;
- Drills;
- Having fewer crew on-board means two 6 hour watches per day leaving only two X 6 hour rest periods in total for sleep, rest, recreation, communications, exercising and consumption of meals;
- It is not unusual to be expected to exceed on watch hours as necessary to maintain ship operations.

**Different types of sleep**

**Non-REM (Non-Rapid Eye Movement) Sleep**

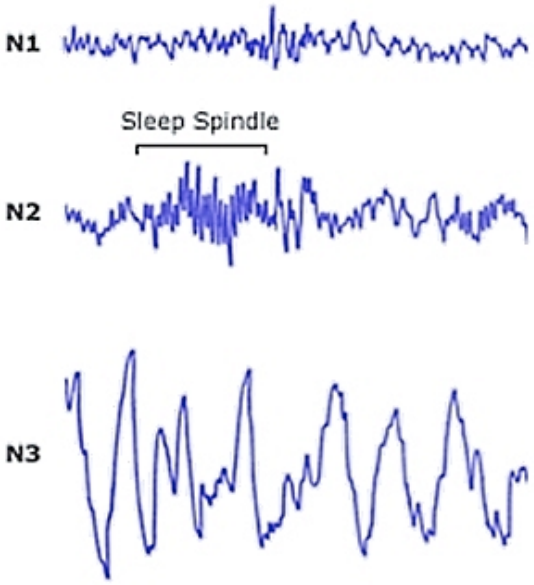
Non-REM sleep, which is perhaps best defined negatively as any sleep not recognisable as REM sleep, consists of three separate stages (stage1, stage 2 and stage 3), which are followed in order upwards and downwards as sleep cycles progress.

**Stage 1** (NREM1 or N1) is the stage between wakefulness and sleep and is sometimes referred to as somnolence or drowsy sleep, in which the muscles are still quite active and the eyes roll around slowly and may open and close from time to time.

The brain's electrical wave patterns can demonstrate the three stages of non-rem sleep.

Stage 1 is the period of transition from relatively unsynchronised and faster brain waves which occur during the awake state to more synchronised but slower brain waves.

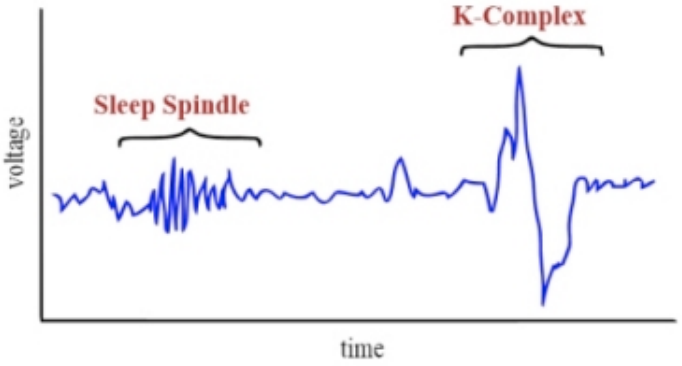
Notes




During stage 1 sleep breathing gradually becomes more regular and the heart rate begins to slow. Dreaming is relatively rare during this stage but sudden twitches are quite common as the last gasps of waking control before sleep takes over.

During this short period of very light, easily disrupted sleep, usually lasting less than 10 minutes, the sleeper may be aware of sounds and conversations but feels unwilling rather than unable to respond to them.

A person awakened during this period will often believe they have never slept at all. Typically, this stage represents only about 5% of the total sleep time.




**Stage 2** (NREM2 or N2) is the first unequivocal stage of sleep during which muscle activity decreases still further and conscious awareness of the outside world begins to fade completely.

If any sounds are heard, the sleeper is not able to understand their content at this point.

Brain waves during stage 2 are mainly in the lower frequency wave range but in addition stage 2 is characterised by two distinguishing phenomena:

- Sleep spindles in the form of short bursts of brain activity lasting about half a second each and
- K-complexes in the form of short negative high voltage peaks followed by a slower positive complex and then a final negative peak with each complex lasting 1-2 minutes - see the diagram above.

Together these serve to protect sleep and suppress response to outside stimuli as well as to aid in sleep-based memory consolidation and information processing.

Sleepers pass though this stage several times during the night resulting in more time being spent in stage 2 sleep than in any other single stage.

Typically stage 2 sleep constitutes about 45%-50% of total sleep time for adults.

**Stage 3** (NREM3 or N3) is also known as deep or delta or slow-wave sleep (SWS).

During this period the sleeper is even less responsive to the outside environment and is essentially cut off from the world and unaware of any sounds or other stimuli.

Stage 3 sleep occurs in longer periods during the first half of the night and represents around 15%-20% of total adult sleep time.

Stage 3 is characterised by low frequency waves along with some sleep spindles, although much fewer than in stage 2.

As well as neuronal activity, other physical indicators such as brain temperature, breathing rate, heart rate and blood pressure are all at their lowest levels during stage 3 sleep.

Dreaming is more common during this stage than in the other non-REM sleep stages.
This is also the stage during which sleep-walking, sleep-talking and bedwetting might be experienced.

Information processing and memory consolidation also takes place during this period.

It is much more difficult to wake a person during stage 3 sleep and if awakened at this stage they will often feel very groggy and may take up to 30 minutes before they attain normal mental performance.

**REM (Rapid Eye Movement) Sleep**

REM sleep occurs in cycles of about 90-120 minutes duration throughout the night.

It accounts for up to 20-25% of total sleep time in adult humans.

In particular, REM sleep dominates the latter half of the sleep period especially the hours before waking.

The REM component of each sleep cycle typically increases as the night goes on.

As the name suggests, it is associated with rapid and apparently random side-to-side movements of the closed eyes.

This eye motion is intermittent. It is still not known exactly what purpose it serves but it is believed that the eye movements may relate to the internal visual images of the dreams that occur during REM sleep.

Brain activity during REM sleep is largely characterised by low-amplitude mixed-frequency brain waves, quite similar to those experienced during the waking state. Medium to high frequency brain waves more typical of high-level active concentration and thinking occur during REM sleep.

The brain's oxygen consumption is also very high during this period and is often higher than when awake and working on a complex problem. This is an indication of the brain's higher energy consumption during this part of our sleep cycle.

Breathing becomes more rapid and irregular during REM sleep than during non-REM sleep and the heart rate and blood pressure also increase to near waking levels.

Although the muscles become more relaxed during non-REM sleep, they become completely paralysed and unresponsive during REM sleep.

The brain areas involved with long-term memory and emotion are highly active during REM sleep.

Although most people do not tend to wake after each cycle of REM sleep, we are more likely to wake from REM sleep than from non-REM sleep. Usually, these "micro-awakenings" are of a few seconds only and the sleeper does not normally remember them.

However, if a person is over-stimulated, that person might wake up fully and it might then take the length of an entire sleep cycle (1.5 - 2 hours) to get back to sleep.

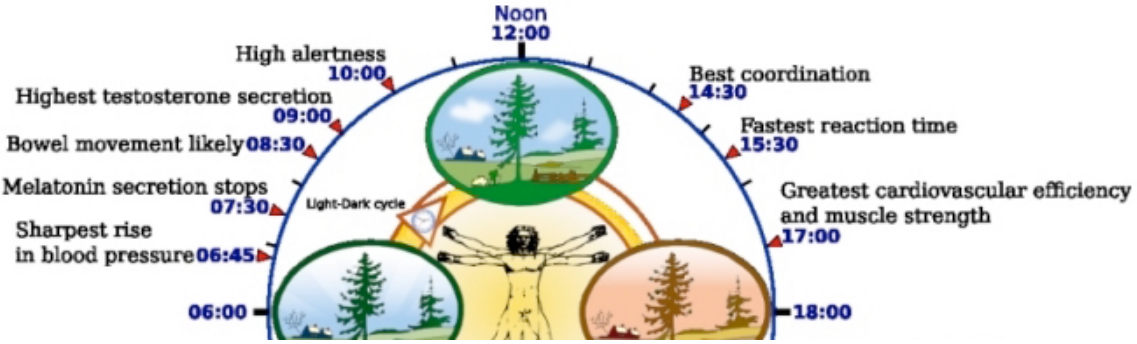
**Window of Circadian Low (WOCL)**

"Sleep pressure", or the need for sleep, expresses itself at different levels depending on the time of day. There are times when a person can hardly sleep at all and if they do, then the sleep provides a substandard quality of recuperation.

On the other hand, there are also times – in particularly between two and six in the morning – in which the urge to sleep is especially strong. The restorative effects of sleep are also much better if one sleeps during this period.

This time period at night is referred to as the Window of Circadian Low (WOCL).

**Daily pattern of alertness**



The period of alertness which is controlled by our Circadian Rhythm is indicated in the above illustration.

- High alertness is indicated at 10.00 AM.
- Best coordination is indicated at 2.30 PM
- The fastest reaction time is indicated at 3.30 PM.
- Optimum alertness, coordination and reaction time is in the period from mid-morning to late afternoon.

**Summary of the key factors effecting sleep quality on board a ship**

**24 hour operation of ships at sea -**

- An ocean going vessel requires watch keeping, navigation and maintenance right around the clock.
- It is therefore necessary to impose a work schedule on the crew that enables these tasks to be performed on a non-stop basis around the clock.
- Typically the crew will be split into two groups. Each group will work at least 6 hours twice daily.
- Sleep will be undertaken during the off watch periods of 6 hours each. The reality is that crew will only sleep for part of the time that they have off-watch.
- Therefore their Circadian Rhythms will be significantly disrupted when they join the ship.
- It can take several days for the Circadian Rhythm to adjust to the sleep schedule.

Notes

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**Interruptions to sleep periods**

- Sleep will be interrupted by the noise, light, vibration and movement caused by the operation of the ship at sea.
- When less experienced crew are on watch there can be interruptions to sleep patterns caused by these crew members seeking advice, guidance or supervision.
- Drills can be conducted at any time and all members of the crew are expected to take part, whether or not they are sleeping at the time.
- Emergencies require all crew to perform immediate actions.
- On some vessels the operation at times requires the involvement of all crew, including those who are off-watch at the time.
- Other factors that can interrupt sleep include poor health of the seafarer resulting in pain, discomfort when lying in one position, coughing, snoring, insect bights as well as the smells, snoring, coughing, movement or other discomfort caused by sharing a cabin with another crew member.

**Exposure to 'Blue Light'**

- The light from computers, IPads, smart phones and other personal electronic devices is “short-wavelength-enriched,” meaning it has a higher concentration of blue light than natural light.
- Exposure to this 'Blue Light' immediately prior to sleep affects levels of the sleep-inducing hormone melatonin more than any other wavelength.
- This makes it more difficult for us to go to sleep.

Notes

## Module 6: PSSR Course – Understand & take actions to control fatigue (cont.)
## Section 3 – Consequences of fatigue

My performance on the job can be significantly impaired when I am fatigued.
Impairment will occur in every aspect of human performance:

- Physically,
- Emotionally, and
- Mentally.

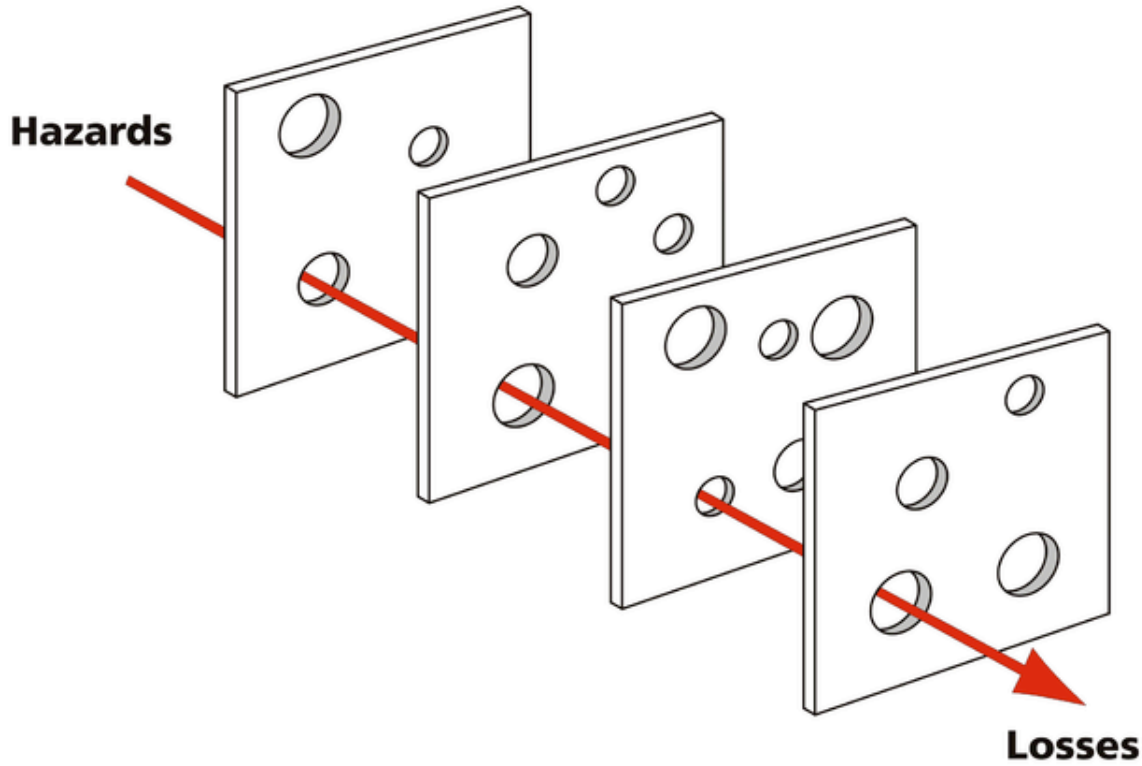
This results in:

- Poor decision making,
- Slow response time,
- Misjudgement,
- Reduced hand-eye coordination, and
- countless other skills.

The Swiss Cheese analogy helps to understand how accidents can happen.

It likens human systems to multiple slices of Swiss Cheese, stacked side by side, in which the risk of a threat becoming a reality is reduced by the differing types of defences layered behind each other.

It is reasonable to assume that a weakness in a single defence would be compensated for by the existence of other defences.




However, if none of these defences are perfect then they might all *'have holes in them'*.
When the slices of defences are brought together and one hole in each slice lines up with holes in all the other slices then there is nothing left to stop an accident from taking place.

The key backup defence against an accident occurring is the human intervention. If this defence is weakened by fatigue or absent all together then the likelihood of an accident occurring is greatly increased.

Just one example of the possible consequences of crew fatigue is the grounding on reefs or beaches of vessels both small and large due to the watch keeper going to sleep.

Maritime studies have also confirmed the association between fatigue and poor performance.

Fatigue is dangerous in that people are poor judges of their level of fatigue. Following examples of fatigue's known effect on performance.

- Fatigued individuals become more susceptible to errors of attention and memory. E.g., it is not uncommon for fatigued individuals to omit steps in a sequence;
- Chronically fatigued individuals will often select strategies that have a high degree of risk on the basis that they require less effort to execute;
- Fatigue can affect an individual's ability to identify, interpret and react to visible or audible warning signs of dangerous situations developing;
- Fatigued seafarers often take longer to react to signs of danger once they have been identified.
- Fatigue also affects problem solving which is an step in processing new tasks

Particularly dangerous situations at sea resulting from sleep debt are brief, uncontrolled and spontaneous sleep episodes whilst working. These are called micro sleeps.

The pressure for sleep increases progressively across successive days of sleep restriction.

This is particularly evident in individuals who are on duty during their circadian low.

During a micro sleep the brain disengages from the environment and no longer responds to visual information and sounds.

Seafarers working duty schedules that disrupt their body clock and subsequently do not get enough sleep are particularity at risk of micro sleeps.

Signs of fatigue can be grouped into three categories:

- Mental - e.g. loss of mental sharpness,
- Physical - e.g. yawning, micro sleeps and
- Behavioural - e.g. irritability or being in a bad mood.

The table below outlines some of the major symptoms under each category; however, it is not inclusive. Additionally, many of these symptoms may be subtle.

Notes

**Fatigue signs and symptoms**

**Mental Symptom Signs**

Inability to concentrate

- Unable to organise a series of activities
- Preoccupied with a single task
- Focuses on a trivial problem, neglecting more important ones
- Reverts to old but ineffective habits
- Less vigilant than usual
- Decline in ability to solve complex problems
- Lapses of attention
- Difficulty multitasking Diminished decision-making ability
- Misjudges distance, speed, time, etc.
- Fails to appreciate the gravity of the situation
- Overlooks items that should be included
- Chooses risky options
- Difficulty with simple arithmetic, geometry, etc.
- Greater indecisiveness Poor memory
- Fails to remember the sequence of task or task elements
- Difficulty remembering events or procedures
- Forgets to complete a task or part of a task
- Memory lapses Slowing of mental processes
- Responds slowly (if at all) to normal, abnormal or emergency situations

**Physical Symptom Signs**

- Involuntary need to sleep
- Slow eyelid closures
- Droopy eyelids
- Itchy eye
- Involuntary sleep attacks
- Nodding off
- Inability to stay awake Loss of control of bodily movements
- Speech difficulties (it may be slurred, slowed or garbled)
- May appear to be drunk
- Affected speech e.g. it may be slurred, slowed or garbled or hard to find the right words
- Feeling heaviness in the arms and legs
- Increased frequency of dropping objects like tools or parts
- Difficulty with hand-eye coordination skills (such as, switch selection)
- Tremor
- Clumsiness Health Issues
- Headaches
- Giddiness
- Rapid breathing
- Digestion problems
- Leg pains or cramps
- Insomnia
- Sudden sweating fits
- Heart palpitations / irregular heart beats

**Behavioural Symptom Signs**

- Mood change
- Quieter, less talkative than usual
- Unusually irritable
- Decreased tolerance and anti-social behaviour
- Depression Attitude change
- Less desire to socialize
- Fails to anticipate danger
- Fails to observe and obey warning signs
- Seems unaware of own poor performance
- Too willing to take risks
- Ignores normal checks and procedures
- Increasing omissions and carelessness
- Displays a "don't care" attitude
- Weakness in drive or dislike for work
- Loss of appetite (and sometimes an increase in unhealthy eating habits)
- Low motivation to perform optional activities

**Sleep debt**

Irregular work hours over more than two weeks has long term effects on health and clinical illnesses increasing the risks of:

- Pain
- Stress
- Obesity
- Coronary heart disease
- Gastrointestinal disorders and
- Diabetes

Long term affects also point to mental health problems such as negative mood states and depression.

A substantial body of literature has linked long working hours, defined as more than 60 hours per week, over several years, with poorer health such as:

- Lower mental health status
- Self reported hypertension
- Heart problems
- High blood pressure
- Gastrointestinal disorders
- Job dissatisfaction
- Smoking and
- Effects on eating and sleeping as a result of disruption to a seafarer's Circadian Rhythm.

Fatigue is known to detrimentally affect performance and may reduce:

- Individual and crew effectiveness and efficiency
- Decrease productivity
- Lower standards of work and may lead to
- Errors being made.

The high instances of injuries and accidents related to fatigue within maritime operations results in great economic, environmental and human cost.

Unless steps are taken to alleviate fatigue it will remain a hazard to ship safety.

Fatigue management systems which address the risks of fatigue and its causes are therefore essential.

**A Case Study in Fatigue**

**The Master**

We'll call him John, it's not his real name. He joined the shipping company in 1999 as a Chief Officer. In 2004 the UK Maritime and Coastguard Agency issued a certificate of equivalent competency. This allowed him to sail on British-flagged ships as a master. Later that year he took his first trip as a relief master, with a second turn as relief master in February 2005. All in all he'd spend five months as a relief master before boarding a new vessel on July 18th 2005. For the first time in his career, he was master of his own ship.

**The Ship**

She was the Lerrix, a 73 and a half metre long general cargo vessel of 1989 gross tonnes built in 1976.

She had a crew of seven. Registered in Hull, UK under the British flag she had previously been flagged in Bermuda. Why that was important we'll see in a moment.

**The Navaids**

The navigational aids on the bridge were basic, but complied with statutory requirements: There were two radars, neither had an automatic radar plotting aid, or ARPA, capability. There was a stand-alone Global Position System receiver to identify the ship's position, and an Automatic Identification System, or AIS, which transmitted the vessel's identity and position to others in the area and displayed the name and position of similarly equipped vessels on a screen aboard the Lerrix. John felt that another piece of equipment would be useful: an Electronic Chart display. There wasn't one on the bridge so he brought his own. When he boarded the Lerrix he mounted his personal GPS receiver on the bridge console and plugged it into a laptop computer which he placed in front of a comfortable chair. This was used by himself and the officer on watch.

The navigational software was made by Transas, a much respected provider based in Russia. Although there are several cheap, and sometimes free, navigational software products available, the software in John's laptop was a pirated version he had downloaded from the internet. It hadn't been updated for six years. It didn't have the way-point, cross track and other alarms that legitimate navigational software offers.
John's informal navigational aid did not breach company regulations because at the time the company did not have any regarding personal navigational equipment. The company regulations were well behind technology developments, and didn't take account of the fact that personal electronic navigational systems cost little more than a night out on the town.

**The Voyage**

So, at 21.00 hours October 8, 2005, with John as the Officer on Watch, the Lerrix left the Alexandra Dock in Hull, sailed downriver and at 23.00 set a course across the North Sea to the River Elbe and the Kiel Canal. She was laden with second hand cars and containers bound for Klaipeda, Lithuania, on the Baltic Coast.

At midnight, John handed the watch over to the first mate and went below to take his six-hours rest. He didn't get much sleep. Several times he woke up, lit up a cigarette and drank coffee as he watched the traffic on the Elbe pass by. Weighing heavily on his mind was distress at the death of a colleague two weeks before, a loss which he had yet to come to terms with.

John relieved the First Mate at 06.00 and at 07.45, with a pilot aboard, entered the Kiel Canal.

Nothing remarkable happened for the next few hours and at 12.00 hours he was relieved by the First Officer again went below for lunch then put his feet up for a few hours. But he didn't get much rest: At 13.00 and 14.00 he went to the bridge to check on the vessel's progress and at 15.00 he went to the bridge as the ship entered the final lock on the Kiel Canal. About a half hour later the vessel left the Kiel Canal and commenced the last leg of her journey to Lithuania. John went below again at 16.45 for supper.

When John returned to the bridge at 18.00, in darkness, he brought with him a burden of fatigue that had built up since leaving Hull. He opened the bridge door to take away the smoke for his cigarettes and chugged coffee to keep going. Even so, it didn't show. The ship's AB/Cook arrived on the bridge at 19.45 for lookout duty and didn't see anything amiss with the John's behaviour.

The cook had never been briefed on the seriousness of lookout duty. If he had, he might have approached his task with more enthusiasm but he had something on his mind. He was due to leave the Lerrix the next day and he wanted to hand over a clean gallery to his relief. His job on the bridge was to be a lookout, but he saw his real job as being a clean cook.
For the next two and a half hours the two men chatted until, sometime between 22.30 and 23.00 hours he requested permission to clean the galley. John agreed. It was probably the worst decision of his career.

What John didn't know is that the bridge watch alarm wasn't working. A watch alarm sets off an alert at intervals, pushing a button on the bridge switches off the alarm until the next interval. The idea is to make sure that someone is awake on the bridge.

**Watch alarm**

He didn't know the Lerrix watch alarm was disconnected because in the nearly three months he'd commanded the vessel, he hadn't discovered that the Lerrix had a watch alarm. He didn't know that because the watch alarm button hadn't been marked. It was something anonymous on the console that nobody bothered to ask about.

Under the Bermuda registry, if two or less ABs are on the bridge, a watch alarm must be fitted. When the vessel switched to the British registry the AB compliment on the bridge was increased to three and the watch alarm was no longer a statutory requirement.

Alone on the warm, darkened bridge, in a comfortable chair, with the glow of the laptop and its crippled navigational software, and an unknown and disconnected bridge watch alarm, and the gentle, soothing movements of the vessel, John feel asleep with the ship on autopilot.

For all practical purposes, the vessel was now NUC, not under command.

As John slept soundly for the first time since leaving the Alexandra Dock more than a day before, the vessel headed for the Darss Peninsular on the German Coast.

The vessel missed a course alteration, left its traffic lane and headed for dry land.
As John sleeps The Lerrix misses a course alteration at 2254 at full speed.

German Traffic control at Warnemunde realised something was wrong. A patrol launch, the Arkona, was sent to investigate. VHF calls to the errant vessel went unanswered. She sailed silently like the Mary Celeste.

The grounding was not very dramatic. In fact, when it came at 23.42, it was so gentle, no-one on the ship noticed, least of all our cozy captain. She just drove herself up the beach at full power and went on doing so for nearly 18 more minutes. The cook, who was showering at the time, didn't notice, nor did the First Mate who was preparing for his watch at midnight.

A few seconds before midnight, John woke up, saw the radar in front of him and hauled the engine telegraph to full astern. Engine room alarms sounded as the First Mate entered the bridge. But the Lerrix was aground.

Nobody was hurt, there was no pollution, and only the vessel's paintwork was damaged, although it probably wasn't a great career move for John on his first full command.

**The Fatigue Factor**

John's problem was fatigue. As a Master, fatigue comes with the territory, yet it's something for which there is little training or preparation. Mandated rest periods and drinking coffee simply aren't enough, it's also a matter of using available resources to combat fatigue. There is a need for training in fatigue countermeasures but unless it is made mandatory, it isn't likely to happen. When he let the lookout leave the bridge, John was without the support he needed simply to keep awake and alert. It was a bad decision; indeed, the official Maritime Accident Investigation Branch report called it 'irrational', typical of fatigue. A sleepy captain was now on watch alone. Once he had made that decision, everything else, from the unknown watch alarm to the mute pirated software fell into place and made the grounding all but inevitable.

**Doing The Numbers**

If 'all but inevitable' sounds presumptuous consider this: In a Maritime Accident Investigation Branch study of 66 selected incidents involving 75 ships over nine years, one third had a fatigued officer on the bridge alone. The Lerrix had a fatigued officer on the bridge alone. In two thirds of the incidents no proper lookout was being kept. The Lerrix was not keeping a proper lookout. A third involved a sole watcher on the bridge at night. There was only one man on watch on the bridge of the Lerrix that night. If I're maths smart, I'll notice that all comes to one and a third, the Lerrix fitted the profile a little more than 130 per cent.

**The Numbers**

- Fatigued Officer on bridge – 33%
- No Proper Lookout – 66%
- Single Watchkeeper – 33%
- Total- 133.32%

Putting a crew on a ship costs a lot of money and the industry is very cost sensitive. Manning is the biggest single cost factor in this very competitive environment. On some vessels, like the Lerrix, costs are trimmed by utilising the master as a watchkeeper, alternating with the chief officer. According to the Maritime Accident Investigation Branch report on the Lerrix, ships of under 3,000 gross registered tonnes, like the Lerrix are more likely to be involved in a grounding.

**Snooze Control**

Fatigue will remain a factor in maritime accidents for the foreseeable future. So how do we deal with it? First, accept the reality of fatigue and take defensive measures.

**Plan Ahead**

There are certain times in a passage when a master must be on the bridge whether or not it's his rest period, examples in this case were the entrance and exit to the Kiel Canal. Look at the passage plan, identify those events and try to allow for them in scheduling watch-keeping routines. If I can schedule the night watch so I am off the bridge and resting before sunrise, I'll have a better chance of getting real sleep.

**Be Wary**

If I am not getting fully rested, or like John under additional personal stress, don't just try to 'cope', take positive measures. Drinking coffee can help for a while but if lack of rest and stress continues, as it did with John, I am building up a fatigue debt that will have to be paid and it can make matters worse. Better still, drink water or fruit juices.

**Avoid Being Alone, Stay Active**

At night, try to avoid being on the bridge alone. If I do have to be alone, use the watch alarm. Don't make myself too comfortable, because that's what my fatigue is waiting for. Find means to maintain mental stimulation: Don't sit there with nothing to do and stare at a glowing computer screen as John did. Make-work if I have to, check positions, take star sights, renew my acquaintance with the sextant, in fact anything that keeps me moving and my mind working. Keep physically and mentally active.

**Have Breakfast**

I might take a tip from the movie industry, which is also subject to the rigors of working at night in a stressful environment: have breakfast as the first meal of my working day, whenever than day begins. If my first watch is at 6pm, have a breakfast-type meal: bacon, eggs, cornflakes, whatever I would normally have at the start of the day. It'll set off some psychological and physiological triggers that can help I maintain alertness.
And I can increase my resistance to fatigue by rest, exercise and a balanced diet. We'll be looking at those issues in the future.

As for John's snaffled and silent software, well, would I want a pirate on my bridge?

***Our thanks go to marineaccident.org for this extract from their website***

Notes

## Module 6: PSSR Course – Understand & take actions to control fatigue (cont.)
## Section 4 – Fatigue mitigation

### Cures for fatigue

What can seafarers do?

- Really the only cure for fatigue is sleep.
- The most effective strategy to fight fatigue is to ensure that I get the very best quality and quantity of sleep. The provision of adequate sleep opportunity is important to ensure adequate sleep.
- Sleep loss and sleepiness can degrade every aspect of human performance such as decision making, response time, judgement, hand eye coordination and countless other skills.
- The company should provide I with an adequate sleep opportunity for recovery.

In order to be effective in satisfying my body's need sleep must meet three criteria:

  - Quantity
  - Duration
  - Quality &
  - Continuity

Sleep is most valuable if obtained in a single block. A short sleep or nap can provide a powerful boost to alertness. However, it is important to know that napping does not eliminate the need for sleep.

### Schedule rest breaks

Rest breaks

- Short rest breaks within duty periods
- Rest, apart from sleep, can be provided in the form of short breaks or changes in activities during the duty period.
- Rest pauses or breaks are indispensable may be helpful as a physical requirement if performance is to be maintained over long periods of time.
- Factors influencing the need for rest are the length and intensity of the activities prior to a break or a change in activity, the length of the break, or the nature or change of the new activity.
- It is recognised that in a shipboard environment this may not always be feasible, however as much as possible short breaks should be planned into the duty period.
- Techniques for optimising rest breaks
- A short sleep or nap can provide a powerful boost to alertness. Research has identified strategic napping as a short-term relief technique to help maintain performance levels during long periods of wakefulness.
- Naps as short as 10 to 15 minutes are known to deliver measurable benefits. Naps are helpful in maintaining performance if sufficient longer sleep is occasionally missed.
- The most effective length of time for a nap is about 20 minutes.
- I should take naps in the way that I believe best suits me.
- Napping should be encouraged to be a planned activity of fatigue management and prevention. This means that if I have the opportunity to nap I should take it.
- However, there are some drawbacks associated with napping. One potential drawback is that naps longer than 30 minutes will cause sleep inertia (waking in a bad mood because the process of deep sleep is interrupted).

**What I can do to get a good sleep**

Optimise my sleep opportunity

When I am given adequate opportunity for sleep it is essential to take full advantage of it.

- If possible, develop consistent sleep times by going to bed at the same time every day)
- Develop and follow a pre-sleep routine to promote sleep at bedtime such as having a warm shower, reading calming material or just making a ritual of pre-bed preparation.
- Get sufficient sleep, especially before a period when I expect that time for adequate sleep will not be available. A white noise generator or ear plugs can be of use if I can sleep with them in
- Avoid stimulating activities prior to sleep such as exercise, television and movies
- Make the sleep environment conducive to sleep by reducing the light & noise levels & adjusting ventilation & heating or cooling in the accommodation space
- A sleep mask be used to reduce light intensity
- Whenever possible, ensure that I give myself enough time in bed for plenty of sleep
- Satisfy any other physiological needs before trying to sleep - if hungry or thirsty before bed, eat or drink lightly to avoid being kept awake by digestive activity and always visit the toilet before trying to sleep
- Avoid alcohol and caffeine alcohol, caffeine and other stimulants prior to sleep (keep in mind that coffee, tea, colas, chocolate, and some medications, including cold remedies and aspirin contain alcohol and/or caffeine). Avoid caffeine at least six four hours before bedtime
- Consider relaxation techniques such as meditation and yoga which can also be of great help if learnt properly
- Do not nap during the day if I have difficulty sleeping during my normal sleep period.
- Limit the use of personal electronic devices prior to bed time.
- Avoid interruptions to my sleep by colleagues
- Seek professional help if I suffer from a sleep disorder or other medical or physical problem that keeps I awake
- Do my best to solve family problems at home before my departure for the ship
- Develop a plan to deal with concerns about work or other worries & focus on the solutions rather than the problems
- If the food I am served upsets me, talk to the Chef about what I would like to eat
- Medication can effect my sleep - seek professional advice on this
- Do not take banned substances - There is no place for me on the ship if I take recreational drugs
- Avoid using personal electronic devices such as computers, IPads, Tablets and Smart Phones which emit blue light before sleep as they can delay the onset of sleep
- Avoid social activities or high arousal just before my sleep period because this activity can result in an inability to sleep

If I continue experiencing inadequate sleep and the opportunity for recovery from work is not provided, my health, wellbeing and the safety of the ship will be at risk.

**Report my fatigue**

- All causes of insufficient or poor quality sleep should be identified and treated as potential shipboard hazards.
- On-board safety risk management must include these sleep deprivation hazards.
- The company should have processes in place to provide me with the opportunity to report situations which prevented me from obtaining adequate sleep.
- I should also report any situation where I feel at risk of making fatigue related errors, specifically when conducting safety critical tasks such as navigating in congested waters or in proximity of navigational hazards etc.
- The process can be as simple as verbally reporting to my supervisor or other senior officer or by utilising a Sleep Diary to monitor & report my sleep.

Notes

## Module 6: PSSR Course – Understand & take actions to control fatigue (cont.)
## Section 5 – Recording hours of work & rest

A summary of what AMSA Marine Orders Part 28 requires:

- Seafarers must record hours of rest for the duration of an assignment to a vessel
- Offences relating to false or misleading information or documents are prosecuted under Division 137 of the Criminal Code
- Seafarers must make a personal record of hours of rest every day
- Seafarers must transfer the personal record to the records of the vessel within 7 days after the period of rest to which the record relates
- The owner of a vessel must keep records transferred for at least one year
- The records of the vessel must be in a standardised format
- The owner of a vessel must, on request by a seafarer during the retention period, give the seafarer a copy of the records relating to the seafarer
- The records must be available for inspection by an inspector during the retention period

**Maximum work periods & minimum rest periods**

Abbreviated summary of AMSA Marine Orders Part 28 Requirements

The minimum hours of rest for a seafarer must be:

- 10 hours in any 24 hours; and
- 77 hours in any 7 days.
- The minimum hours of rest may be divided into 2 periods, of which 1 period must be at least 6 hours.
- The interval between consecutive periods of rest must not exceed 14 hours.

**Emergency or drill or other overriding operational conditions**

- In an emergency or if a drill is being conducted or essential shipboard work is being performed the master may suspend the watch schedule and personally perform any hours of work necessary and require another seafarer to perform any hours of work necessary during the emergency, drill or special work period.
- As soon as practicable after the special circumstances end the master must take a compensatory rest period and ensure that any other seafarer who performed work in a scheduled rest period while the circumstances existed is given a compensatory rest period.
- If a seafarer's minimum hours of rest are disturbed by call outs to work while the seafarer is on call (e.g. when a machinery space is unattended), the seafarer must be given a compensatory rest period.
- Required musters, fire-fighting, lifeboat drills and drills must be conducted in a way that minimises the disturbance of rest periods and does not induce fatigue.

Notes

**Watch schedules**

The owner of a vessel must ensure that current watch schedules are displayed in areas of the vessel easily accessible by all seafarers on board.

Watch schedules will

- Be in a standardised format
- Cover the anticipated schedule of service at sea and in port for each seafarer employed on board
- Refer to watch keeping duties as well as any additional work which is expected
- Contain the maximum hours of rest required under Marine Orders Part 28
- Provide a total scheduled work/rest/hour figure for each seafarer
- Be written in English

*Have a safe and rewarding career at sea!*

Notes