NDRF

AQUATIC DISASTER RESPONSE COURSE

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Saving Lives & Beyond...

National Disaster Response Force, India

DG'S FOREWORD

National Disaster Response Force has great responsibility towards providing an efficient and prompt "Humanitarian Assistance and Disaster Relief" to the victims of the disasters whether natural or man-made. An efficient, prompt and specialized disaster response mechanism cannot be made functional unless Force does not have a holistic, uniformed and well-structured disaster response training system.

NDRF can't realize its vision and mission unless it train and re-train its Officers and men. To be a multidisciplinary, multi-skilled and high-tech specialist Force, all out efforts are require to be made by identifying the specific disaster response training courses and devising a unified, structured and uniform course module as well as syllabus for these courses.

In addition to attain an effective and efficient disaster response capability, NDRF has also a prominent role to play to contribute significantly at inculcating a culture of preparedness amongst all stakeholders through community capacity building in training & awareness programme throughout the country in achieving greater aim of making India resilient towards disaster. To impart disaster response training to State Disaster Response Force in each State/UT is one of the primary responsibilities of the NDRF.

Based upon the extensive practical experience in operational and training activities since the raising of NDRF, a fresh detailed training needs analysis (TNA) has been done for adopting best practices in the disaster response training in preparing the instant Aquatic Disaster Response Course by the Trg. Dte, HQ NDRF. This "Aquatic Disaster Response Course Precis" would not only prove lighthouse to NDRF but for SDRF too. I am sure that this "Aquatic Disaster Response Course" would definitely prove to be a major step towards the future where a holistic, uniformed and well-structured disaster response training system which will hold the key to an efficient and successful disaster response mechanism.

(PIYUSH ANAND, IPS)
DG NDRF

IG's FOREWORD

The transformation of NDRF from its roots in combat operations to a highly specialized and humanitarian disaster response force has been a remarkable journey, marked by immense dedication and adaptability. This shift required a comprehensive reimagining of training practices, moving beyond the core competencies traditionally instilled in CAPF personnel.

Training, which began in the early 2006, involved the painstaking development of modules and courses, created with the expertise of both national and international specialists. While the syllabi and training materials prepared at various centers have served the force well, the rapidly evolving landscape of disaster management—encompassing new techniques, methodologies, and equipment—now necessitates a thorough reassessment of NDRF's training needs to ensure continued excellence in its mission.

Accordingly, a comprehensive Training Needs Analysis (TNA) was conducted, leading to the implementation of a new precis on ***Aquatic Disaster Response Course (ADRC)*** aimed at standardizing NDRF's training across all units and the NDRF Academy. As part of this effort, a thorough revision of existing modules was undertaken to ensure the training content remains relevant and effective.

After considerable effort, NDRF has successfully compiled and finalized the precis on Aquatic Disaster Response Course (ADRC) training, which will now be distributed to all units and the NDRF Academy. This initiative marks a significant step toward uniformity in ADRC training across the force. I commend the officers and the other Board members who prepared this precis for their tireless dedication and efficiency in completing this critical task within a remarkably short timeframe. My best wishes to everyone involved in this achievement.

(NARENDRA SINGH BUNDELA, IPS)

INSPECTOR GENERAL, NDRF

DIG's FOREWORD

I am pleased to acknowledge the invaluable support extended by the dedicated team of instructors, drawn from various units, the NDRF Academy, and the HQ NDRF, in preparing this ***ADRC (Acquatic Disaster Response Course)*** Precis for the NDRF personnel. It is my sincere duty to place on record my deep appreciation for the special efforts made by all the instructors who contributed their technical knowledge and expertise to this handbook.

I would like to extend my heartfelt gratitude to Sh. Harvinder Singh, 2IC (R & D), HQ NDRF, for his tireless involvement in reviewing the entire content through extended sessions. His previous experiences of unit operating in floods operations helped in preparing the precis and instrumental in modulating the contents, to meet the specific needs of the NDRF.

The valuable contributions and sincere efforts of all Board members made it possible to conceptualize and finalize this precise training material. The approach adopted in this handbook focuses on enhancing disaster response learning, equipping volunteers with essential knowledge and skills. It serves as a vital resource for standardizing the training modules of the ADRC.

Finally, I am profoundly grateful to Shri Piyush Anand, IPS, Director General NDRF, and Shri Narendra Singh Bundela, IPS, Inspector General NDRF, for their unwavering guidance and insightful suggestions in bringing this Precis to completion for the benefit of our NDRF Rescuers.

(B.B. VAID)

DEPUTY INSPECTOR GENERAL, NDRF

BOO/TEAM CONTRIBUTION

In preparing this ADRC book for the responders, the significant contributions made by **Sh. Harvinder Singh, Second in command, (R & D), HQ NDRF, Sh. Anupam, Dy. Commandant, Sh. Santosh Kumar Singh, Dy. Commandant, Sh. Pawan Kumar Yadav, Assistant Commandant, Inspector Pardeep Kumar and Inspector Nakul Kumar**. They have contributed through knowledge-based technical inputs to finally prepare the book.

Their valuable contributions and sincere efforts have eventually made it possible to conceptualize and prepare the hand book for the participants. The approach focuses on to facilitate learning and understanding of the required knowledge and skills by the responders. This book is intended to serve as an essential book in building a truly transformative approach in pursuit to become a 'professional responders'.

Finally, we would like to express my gratitude to **Shri Mohsen Shahedi, DIG (OPS/Trg), Shri H P S Kandari, Comdt 1st NDRF, Shri S K Singh, Comdt 9th NDRF and Shri Pranshu Srivastava, Second in command (Trg) of HQ, NDRF** for their guidance, constructive criticism and valuable suggestions for finalizing this **ADRC Book**.

Aquatic Disaster Response Course

LESSON-01

COURSE INTRODUCTION

CONTENT

OBJECTIVES:-

Upon completion of this lesson, you will be able to understand:-

1.1. About the course, methodology, training aids, classroom discipline and evaluation method.

1.1.1. Personal Introduction:

All participants, trainers, assistant trainers and other support personnel will introduce themselves.

1.1.2. Expectation of the participants:

The purpose of this short exercise is to find out your expectation from the Aquatic Disaster Response Course.

1.1.3. Reference material:

Whatever reference material is given to you for reading, you should keep it safe. Apart from this, you will also find additional reference for different lessons. Materials will be provided by instructors in the class.

1.1.4. Hand-outs

On various occasions the instructor will distribute hand-outs for practice in the context of the given task.

1.1.5. Course Method

This course is for adults and interactive lecture methodology/demo and practical training will be used for imparting training. Full participation and continuous exchange of ideas between the participant and the instructor will be almost requirement for this training. In this course, participants will acquire background knowledge and manual skills. Instructional and demonstration objectives will be clearly stated at the beginning of each lesson.

1.1.6. Objectives of Training

At the end of this course you will be able to know:-

i. Listing the steps for preparingthe equipment for Aquatic Disaster Response.
ii. Description of the procedure for assistance request and preparing documents.
iii. Reporting the situation and requesting resources. Assess the scene and listing the steps to reach the victim.
iv. To ensure the safety of both rescuers and victims.
v. To teach rescuers swimming, techniques for safety reaching and extracting individuals trapped in water bodies.
vi. To provide PHT to the victims who may sustain injuries or require immediate medical attention in aquatic disaster situations.

1.1.7. Evaluation Method

1.1.7.1. Weekly Test

After completion of every week participants progress will be assessed through weekly test.

1.1.7.2. Group exercise

After completion of every week participants will perform the group exercise to feel the actual scene of the incident.

1.1.7.3. Daily Assessment

After each day, participants will be evaluated by instructors and participants may also be able to analyse the highlights and shortcomings of that day.

1.1.7.4. Conditions For Passing The Course

It is very important to strictly follow the time in every activity of the course (lesson, practice and assessment). The minimum score to pass the courses will be 70% Marks in aggregate and to pass the endurance swimming will be mandatory.

1.1.8. Course Module and Attendance

The rules of participation and attendance in this course are as follows:-

- Participation in all classes and activities is mandatory.
- Be on time – This develops a sense of mutual respect and responsibility among the participants.

1.1.9. Feedback of Participants

After completion of the entire course, feedbacks will be taken about the entire course. With suggestions, necessary improvements will be made in the future courses.

1.1.10. Medical Aid

- During practical sessions of the course, there should be an ambulance along with nursing assistant near by the training area.
- The IRBs deployed during practical training must have first aid kit.
- A well trained team of Deep divers should be available during the practical sessions to handle any eventuality.

1.1.11. Any Question?

During the class you can ask the instructor any doubt or question related to the topic. If the instructor feels that they can give a better answer to that question later, it will be recorded in the file.

LESSON-02

AQUATIC DISASTER IN GENERAL

CONTENT

OBJECTIVES:

Upon completion of this lesson, you will be able to understand

2.1. Aquatic Environments
2.2. Definition of Aquatic Disaster.
2.3. IRS and Structure of rescue team.
2.4. Steps in the initial assessment stage during a FWR operation.
2.5. Phases of flood water rescue operation.

2.1. AQUATIC ENVIRONMENTS

Swimmers must have knowledge of potential dangers in different aquatic environments. An understanding of what constitutes safe, responsible behaviour around water will help to ensure safety. Various aquatic environments we come across are as under:-

2.1.1. Rivers

Rivers, creeks and water holes can be very dangerous and are often close to populated areas.

- Dangers to look for include the following:
  - Crumbling banks
  - Uneven and unsafe river beds
  - Submerged obstacles

- Stay safe at the river:
  - Never go alone.
  - Only participate in activities such as swimming and aquatic training.
  - Read and obey all signs in the area.
  - Always check the water carefully before entering safely.
  - Enter cold water slowly.
  - Watch out for and stay away from, ferry points/ boat areas.

2.1.2. Lakes and Dams

The flat, still appearance of lakes and dams often gives a false impression of safety. Strong winds can produce short, choppy, dangerous waves and reduced temperatures.

- The potential dangers include the following:
  - River entry points
  - Cold water
  - Waves

2.1.3. Swimming Pool

The local public swimming pool, a theme park or a hotel pool are popular places to enjoy a swim.

- Dangers may include:
  - Large crowds with young children, elderly people or inexperienced swimmers
  - Slippery surfaces around the edges
  - A varied depth of the water
- Stay safe at the public pool:
  - Read and obey notices giving advice to swimmers.
  - Obey the pool lifeguards.
  - Check the depth markings on the pool side to see where it is best to swim or dive.
  - Stay clear of deep water unless you can swim.
  - Make sure the water is clear before jumping in.

2.2. DEFINITION OF AQUATIC DISASTER:-

2.2.1. Definition:-

- Aquatic means relating to water, living in or near water or taking place in water.
- Water related disaster is called aquatic disaster.
- Aquatic disasters include flood, tidal waves, storm surge, tsunami etc.
- Excess or low water availability creates the situation of aquatic disaster.

2.2.2. Reasons of Aquatic Disaster

2.2.2.1. Enhance Water Level

From any reason when water level is certainly enhanced then, water is spread in all over area and creates a flood situation. Sometimes increased water level in dam may result in dam breach/failure leading to aquatic disaster.

2.2.2.2. Heavy Rain Fall

- **Moderate rain**- when the precipitation rate is between 2.5 to 10 mm per hour.
- **Heavy rain**- when the precipitation rate is between 10 mm to 50 mm per hour.
- **Violent rain-** when the precipitation rate is > 50 mm per hour.

2.2.2.3. Climate Change

Uncertain change of climate leads to heavy rain which causes flood.

2.2.2.4. Break In Dam Or Pier

Due to break down of dam or pier the stored water get discharged causing flood like disastrous situation.

2.2.2.5. Cloud Burst

Due to cloud burst, sudden heavy rain fall occurs creating a disaster like situation.

2.2.2.6. Excess Water Discharge From Dam

In a situation while excess water is discharged from a dam for safety of dam, the excess water discharged can create a situation of flood in some region. It is a type of aquatic disaster.

2.2.2.7. Uncertain change of river course

Some rivers like (Koshi, Brahamputra, Gandak) keep changing their course and many villages get flooded. This situation may lead to casualties, injuries and loss of livelihood.

2.2.3. Types of Aquatic Disasters

2.2.3.1. Flood

An over flow situation of water on to a normally dry land. The inundation of a normally dry area caused by rising water in an existing waterway, such as river, stream or drainage ditch.

2.2.3.2. Storm Surge

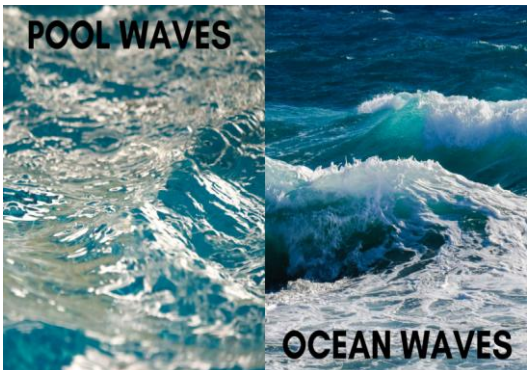
A storm surge is a rise in sea level that occurs during tropical Cyclones. The storms produce strong winds that push the water into shore, which can lead to flooding.

2.2.3.3. Tsunami

A tsunami is a series of waves in a water body caused by the displacement of a large volume of water, generally in an ocean or a large lake. Tsunamis are giant's waves caused by earthquakes or volcanic eruptions under the sea.

2.2.3.4. Tidal Waves

Tidal waves are caused by the rise and fall of the tide. These waves don't always flow into and out from shore/ they may flow across or at an angle to the shore. This often occurs at the entrance to bays, inlets and river mouths



2.2.4. Effect of Aquatic Disaster

- **Loss of Human Life**
- **Injury**
- **Loss of Livelihood**
- **Displacement**
- **Spread of Disease**

2.2.5. Do's and Don'ts

2.2.5.1. BEFORE DISASTER

- Ignore rumours, stay calm and don't panic.
- Keep your mobile phones charged for emergency communication.
- Listen to radio; watch TV, read newspapers for weather updates.
- Keep cattle/animals untied to ensure their safety.
- Prepare an emergency kit with essential items for safety and survival.
- Keep your documents and valuables in water-proof bags.
- Know the safe routes to nearest shelter/raised pucca house.
- Evacuate immediately to safe places when directed by government officials.
- Store enough ready-to-eat food and water for at least a week.
- Be aware of flash flood areas such as canals, streams, drainage channels

2.2.5.2. DURING DISASTER

- Don't enter floodwaters. In case you need to, wear suitable footwear.
- Stay away from sewerage lines, gutters, drains, culverts, etc.
- Stay away from electric poles and fallen power lines to avoid electrocution.
- Mark any open drains or manholes with visible signs (red flags or barricades).
- Do not walk or drive in the flood waters.
- Flood water can wash away vehicles as well.
- Eat freshly cooked or dry food. Keep your food covered.
- Drink boiled/chlorinated water.
- Use disinfectants to keep your surroundings clean.

2.2.5.3. AFTER DISASTER

- Do not allow children to play in or near flood waters.
- Don't use any damaged electrical goods, get them checked.
- If instructed, turn off utilities at main switches and unplug appliances.
- Don't touch electrical equipment if wet.
- Watch out for broken electric poles and wires, sharp objects and debris.
- Do not eat food that has been in flood waters.
- Use mosquito nets to prevent malaria.
- Be careful of snakes as snake bites are common during floods.
- Don't use the toilet or tap water if the water lines / sewage pipes are damaged.
- Do not drink tap water until advised by the Health Department that the water is safe to drink.

2.3. IRS AND STRUCTURE OF RESCUE TEAM

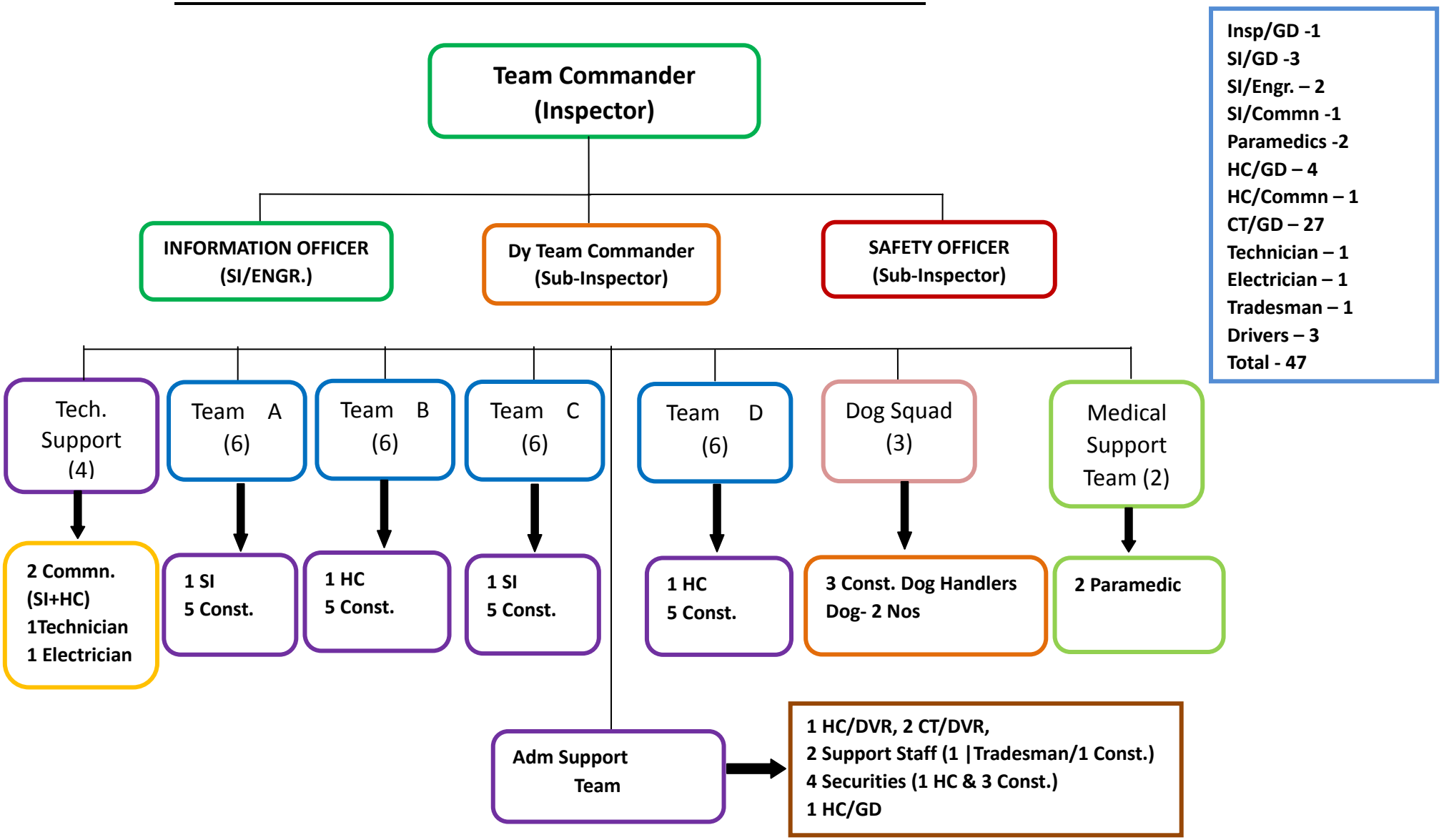
2.3.1. What is IRS?

- Standardized, on-scene, all-hazard incident management concept.
- Allows its users to adopt an integrated organizational structure.
- Has considerable internal flexibility.
- A proven management system based on successful practices.
- The result of decades of lessons learned in the organization and management of emergency incidents.

2.3.2. Why use IRS?

- Missions require coordination among several different agencies.
- India has adopted IRS to better integrate response in multi-agency activities - especially during disasters.

2.4. STRUCTURE OF FWR SEARCH & RESCUE TEAM OF NDRF



2.4. STEPS IN THE INITIAL ASSESSMENT STAGE DURING A FWR OPERATION

Initial assessments consist of a systematic and ordered procedure for analysing condition during FWR operation. The purpose is to ensure safety and protection to the fullest extent possible for the rescuers, bystanders and victims. It begins with the operation phase and continues until the rescue operation is completed.

The initial assessment consists of the following steps:

2.4.1. Compile information

Once reach at incident site, consult local authorities, gather data and conduct a need analysis. Confirm and update all information obtain.

2.4.2. Establish command post

After gathering information establish command post for smoothly conduct FWR operation.

2.4.3. Establish operational objects

- General access to the disaster site.
- Strategic planning and priorities.
- Allocating resources and personnel managing operations begun by local divers or other organization.
- Use proper PPE as per FWR operation such as Personal Floating Device (PFD), water rescue helmet and approved footwear.

2.4.4. Assign task to rescue squads

- Assign task to all rescue squads. All squads member must know about their assign task.

2.4.5. Reassess the situation and make necessary adjustment

- Reassess the situation and if mandatory then make necessary adjustment during any time of operation.

2.5. PHASES OF FLOOD WATER RESCUE OPERATION

2.5.1. PHASE I – ARRIVAL

2.5.1.1. Establish Command

a) On arrival, Team Commander shall assume Command and begin an immediate size up of the situation.

b) On arrival, Team of NDRF should be assigned Rescue Sector. Rescue Sector responsibilities include:

- Assuming technical rescue operations control.
- Identifying hazards and critical factors.
- Developing a rescue plan and back-up plan.
- Communicating with and directing Team resources assigned to Rescue Sector.
- Informing Command of conditions, actions and needs during all phases of the rescue operation.

c) Designate a Safety Officer. Considerations for Safety Officer include:

- One of the Regional Special Operations qualified Safety Officers.
- Any experienced Team Commander assigned to the incident.

2.5.1.2. Size-up

- Secure a witness to assist in gathering information to determine exactly what happened and the location of any victim(s). If no witnesses are present, Command may have to look for clues on the scene to determine what happened.
- Assess the immediate and potential hazards to the rescuers.
- Isolate immediate hazard area, secure the scene and deny entry for all non-rescue personnel.
- Assess on-scene capabilities and determine the need for additional resources.

2.5.2. <u>PHASE II- PRE-RESCUE OPERATIONS</u>

It must be determined if this will be a RESCUE operation or a RECOVERY operation based on the survivability profile of the victim(s) which include factors such as the location and condition of the victim(s) and elapsed time since the accident occurred.

2.5.2.1. Make the general area safe

- Establish a hazard zone perimeter.
- Keep all non-essential rescue personnel out of the hazard zone.
- Remove all non-essential civilian personnel at least 150 feet away from the hazard zone.

2.5.2.2. Make the rescue area safe

a) All personnel operating at or near the water shall be in proper Personal Protective Equipment (PPE) which will include at a minimum: Personal Flotation Device (PFD), approved water rescue helmet, and approved footwear.

b) Identify hazards that are present which include but are not limited to:
   - The volume of water.
   - The velocity of the water.
   - Debris in the water.
   - Depth of the water – rising / falling.

c) Assign personnel upstream.
   - Rescue personnel shall be assigned upstream to advise Rescue Sector of any upstream hazards that may affect the rescue operation.

d) Assign personnel downstream.
   - Rescue personnel shall be assigned downstream with throw bags to capture rescue personnel or victim(s) that may be washed downstream.

e) Assemble all necessary personnel, equipment and patient packaging equipment that will be required for the rescue operation.

2.5.3. PHASE III- RESCUE OPERATIONS

- Technical rescue operations shall be conducted by trained rescuers.
- Ensure that all personnel operating in operational area should wear appropriate PPE.
- Develop a rescue plan and a back-up plan.

2.5.3.1. The rescue plan

Rescue operations should be conducted with as little risk to the rescuers as necessary to affect the rescue. Low-risk operations may not always be possible but should be considered first.

The order of rescue from low-risk to high-risk are:

a) **Talk-** If water is calm or slow moving tries to talk the victim into self-rescue if possible.

b) **Reach**- Extend an arm, pike pole, rescue hook, or any other such object to reach the victim and pull from the water.

c) **Throw**- Attempt to throw the victim(s) a throw-bag rescue line or some other type of approved safety flotation device and "pendulum-belay" the victim(s) to the bank.

d) **Row**- If it is determined that a boat-based operation shall be utilized; Rescue Squad shall assign a company on the opposite bank to assist in establishing an anchor for an approved rope system.

e) **Go**- If it is not possible to row to the victim, Rescue squad should consider putting a rescuer or rescuers in the water to reach the victim.

2.5.3.2. Assess the victim

When the rescuers reach the victim, a primary survey shall be completed. If the victim is conscious, rescuers should determine if the victim can assist in the rescue. If the victim is unconscious, the rescue must be completed as quickly as possible.

2.5.3.3. PHT for victim

a) Initiate C-spine precautions as soon as possible.
b) Conduct a secondary survey and correct any life threatening conditions.
c) Provide for ALS level treatment and transportation to a hospital.

2.5.3.4. Roles and responsibilities of the women rescuers in FWR operation:

a) The deployment of women personnel in NDRF shall be made along with the teams (2/4/6 per team) on the basis of requisitions.
b) The deployment of women rescuers will be on need basis to be assessed by the local battalion Commander/HQ NDRF.
c) Women rescuers may be detailed for rescue and relief work in operations during International deployments also.

d) During flood disaster women rescuers be preferably detailed for rescue and evacuation of female victims/children to ensure/maintain their privacy and dignity.

2.5.4. PHASE IV- TERMINATION

a) Ensure personnel accountability.
b) Consider decontamination of victim(s) and rescuer(s).
c) Recover all tools and equipment used in the rescue/recovery.
d) Consider debriefing after Incident.

REVIEW:-

The participants learnt about:-

2.1. Aquatic Environments
2.2. Definition of Aquatic Disaster.
2.3. IRS and Structure of rescue team.
2.4. Steps in the initial assessment stage during a FWR operation.
2.5. Phases of flood water rescue operation.

LESSON-03

STUDY OF AQUATIC BODIES & FLOOD

CONTENT

OBJECTIVES:

Upon completion of this lesson, you will be able to understand

3.1. Study of water flow
3.2. Different types of water bodies.
3.3. Properties of water bodies and effect on rescue operation.
3.4. Definition of flood, types and effects.
3.5. Water bodies Hazards

3.1. STUDY OF WATER FLOW

3.1.1. Orientation

It is important to use common terminology when operating in a flooded environment.

When we refer to water flow we use the terms:

- **Upstream-**The direction the water is flowing from
- **Downstream-** The direction the water is flowing to
- **River right-** The right side of the channel when you are looking downstream
- **River left-** The left side of the channel when you are looking downstream.

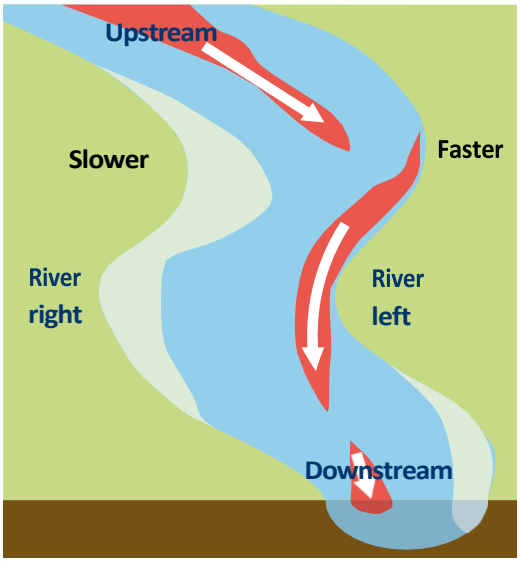
3.1.2. Speed of water flow

Water always flows in straight lines, which means that the flow of water is always faster on the outside of the bend and slower on the inside of a bend.

Slow water flow

Medium water flow

Fast water flow



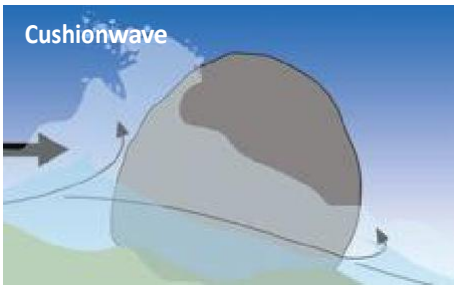
- The cross-section of the flow (shown below) shows us how water flows at different speeds, depending on how close it is to the riverbed or bank. The fastest flow will be in the center near the surface. The closer the flow is to the edges, the slower it will flow due to friction with the riverbed.

3.1.3. How objects affect water flow

Objects in the water will change the water flow.

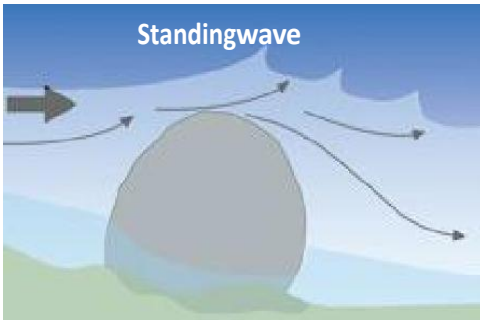
3.1.3.1. Cushion wave

An object that is higher than the water level will form a cushion wave on its upstream side. The water pushes up and against the object before falling away to the sides. Stay awayfrom the cushion wave to avoid getting trapped.



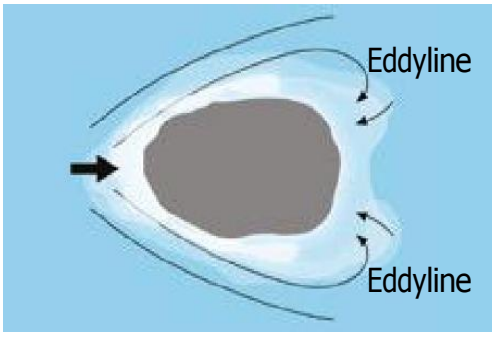
3.1.3.2. Standing wave

If water flow increases, a cushion wave will change to a standing wave. A standing wave indicates that there is an object under the surface of the water. Water is pushed up and over it and creates turbulent water. Be aware that there will be a hazard below astanding wave.



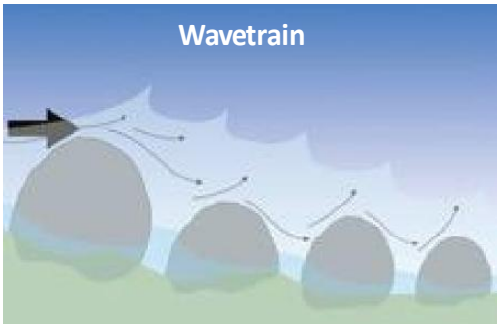
3.1.3.3. Eddy

- This is an area of circulating water out of the main flow.
- The line between the eddy and the flow is called the eddy line.



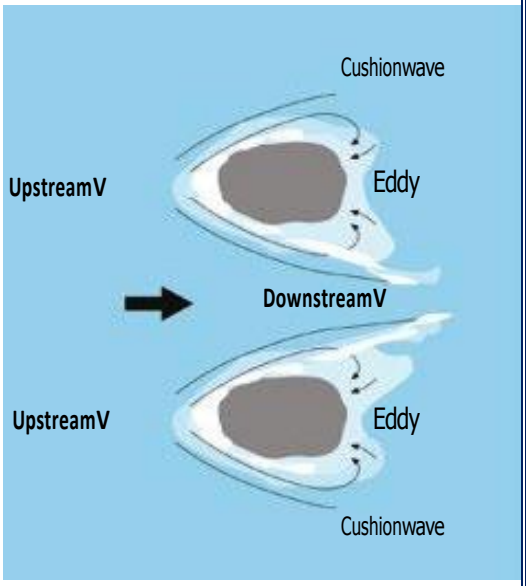
3.1.3.4. Wave train

- A series of standing waves is known as a wave train.



3.1.3.5. Upstream V

- Once water has hit the upstream side (forming a cushion wave), it then flows out, past the object creating a V shape pointing upstream.



3.1.3.6. Downstream V

- A downstream V is found between two objects in the water. This is an area of faster flow.
- Any object in the flow will be pulled into this faster flowing water.

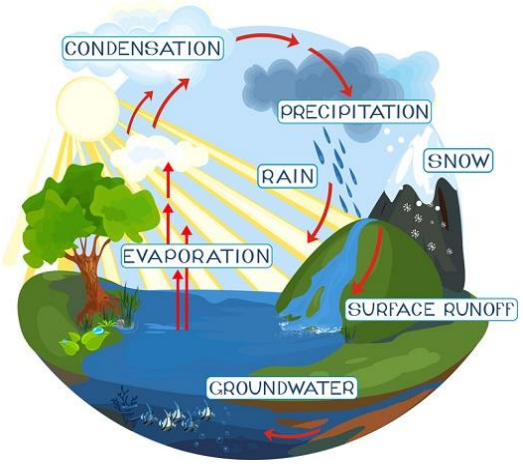
3.2. DIFFERENT TYPES OF WATER BODIES

3.3. PROPERTIES OF WATER BODIES AND EFFECT ON FLOOD WATER RESCUE OPERATION

3.3.1. Properties of water bodies

a) **Rain water**
b) **Surface water**
c) **Under ground water**

a) Rain water

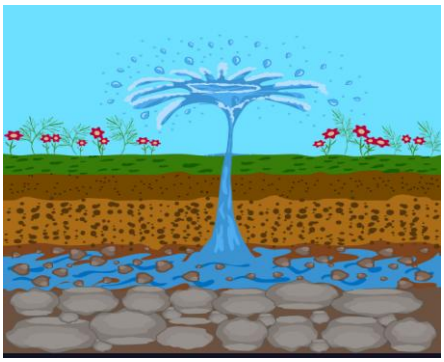


Rain is water droplets that have condensed from atmospheric water vapor and then fall under gravity. Rain is a major component of the water cycle and is responsible for depositing most of the fresh water on the earth. It provides water for hydroelectric power plants, crop irrigation and suitable conditions for many types of ecosystems.

b) Surface water

Surface water is water located on top of land,forming terrestrial (surrounding by land on all sides)water bodies and may be also referred to as blue water, opposed to the sea water and water bodies like an ocean.

c) Under ground water



Typically, ground water is through out of as water flowing through shallow aquifers, but in the technical sense, it also contains soil moisture, permafrost, immobilewater in very low permeability bedrock and deep geothermal or soil formation of water.

3.3.2. Effects on flood water rescue operation

a) Impacts on people and society

- Flooding can cause physical injury, illness and loss of life. Deep, fast flowing or rapidly rising flood waters can be particularly dangerous.

- Floodwater contaminated by sewage or other pollutants (e.g. chemicals stored in garages or commercial properties) is also likely to cause illnesses, either directly as a result of contact with the polluted floodwater or indirectly, as a result of sediments left behind.

- As well as the immediate dangers, the impact on people and communities as a result of the stress and trauma of being flooded, or even of being under the threat of flooding, can be immense.
- The ability of people to respond and recover from a flood can vary. Vulnerable people, such as the elderly, people with a disability or those who have a long-term illness are typically less able to cope with floods than others. Some people may have difficulty replacing household items damaged in a flood and may lack the financial means to recover and maintain acceptable living conditions after a flood.

b) Damage to property

- Flooding can cause severe damage to properties. Floodwater is likely to damage internal finishes, contents and electrical and other services and possibly cause structural damage.

c) Damage to infrastructure

- The damage flooding can cause to businesses and infrastructure, such as transport or utilities like electricity, gas and water supply, can have significant detrimental impacts on individuals and businesses and also local and regional economies.
- Flooding of primary roads or railways can deny access to large areas beyond those directly affected by the flooding for the duration of the flood event, as well as causing damage to the road or railway itself.
- Flooding of water distribution infrastructure such as pumping stations or of electricity sub-stations can result in loss of water or power supply over large areas. This can magnify the impact of flooding well beyond the immediate community.

d) Impacts on the environment

- Detrimental environmental effects of flooding can include soil and bank erosion, bed erosion, siltation or landslides. It can damage vegetation and pollutants carried by flood water can impact on water quality, habitats and flora and fauna. Flooding can however play a beneficial role in natural habitats.

e) Damage to our cultural heritage

- In the same way as flooding can damage properties, flood events can damage or destroy assets or sites of cultural heritage value. Particularly vulnerable are monuments, structures or assets (including building contents) made of wood or other soft materials, such as works of art and old paper-based items such as archive records, manuscripts or books.

3.4. DEFINITION OF FLOOD TYPES AND EFFECTS.

A flood is an overflow of water that submerges land that is usually dry. In the sense of "flowing water", the word may also be applied to the inflow of the tide. Floods are an area of study of the discipline hydrology and are of significant concern in agriculture, civil engineering, public health& safety.

3.4.1. Types of flood-There is several types of flood –

3.4.1.1. Flash Flood

3.4.1.2. River Flood

3.4.1.3. Coastal Flood

3.4.1.4. Urban Flood

3.4.1.5. Pluvial flood(pond flood)

3.4.1.6. GLOF

3.4.1.7. LLOF

3.4.1.1. Flash Flood:

A flash flood is a rapid rise of water along a stream or low-lying urban area. Flash flooding is usually caused by heavy rainfall in a short amount of time generally associated with cloud burst.

3.4.1.2. River flood:

River flooding is the most common type of flooding in many parts of the world. It occurs when a water body exceeds its capacity to hold water and usually happens due to hold water and usually happens due to prolonged heavy rainfall.

3.4.1.3. Coastal flood:

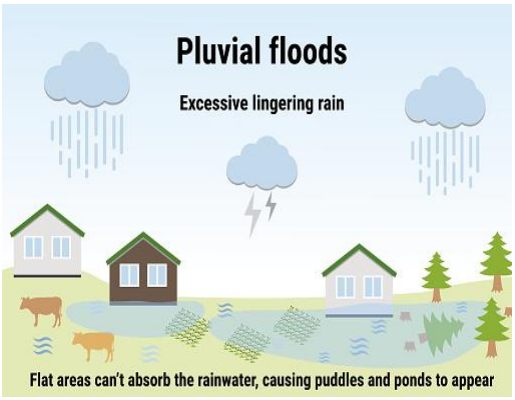
If a flood is associated with cyclone, high tides and tsunami, then it is called a coastal flood. These floods affect the coastal areas the most.

3.4.1.4. Urban flood:

Urban flooding is the inundation of land or property in a built up environment, particularly in more densely populated areas, caused by rainfall overwhelming the capacity of drainage system.

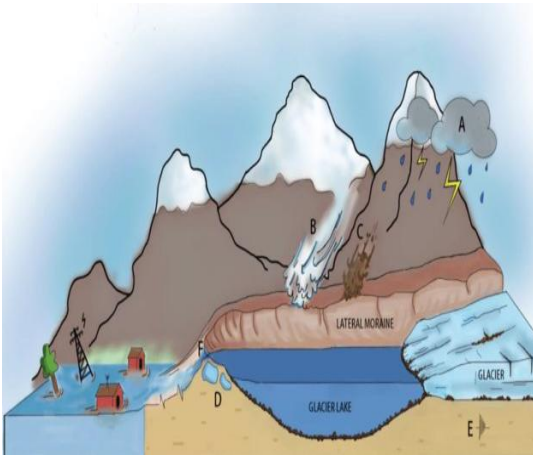
Although sometimes triggered by events such as flash flooding or snowmelt, urban flooding is a condition, characterized by its repetitive and systemic impacts on communities that can happen regardless of whether or not affected communities are located within designated floodplains or near any body of water.

3.4.1.5. Pluvial Flood (Pond Flood)



Pluvial flooding occurs when the amount of rainfall exceeds the capacity of urban storm water drainage system or the ground to absorb it. This excess water flow overland, pond in natural or manmade hollows and low-laying areas or behind the obstruction.

3.4.1.6. GLOF



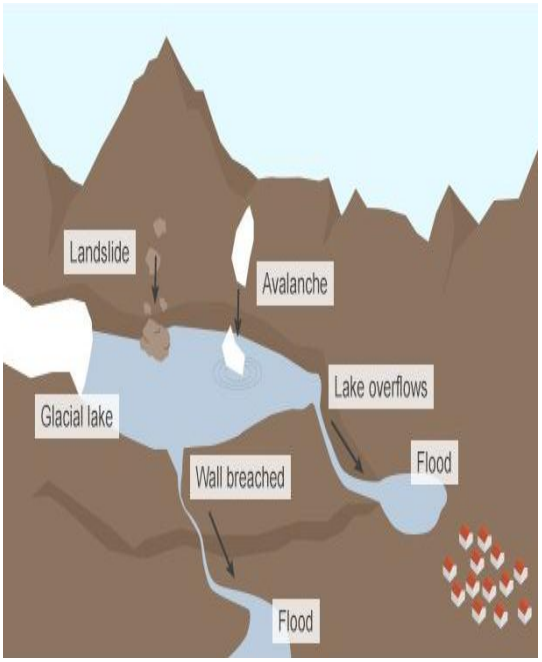
- A Glacial Lake Outburst Flood, or GLOF, is sudden release of water from a lake fed by glacier melt that has formed at the side, in front, within, beneath, or on the surface of a glacier.

- GLOFis a type of outburst flood caused by the failure of a dam containing a glacial lake. The dam can consist of glacier ice or a terminal moraine. Failure can happen due to:

  a) Erosion
  b) Avalanche
  c) Earthquake
  d) Volcanic Eruptions under the ice,

3.4.1.7. LLOF

Landslide Lake Outburst Floods (LLOFs) are common in the Himalayan river basins. These are caused by breaching of lakes created by landslides.



- A landslide or snow avalanche can create obstructions in the normal path of a flowing river or stream, which results in the formation of a temporary pool, or a dam-like situation.
- When this obstruction finally gives way to the force of accumulating water, it creates a situation similar to a lake burst. This is called Landslide Lake Outburst Flood.

3.4.2. CAUSES OF FLOOD-

- **Heavy rainfall**
- **Dams Collapse**
- **Snowmelt**
- **Cyclone**
- **Tsunami**
- **Over flow river**

3.4.3. NEGATIVE IMPACT OF FLOOD-

3.4.3.1. Drinking water- Drinking water gets contaminated during flood situation. Assume your water is contaminated if floodwater has reached your well or spring and do not use it for drinking until you know it is safe.

3.4.3.2. Transport- The flood event affects the transportation network and its connectivity by reducing, deviating or cancelling.

3.4.3.3. Economy- Economic loss is caused by a natural disaster such as a flood and drought. (Pure economic loss is usually defined as financial loss that excludes property damage.

3.4.3.4. Disease- Use of danger Contaminate water for drinking during flood can lead to typhoid fever, cholera and hepatitis.

3.4.3.5. Tourism- Flood impacts to the tourism include the decline of visitor's numbers and consequent business losses, damage to facilities and local infrastructure.

3.4.4. REDUCE THE FLOOD RISK-

Although flood risks can never be completely eliminated, there are mitigation measures to minimize the flood risk.

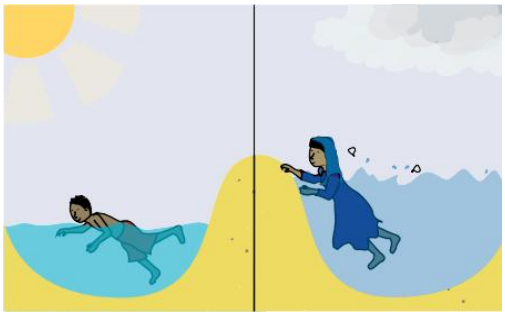
- **Plant more tree-** Trees help in holding soil in the ground. If any area, more trees are there, the effect of flood will be less on people.
- **Restore river-** Barrages are unhealthy for the environment in a long term, so restoring rivers will help rivers flowing in their own way.
- **Flood warning system-** If we install flood warning system at our residential area than the tragedy would not happen.
- **Better and safe homes-** During the floods, a lot of house get affected. So house in the flood area should be strong.

3.5. WATER BODIES HAZARDS

Types of Hazard

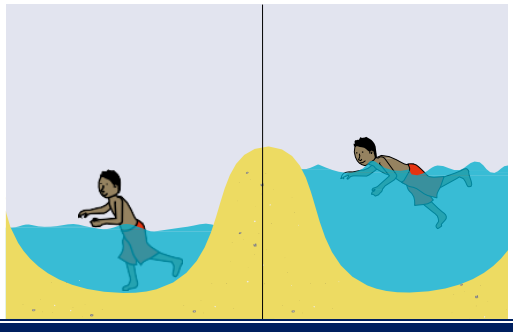
The flood environment can have many different types of hazards that a rescuer should be aware of.

3.5.1. Weather



The weather can cause floods. Areas that were previously easily accessible may be inaccessible following heavy rainfall. If there's fog, visibility will be limited.

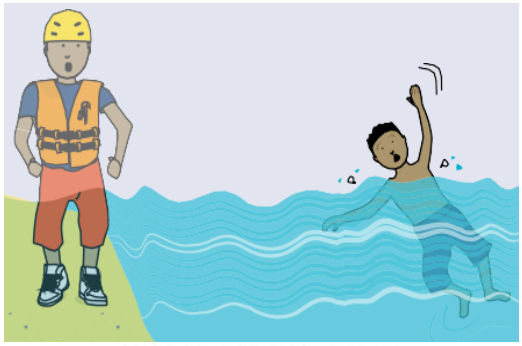
3.5.2. Tides



Natural water bodies can change very quickly depending on the tides.
High tides can cause coastal flooding and make rivers unable to cope with the amount of water they are carrying.

3.5.3. Water speed

Even when moving at only a few meters per second, water flow can create an incredible force even on small surfaces like your legs. At higher speeds, it can be impossible to fight against.

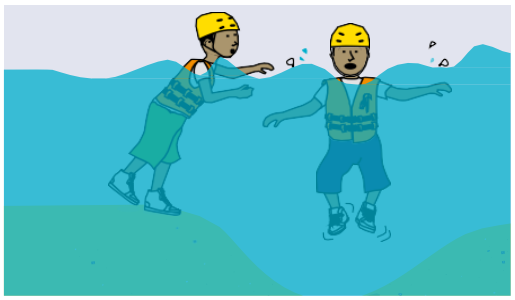


3.5.4. Water temperature

Water temperature can be a hazard both to the rescuer and casualties, especially if it is cold water.

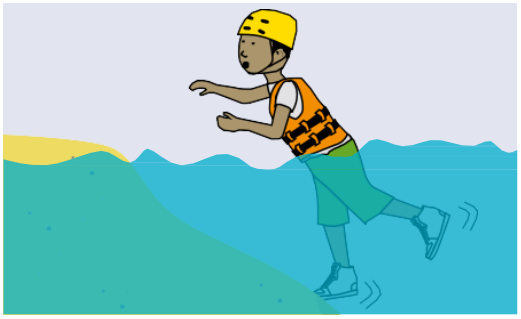
3.5.5. Water depth

A sudden change in water depth may result in a person stepping or falling into deep water beyond their capability.



3.5.6. Entry and Exit

Steep, slippery and unstable banks can limit access and exit from the water and also be a danger to the rescuers.



3.5.7. Entrapment

Entrapment occurs when a person gets caught on a submerged object or stuck in the mud. You should never put your feet down if you find yourself caught in the flow of water.

3.5.8. Electricity

In an urban environment rescuers may be working close to electricity cables as the flood water rises.

3.5.9. Floating debris

Within the flow, moving along with the water is likely to be floating objects. These have the potential to become hazards and can affect the flow of water.

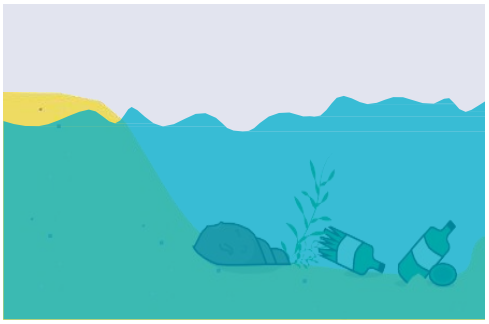
3.5.10. Strainers

Strainers are objects that allow water to pass through but hold larger solid objects. It can be a natural object, such as a tree hanging in the water, or manmade, such as gates or railings. In either case, the responders should avoid operating up stream of a known strainer.

3.5.11. Animals

Dangerous animals may be found in the flood water. Stay leart and keep away if you see any. Warn others if you can.

3.5.12. Under water objects



Responders should be ware of injuring themselves on dangerous objects such as sharp rocks, broken glass or under water debris. Foot protection or shoes shuld be worn shere possible.

REVIEW:-

The participants learnt about:-

3.1. Study of water flow
3.2. Different types of water bodies.
3.3. Properties of water bodies and effect on rescue operation.
3.4. Definition of flood, types and effects.
3.5. Water bodies Hazards

LESSON-04

SWIMMING & LIFE SAVING SKILLS

CONTENT

OBJECTIVES:

Upon completion of this lesson, you will be able to understand:

4.1. Swimming in General
4.2. Importance
4.3. Different swimming styles
4.4. Under water swimming
4.5. Self-Rescue swimming

4.1. SWIMMING IN GENERAL

- **INTRODUCTION**

  Swimming is an activity of propelling oneself through water using the limbs.

- **DEFINITION**

  Swimming is the self-propulsion of a person through water by combined arm and leg motions and the natural flotation of the body.

  - It can be a fun leisure and sports activity.
  - It is really a good low-impact way of staying in shape.
  - It could potentially save your life and others.

4.2. IMPORTANCE

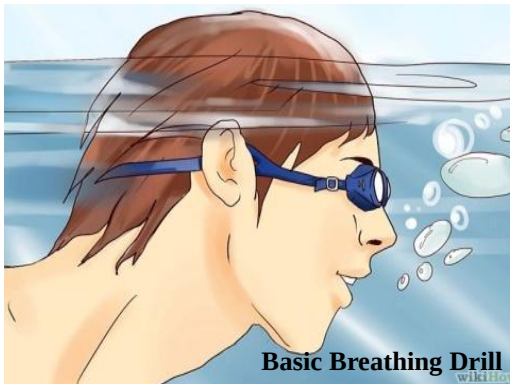
- It helps the rescuer to overcome the fear of water and as well as build the confidence of rescuer during rescue.
- It helps the rescuer to save their life as well as of other during disaster or any unforeseen situation.
- It provides full body exercise.
- Increases heart rate without putting stress on the body.
- Improves strength.

4.3. DIFFERENT SWIMMING STYLE

- **BASIC SKILLS IN SWIMMING**

There are seven basic skills in swimming which are as follows-

4.3.1. Blowing Bubbles-

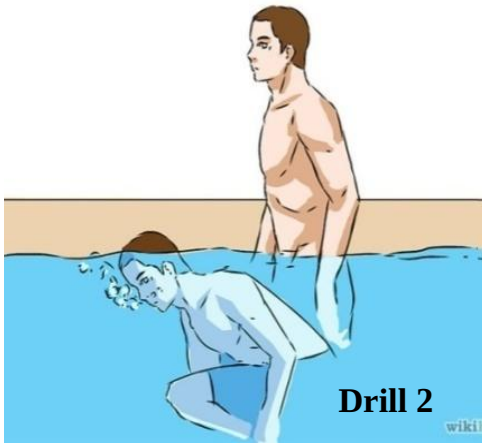


It improves breathing technique.

- **Drill #1:**

In shallow water, hold your breath and then crouch down so that your head gets under water. Hold for some seconds and then come back up.

- **Drill #2:**



Same as drill #1, but exhale under water through the nose so that you blow bubbles.

- **Drill #3:**

Same as drill #2, except that you now blow bubbles both out of your nose and your mouth.

- **Drill #4:**

In shallow water, crouch so that the water surface is between your nose and your mouth.
Now practice inhaling through the nose above water and exhaling through the mouth under water.

- **Drill #5:**

In shallow water, submerge your face and blow bubbles out of the mouth, nose, or both.
Then grab the border of the pool and try to get into a horizontal position face down while still blowing air out of the mouth and nose.

- **Drill #6:**

Still in shallow water blow of bubble so that your head rhythmically goes in and out of the water. Exhale while your head is submerged and inhale while your head is emerged.

4.3.2. Gliding through water

- Gliding helps you to get used to the sensation of moving through the water headfirst.
- Try gently pushing off the side wall of the pool, with your arms stretched out, in front of your head.
- Keep your head face-down in the water and glide until you slow down.

4.3.3. Floating technique

- Every rescuer can—and should—learn how to float in water. Knowing how to float can save one's life, and it's the first step in learning how to swim freestyle.
- The human body is, by weight, roughly two third of water. This means your density is similar to that of water. Thus, you shouldn't have to do much, to float on top of the water.

4.3.4. Types of floating

4.3.4.1. Horizontal Survival Float (Back Float)

How to back float?

- Prepare to float on your back.
- Adjust your head.
- Lift chin.
- Position arms correctly.
- Arch back slightly.
- Lift chest.
- Knees bend.
- Move your arms and legs slowly.

4.3.4.1.1. Dead man's float

Lying on the prone (face down in water) with minimal leg movement, and staying afloat with the natural buoyancy. Lift the head to breathe only then back to floating. This style is only to stay afloat and to rest.

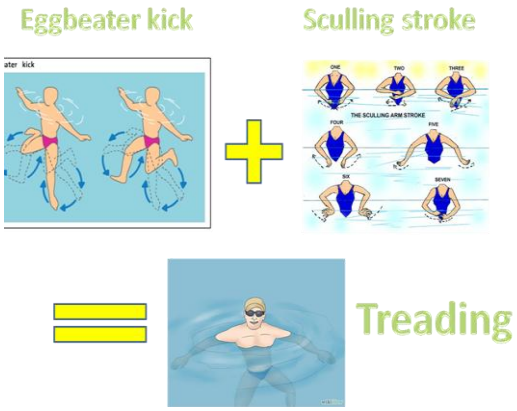
4.3.4.1.2. Starfish float

The starfish float is a basic swimming technique. To, do so, you float on your back or your chest in a horizontal position with the arms and legs spread.

4.3.4.1.3. Drown proofing

- It is commonly used in adult special rescuer training.
- In the drown proofing survival technique, the subject floats in a relaxed, near-vertical posture, with the top of the head just above the surface.

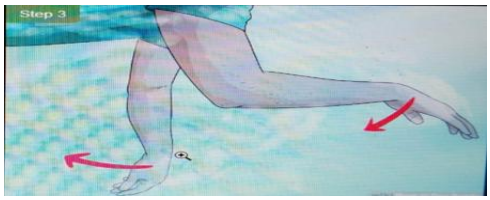
4.3.4.1.4. Treading water



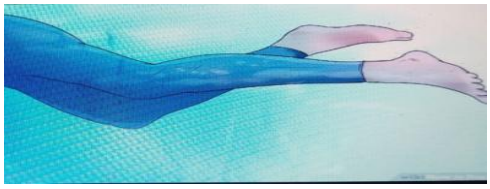
- Water treading is an aspect of swimming that involves a swimmer staying in a vertical position in the water while keeping his or her head above the surface of the water.
- It is a combination of an eggbeater kick and sculling.

4.3.4.1.5. Doggy paddle-

- This technique combining basic kicking with paddling arms. (Most often with head out of the water)



- Float upright in the water and take a deep breath.
- Lower your face into the water (keeping your mouth closed) and bring your arms forward to rest at water level.



- Relax in this position until you need to take in more air
- Raise your head above the surface. Treading water and exhale. Take another breath and return to the relaxed position.

- Combining basic kicking with paddling arms. (Most often with head out of the water).

4.3.4.1.6. Flutter kick

The primary purpose of the flutter kick is not propulsion but keeping the legs up and in the shadow of the upper body and assisting body rotation for arm strokes.

I. Front flutter – Freestyle

To flutter kick, start by pushing one of your legs down into the water with your toes pointed and turned slightly inward.

II. Back flutter – Backstroke

The flutter kick is a simple and efficient kick used in the front crawl/freestyle stroke, but also in the backstroke.

4.3.4.1.7. Coordination

It is the synchronization of movement of hands and legs with breathing. It takes time to master these skills in order to be a better swimmer.

4.3.5. SWIMMING STYLE/ STROKES

There are four swimming strokes-

4.3.5.1. Freestyle
4.3.5.2. Backstroke
4.3.5.3. Breaststroke
4.3.5.4. Butterfly

4.3.5.1. <u>FREESTYLE</u>

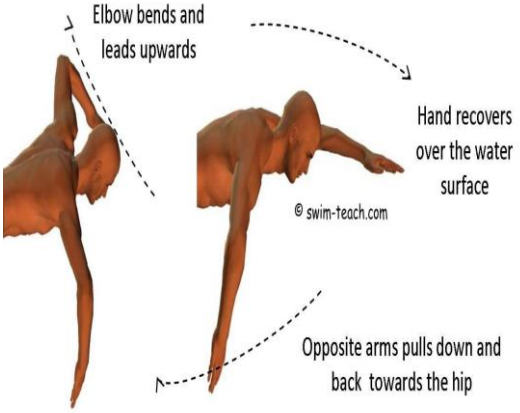
This is the most popular stroke and the easiest for beginners to learn. It is a simple flutter kick and windmill arm motion, like the backstroke, only on your belly. The most difficult part is coordinating the breathing since your face is in the water most of the time.

4.3.5.1.1. The leg kick:

- It's a flutter kick where the legs kick in an alternating order.
- Bend the knees slightly.
- Relax the feet and ankles (they should be almost floppy).
- Emphasize the down-kick for propulsion.

4.3.5.1.2. The arm stroke:

- Move the arms in an alternating windmill motion.
- Pull each arm through the water with equal strength and arm reach to ensure that you swim straight.
- Pull arms underwater in an "s" pattern.
- Cup the hands but keep the wrist and hand relaxed during recovery.



4.3.5.1.3. Breathing:

- Raise one arm to begin the stroke. As the shoulder rises, turn the head to catch a breath.
- Turn the head only enough to leave the water to breath. Do not lift the head because it will slow you down.
- Take as many breaths as necessary and then exhale through the nose and mouth when the head returns to the water.
- Repeat the head turn to the other side in coordination with the beginning of the opposite arm stroke.

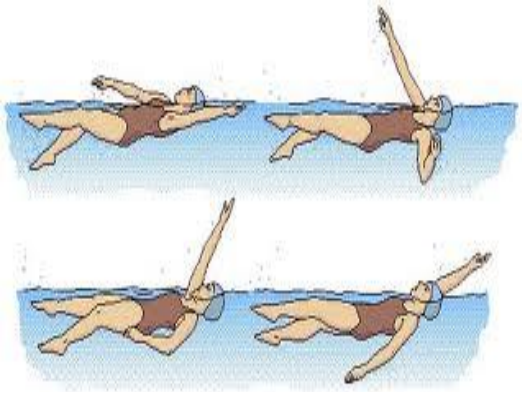
4.3.5.2. BACKSTROKE

- Similar to the freestyle in that you use an alternate windmill arm stroke and flutter kick.
- Two keys to a proper backstroke are that your arms move with equal strength, otherwise you will swim off to one side, and that your body rolls from side to side so that your arms catch enough water to propel you forward.

4.3.5.2.1. The leg kick:

- It's a flutter kick where the legs kick in an alternating order.
- Bend the knees slightly.
- Relax the feet and ankles (they should be almost floppy).
- Emphasize the up-kick for propulsion.

4.3.5.2.2. The arm stroke:



- Move the arms in an alternating, windmill pattern as they rotate and pass your face.
- Cup the hands, and the thumb leaves the water first.
- Move the hands in an "s" pattern when they are pushing the water.

4.3.5.2.3. Breathing:

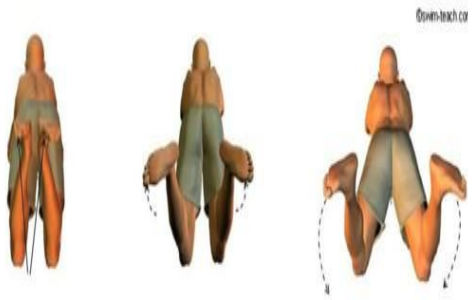
- Keep your head back and eyes toward the ceiling.
- You can find your own breathing pattern with the backstroke because the breathing is less coordinated with the arms and kick than other strokes since your head should always be out of the water.

4.3.5.3. BREASTSTROKE

This is a difficult stroke in comparison to free style. The basics are that your arms pull, you breathe, you kick (arms alternate with the kick), and you glide.

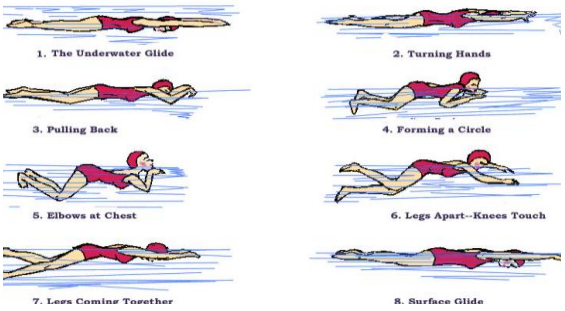
4.3.5.3.1. The leg kick:

- Bring the knees to chest.
- Thrust the legs backward and straight.
- Snap the legs together to push the water and propel you forward (frog kick).



4.3.5.3.2. The arm stroke:

- Start with the arms overhead.
- Pull on the water, and bring arms toward the chest.
- Keep the hands cupped.
- Return arms to starting position.



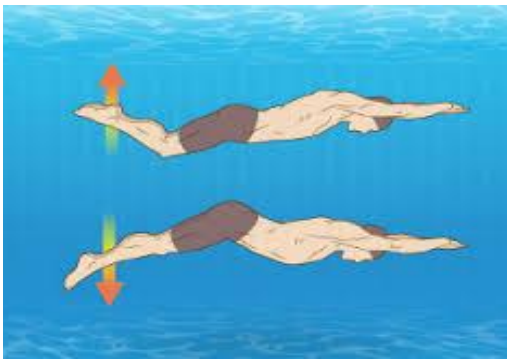
4.3.5.3.3. Breathing:

Breathe every time you stroke with your arms.

4.3.5.4. BUTTERFLY STROKE

During the stroke, the legs move together in a dolphin kick (imagine a mermaid), the arms move together to push the water downward and backward, and the torso undulates like an earthworm as the body moves forward through the water.

4.3.5.4.1. The leg kick:

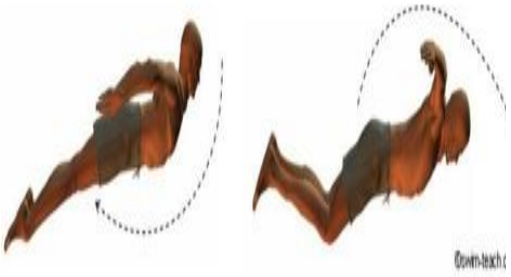


- Bend the knees slightly, and keep them together.
- Make a downward thrust by straightening the knees and whipping the feet downward.
- There should be two kicks for every arm stroke.

4.3.5.5. The arm stroke:

- Move the arms together, and pull through the water with the hands cupped.
- Face the palms outward, and press down and outward.
- Swing the arms forward above the water in a sweeping motion to complete the stroke.

4.3.5.6. Breathing:



Breathe at the end of the arm stroke.

4.4. UNDER WATER SWIMMING

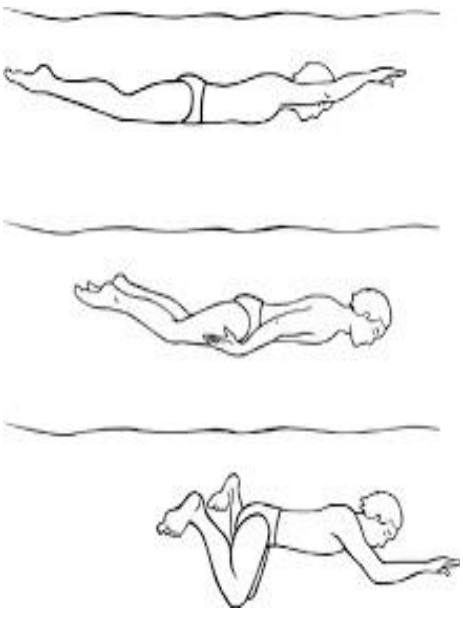
Swimming underwater is an important skill to learn. It can help to develop water confidence, breath holding techniques, relaxation in the water and develop an awareness of body movement in water. It helps competitive swimmers to improve the distance gained with their dives and turns; is an important water safety skill; and can used in scenarios such as swimming away from a fire, under an oil slick or boat and retrieving submerged objects or an unconscious person.

4.4.1. Safety Issues

- Underwater swimming should be combined with other teaching such as swimming, water safety and safety gears (fins) rather than having a prolonged time teaching and perfecting under water techniques and distances.
- There are several strokes that can be used for underwater swimming. The standard stroke would be a modified breaststroke or if gear is available the freestyle leg action with fins would be the preferred stroke.
- The use of fins does reduce energy expenditure significantly and an arm action is not necessary, so they are held at the side of the body.
- An arm should be extended beyond the head to guard against submerged objects if swimming in murky water or surfacing by boats.

4.4.2. Modified breaststroke action

- The stroking is slow with a prolonged glide after the arm pull and a short pause after the kick. This is to save energy.
- The arm pull is extended past the hips to the thigh.
- The arms recover close to the body as the legs kick.
- To maintain depth the head is kept low and the chin is inclined to the chest.
- Eyes should be open during the underwater swim.
- Surface before running out of breath.
- When surfacing lead with one hand or rotate on to the back to look for potential hazards.



Modified Breaststroke Action

4.4.3. Swimming underwater while searching for objects

- The safer way to approach a submerged object in deep water is to do a surface dive in clear water and a feet first dive in murky water.
- A series of short dives is preferable to a prolong dive as this could cause fatigue.
- A systematic search pattern has to be established.

4.5. SELF-RESCUE SWIMMING

4.5.1. What you should do if you enter the water

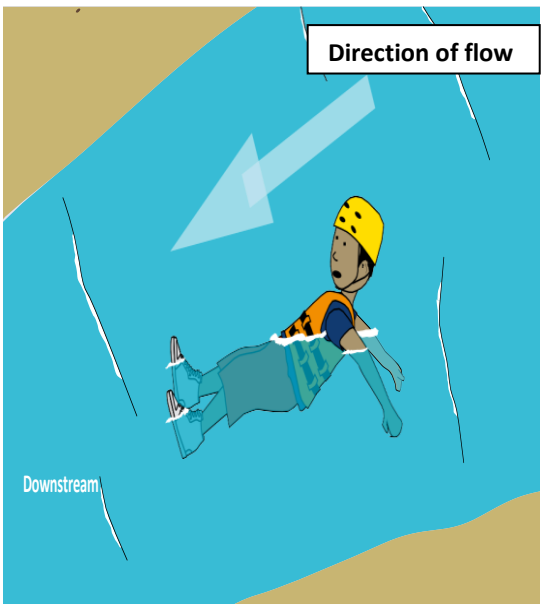
- If a rescuer enters the water they should be aware of:
  - The dangers of the water and objects under the water
  - Others in the water who may panic and grab the rescuer.
- A rescue that requires swimming should only be attempted if the rescuer has been trained in how to swim and conduct rescues in moving water.
- Swimming in flowing water is extremely dangerous. However, if you find yourself in water you should attempt a self-rescue using the following techniques:

4.5.1.1. Defensive swimming

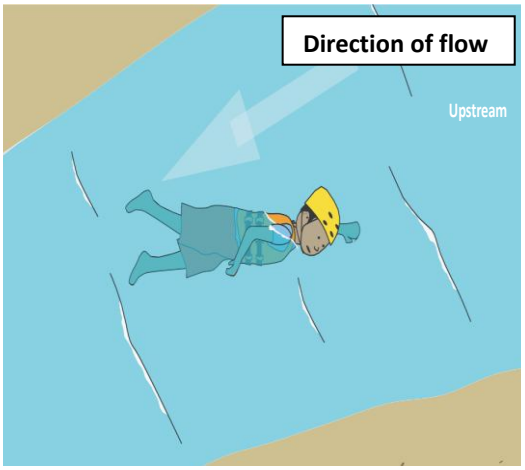
4.5.1.2. Aggressive swimming

4.5.1.1. Defensive swimming

- Defensive swimming is designed to reduce the risk of injury and potential foot entrapment.
- In the defensive swimming position, the swimmer is on their back with their feet pointed downstream. Their hips are as close to the surface as possible. This position helps to minimize the chance of impact injury in moving water, as the swimmer can fend off objects using their feet.
- The arms can be used in a large backstroke action, which slows the swimmer down and allows the swimmer to angle their body so the current can push them in the right direction.



4.5.1.2. Aggressive swimming



- Aggressive swimming techniques can be used to cross river currents, and make rapid progress to a safe area.
- To swim aggressively, the swimmer rolls onto their front in the water. The swimmer can now use a more powerful front crawl style stroke to move in the water at a faster rate. They can then use their body to angle themselves to the point of safety

4.5.2. Escaping from a strainer

If you cannot avoid a strainer then the safest way to escape is to try to swim over it:

- Swim strongly towards the strainer.
- Extend your arms just before reaching the strainer.
- Grab the strainer and push your body over it, kicking hard at the same time.

4.5.3. Defensive techniques

A situation may arise where a rescuer will need to use defence to avoid contact with a person in difficulty. For example, in a boating incident, you may find yourself in a range of a panicked person. At all times it is essential to maintain a safe distance from a person in trouble and therefore defensive positions may need to be adopted.

4.5.3.1. Defensive Position

This position allows the rescuer to reverse away quickly should this be necessary.

How

- Maintain a safe distance from the person in difficulty.
- Tuck the legs rapidly under the body.
- Push the legs forwards.
- Make a final assessment from this safe position.

4.5.3.2. Reverse

The person in difficulty attempts to grasp the rescuer.

How

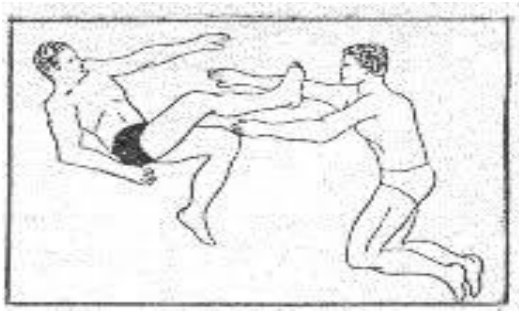
- Tuck the legs rapidly under the body and push those forwards as in the defensive position.
- Kick away vigorously.
- Readopt the defensive position.

4.5.3.3. Blocking

The person in difficulty lunges suddenly at a rescuer before it is possible for the rescuer to move away. While a description of blocking has been provided, the safest way to perform a rescue is to keep a safe distance between the rescuer and the person difficulty.

How

- Raise a leg or aid to block the person.
- Push against the person's body, preferably in the chest area.
- Swim away or submerge if necessary.



4.5.3.4. Two People Locked Together

- A situation may arise when poor swimmers grasp each other in an attempt to remain on the surface.
- This is a very dangerous situation where the following procedure is recommended:

a) Cooperative swimmers

- Place a buoyant aid between the two people.
- One or both people may hold the aid (depending on the size of the aid).
- Tow the people to safety, singly or together.

b) Non -cooperative swimmers (If they will not grab the aid)

- Come from behind one of the swimmers, place the aid in the centre of the two swimmers, and use force to pull the swimmers off each other, by holding onto one swimmer under the armpits and using the defensive position to push off the other swimmers chest.
- The person who you are holding onto tells them to calm down, the other swimmer should be holding onto the aid provided, use an accompanied rescue whilst towing the other swimmer in to safety.

4.5.4. SURVIVAL STRATEGIES AND TECHNIQUES

a) Survival in deep water depends on the ability to use the following:

- **Knowledge** – to understand what to do
- **Judgement** – to decide what to do
- **Skill** – to perform what is required
- **Fitness** – to achieve the desired results

b) Swimmers in survival situations should remain calm and consider the following:

- Winds, currents or tide strength and direction
- Distance from safety
- Ability to swim safely
- The possibility of someone on the shore coming to help
- The weather and water conditions
- Air and water temperature
- Whether a craft will remain floating or submerge
- Whether the craft can be held
- What buoyant objects would help floatation
- The clothing being worn
- Whether to remove heavy clothing

c) To survive in cold water immersion:

- Wear a PFD and protective clothing.
- Grasp large floatation aid or boat wreckage if available and climb as high out of the water as possible.
- Avoid immersing the head.
- Adopt a HELP or huddle position.
- Remain as still as possible.

4.5.5. CONCEPT OF PERSONAL SURVIVAL SKILL

Survival: If you venture in, on or near water you need to know how to perform personal

- **survival skill in case emergency occurs**

- Knowledge of a range of survival strategies and techniques.
- Development of judgement in selecting the most suitable surviving techniques.

- Knowledge of the degree of risk in specific emergencies, e.g. cold water, currents, waves etc.
- Development of swimming skills to be used in case of an accident.
- Ability to use various buoyant aid and the use of personal floatation devices.
- Physical condition and endurance.

If possible practice under supervision in both familiar and unfamiliar environments e.g. cold murky water which is influenced by winds, waves and currents. This will help you to:

- Recognize dangers more easily.
- Assess distance.
- Assess your own ability

4.5.6. CONCEPT OF GROUP SURVIVAL SKILL

In addition to the principles of survival outlined above for an individual, the following additional points may be considered for group survival situations.

How

- Make 2 lines and pair up by facing one another
- Give every person in the group a number
- Use aids effectively.
- Swim survival strokes.
- Line 1 should swim survival backstroke whilst line 2 swims survival breaststroke, this ensures that each pair are keeping an eye on one another
- Swim slow with relaxed strokes while keeping your head out of the water
- Supervise the weaker swimmers and put them in between line 1 and 2
- Stay together as a group and encourage each other
- When the group becomes tired and to avoid muscle fatigue swim through line 1 to change your stroke and position in the water.

REVIEW:-

The participants learnt about:-

4.1. Swimming in General
4.2. Importance
4.3. Different swimming styles
4.4. Under water swimming
4.5. Self-Rescue swimming

LESSON PLAN-05

SEARCH & RESCUE METHODS AND COMMUNICATION

CONTENT

OBJECTIVES:

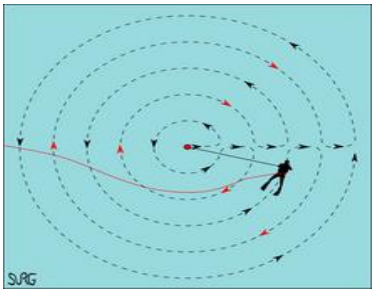
Upon completion of this lesson, you will be able to list

5.1. Search Method techniques
5.2. Common water emergencies and water hazards.
5.3. Shore based dry rescue methods.
5.4. Rescue techniques.
5.5. Steps for water based rescue
5.6. Communication

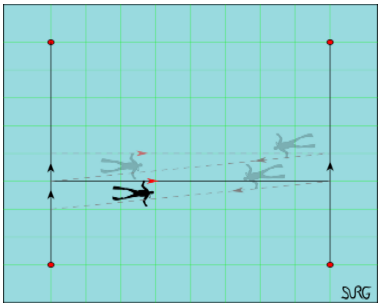
5.1. SEARCH METHOD TECHNIQUES

Types of Search Method techniques:- The Following Search methods are designed to maximize area coverage and improve the chances of locating submerged objects or victims efficiently.

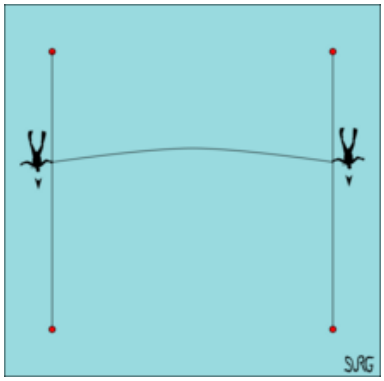
- **Circular Search Pattern :** - An underwater circular search is a procedure conducted by a divers swimming at a series of distances (radii) around a fixed reference point. The circular search is simple a requires little equipment. It is useful where the position of the objects of the search is known with reasonable accuracy.



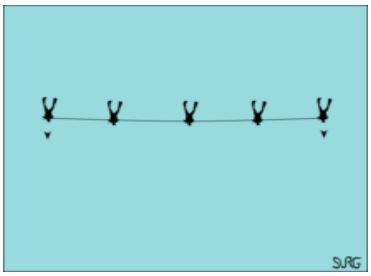
- **Jackstay Search Pattern**:- : This method is suitable for large areas with flat bottoms and minimal current. A guide line (jackstay) is anchored across the search area, and divers move along it in a systematic side-to-side pattern. Once one sweep is completed, the line is moved slightly, and the pattern is repeated. It ensures thorough and organized coverage.



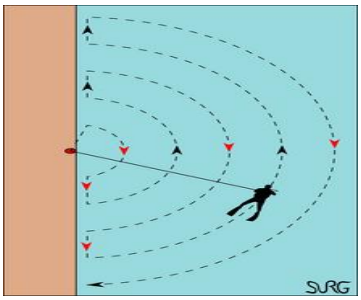
- **Snag line search: -** In this technique, a snag line often fitted with hooks or sensors is towed to detect submerged objects. It is a systematic method that aims to provide full coverage of the search area. The effectiveness depends on the width of the sweep or sensor swath, which in turn depends on the detection equipment used. It is particularly useful for locating items that can be physically caught or sensed by the line.



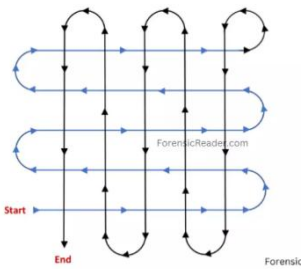
- **Swim line search:-**Divers form a straight line and move forward together, scanning the designated area. It is often used in underwater search and recovery operations. This pattern ensures uniform coverage and is especially effective in open water environments with good visibility.



- **Pendulum (along walls) :-** A search pattern where a swimmer moves in an arc, stopping and changing direction at the end of each arc, resembling a pendulum swing. This technique involves a diver moving in an arc along a wall or vertical surface, changing direction at each end of the arc. It mimics a pendulum swing and is ideal for scanning walls, piers, or underwater structures where targets may be lodged or hidden.

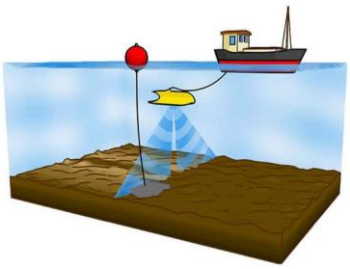


- **Grid search (Double Line)** :- This method involves searchers moving in a systematic zigzag or snaking motion across a defined area. It is particularly effective in shallow waters or small water bodies like ponds, canals, or submerged structures. This pattern ensures that the entire area is thoroughly covered without overlapping or missing sections. It is widely used by ground and shallow water rescue teams during search and recovery operations.

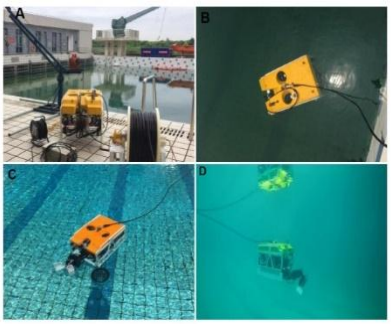


Procedure for Grid Search Pattern Technique

- **SONAR based Search**: - SONAR (Sound Navigation and Ranging) search techniques utilize side-scan or multi-beam sonar systems to map underwater terrain. These sonar devices emit sound waves and analyze the echoes that bounce back to detect underwater structures, terrain changes, or submerged objects. SONAR equipment is typically mounted on boats, enabling search teams to survey larger or deeper areas efficiently without direct human entry into potentially hazardous waters. It is especially useful in murky or deep water where visual searches are not possible.



- **ROV (Remotely Operated Vehicle) Search**:- This method involves deploying underwater robots equipped with cameras and lights. ROVs are controlled remotely and can navigate deep or dangerous waters where diver safety is a concern. These vehicles provide real-time video footage and are useful for inspecting submerged structures, identifying hazards, or recovering objects in risky underwater environments. ROVs significantly enhance safety and efficiency in deep-sea or complex underwater missions.



- **Magnet Search:**- Magnet searching is a basic yet effective technique for locating metal objects in water. A strong magnet is tied to a rope and thrown into the water, then dragged along the bottom to attract and retrieve metal items. This method is cost-effective and ideal for locating tools, weapons, or metallic debris in lakes, rivers, or wells. It's widely used in forensic, archaeological, and recovery operations.

5.2. COMMON WATER EMERGENCIES AND WATER HAZARDS

Hazards at water rescue incidents are incredibly hazardous to crews and can quickly become dynamic incidents. These incidents pose risk of injury or death from drowning and/or trauma to both victims and rescuers.

5.2.1. Sub-surface Hazards

- Entrapment in storm drain or holes foot entrapments

5.2.1.1. Failed roads or walkways
5.2.1.2. Subsurface currents
5.2.1.3. Water travelling underground
5.2.1.4. Swift water hazards
5.2.1.5. Debris (top, suspended, bottom)
5.2.1.6. Strainers
5.2.1.7. Holes
5.2.1.8. Rocks
5.2.1.9. Man-made objects

5.3. SHORE BASED DRY RESCUE METHODS

5.3.1. Commonly there are two types of rescue

5.3.1.1. Shore-based rescues:

Any rescue where the rescuers remain on shore is safer than one in the water. Most common are when rescuers on land coach a swimmer, reach a swimmer or throw ropes to a swimmer.

5.3.1.2. Boat-assisted/based rescues:

Risk increases when leaving shore. Boat can be used to ferry equipment, patient evacuation, Boat is used for the actual rescue. This requires more skill and creates more danger.

Rescue Principles

Awareness –	**1)**	**Recognition of an emergency**
	2)	**Accepting responsibility**
Assessment -	**1)**	**Making informed judgments**
Action -	**1)**	**Planning the action**
	2)	**Effecting the rescue**
After care -	**1)**	**Aid given until medical arrives**

5.4. RESCUE TECHNIQUES

- Water rescue techniques are essential skills that can save lives.
- As aquatic activities become increasingly popular, it is important for rescuers to understand how to rescue. There are two types of rescue techniques.

5.4.1. DRY RESCUE (Non Swimming)

5.4.1.1. Reach
5.4.1.2. Throw
5.4.1.3. Wade
5.4.1.4. Row

5.4.2. WET RESCUE (Swimming)

- **Tow Method:-**
  - **Cross chest tow**
  - **Head tow**
  - **Clothing tow**
  - **Armpit tow**
  - **Double armpit tow**
  - **Vice grip tow**
  - **Support tow**
  - **Wrist tow**
  - **Chin tow**

5.4.3. Dry Rescue (Non Swimming)

5.4.3.1. REACH

- Use a pike pole or rubbish hook to reach out to a victim that is floating in water and pull them to the shore.
- Always hold the tool on the downstream side of your body.
- You may choose to tie yourself into edge protection to avoid dragged into water by the victim.
- Never tie a rope around yourself or someone that may enter the water.

- **When –**
  - The person in difficulty is near the edge then non-swimmers have to affect a rescue alone.

- **How –**
  - Lie down with chest on the ground to increase stability.
  - Give an aid and instruct the person to hold it.
  - Reassure the person steadily to safety.

Reach rescue is the safest for rescuer, should always be considered first in any emergency.

- **Use of Rescue aid:**
  - **Rigid-** branch, stick, umbrella, etc.
  - **Non-rigid-** towel, rope or clothing. A rigid aid should be the first choice

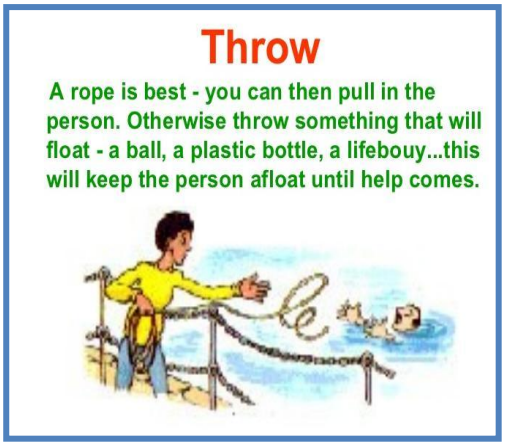
5.4.3.2. THROW:

Use a water rescue throw rope bag or floating device on a rope thrown to a victim. Always have the rope on the downstream side of your body. Use voice instructions the victim to reach and hold onto the rope.

- **When?**
  - Reach rescue is not possible.
  - Victim is slightly far away from river bank.

- **How?**

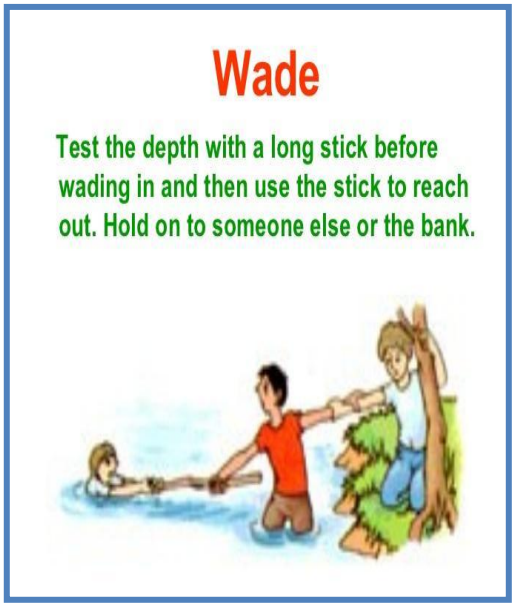
  - Reassure the person in difficulty.
  - Choose a suitable aid, preferably one which can be easily grasped.
  - Tell the person that something is to be thrown and how to use it.
  - Stand well clear of the edge and throw the aid, under arm or over arm, depending on the type of aid and distance to the person.
  - Attempt to land the aid within arm's reach of the person.
  - Instruct the person to hold the aid and to kick



This can be used by weak and non-swimmer when person in difficulty is too far away.

5.4.3.3. WADE

A wade rescue is used when a reach and throw rescue is unsuitable and the conditions of the water permit a safe entry.



Wade rescue (walk into the water):

- **When?**

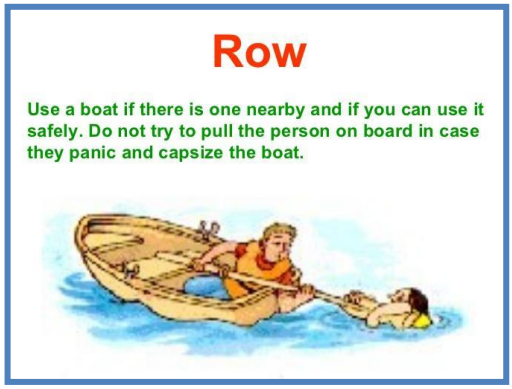
  - Attempts to reach and throw have been unsuccessful.
  - This technique brings the rescuer nearer to the person in difficulty and enables a reach or throw rescue to be attempted.

- **How?**

  - Reassure the person in difficulty.
  - Enter shallow water safety, if possible taking a rescue aid e.g. a stick, to test the depth.
  - Wade by sliding the feet carefully alone the bottom testing the depth with the reaching aid.
  - Reach with the aid when the person is close enough.

5.4.3.4. ROW

If a person in difficulty cannot be reached from the land or shallow water the rescuer may be enter deep water to extend the reach with an aid, provided that is possible to keep a firm hold on the edge throughout the rescue.



- **When?**

When Throw and wade rescue is not possible because of the depth of the water. This is an effective and safe technique to rescue the victim by the use of rescue raft and boats (IRB).

- **How?**

- If a rowboat is available, ROW to the victim and then use an oar or paddle to pull the victim to the stern.
- Let the victim hold onto the stern as you paddle to shore. If the victim is too weak, hold onto him or her until help arrives.
- If using a powerboat, stop the engine and glide to the victim from the downwind side.

5.4.4. WET RESCUE (Swimming)

5.4.4.1. CONTACT RESCUES

Unconscious and conscious person – Who is in distress, may need to be calmed by being supported so that the head and shoulders are clear of the water.

5.4.4.2. CONTACT TOWING TECHNIQUES

An effective contact tow must:

- Keep the person's mouth above water at all times.
- Enable the rescuer and the person being towed to be as horizontal as possible to keep resistance to a minimum.
- Allow freedom for the rescuer's swimming movements.
- Make only reasonable demands upon the rescuer's stamina and strength consistent with the water conditions and distance to be covered.
- Control the unconscious person's head position so that the airway can be kept open and water does not wash over the face.

The following contact rescue techniques may be used to carry out a rescue

5.4.4.2.1. Cross chest tow

Use the cross chest carry when rescuing a victim through heavy surf. It is a good passive victim rear rescue but is more tiring than other rescues.Approach the victim from behind and level him off (described in armpit tows). Encircle his chest with one arm. You can use your other hand on his side to help position him into a secure position.

5.4.4.2.2. Head tow

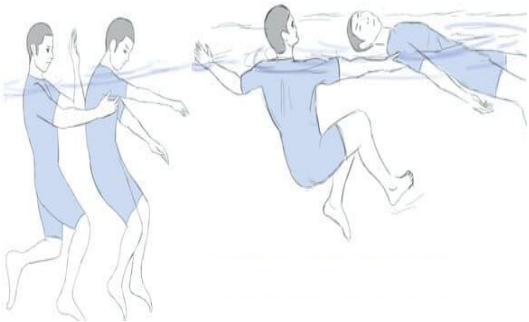
A firm hold of the unconscious casualty's head is required

5.4.4.2.3. Clothing tow

- Only used with an unconscious casualty- It is graded a RED rescue because it requires direct contact with the casualty.
- One hand supports the back of the casualty's head to keep it out of the water.

5.4.4.2.4. Armpit tow

It is necessary to control the body position of the unconscious person and the rescuer does not have the swimming power to perform a cross chest tow



5.4.4.2.5. Double armpit tow

An entry is required from a height of more than one meter into known deep water. A feet-first entry is safer than a head-first entry, especially when the water has debris floating on it. This entry is primarily used in emergencies.

5.4.4.2.6. Vice grip tow

The person in difficulty has a suspected spinal injury.

5.4.4.2.7. Wrist tow

- The person in difficulty is conscious, entirely cooperative, and all other rescue methods are unsuccessful.
- NEVER use a wrist tow with an unconscious swimmer. A wrist tow does not maintain an open airway

5.4.4.2.8. Chin tow

This technique does at least 3 things. It keeps the person's face above water as much as possible, it allows the rescuer to swim with their free hand and their legs and it helps prevent the person from grabbing onto the rescuer, which is dangerous to both persons.

5.4.4.3. NON CONTACT RESCEUS

- **<u>How?</u>**
  - Select a suitable towing aid.
  - Enter the water.
  - Use suitable approach techniques.
  - Adopt a defensive position and tell the person what is going to be done.
  - When it is safe, pass the aid to the person retaining hold of one end of the aid.
  - Instruct the person to hold the aid with two hands.
  - Stretch out on the front with head up.
  - Turn over into the back.

5.4.4.4. Entry & Exit during swimming Rescue

- In selecting the most appropriate method of entry & exit, the life saver must consider the Water condition.
- Height of the starting point.
- Type of aid selected for the rescue.
- Condition of the bottom.
- Condition of the person in difficulty.
- Urgency for entering the water.
- Best place for exit after rescue.

5.4.4.5. Approach during Swimming Rescue

- Head-first surface dive: A head-first surface dive should be used when water conditions are known to be safe. It is used when escaping from danger or when recovering a submerged person.
- Feet-first surface dive: A feet-first surface dive can be used when searching unclear water and for escaping from under upturned boats. The extended feet-first surface dive is used when a quick submersion is required where as a controlled feet-first surface dive is when a slower and controlled descent is required.
- When the water is murky, shallow and state of bottom is unknown, a wading approach must be used. This approach also applies the life saver to move as quickly and as safely as possible to a suitable point from which he begins to swim.
- During the swim out the rescuer should balance the need for the speed with need of conserve energy for a possible difficult return. **Swim fins can be of great assistance to those who can use them.**

5.4.4.6. Recovery of a submerged Person

On reaching the submerge person

- Get into a position close to the head of the person
- Grasp the person under the armpits.
- If possible, push of the bottom with feet to assist in raising the person to the surface.

5.4.4.7. Approach during Swimming Rescue

- Recognising the victim
- Calling for back-up
- Retrieving and securing the patient
- Returning patient to shore

5.5. STEPS FOR WATER BASED RESCUE

5.5.1. CATEGORIES OF PERSONS IN DIFFICULTY

5.5.1.1. Priorities of Rescue

When more than one person is in difficulty, the rescuer must consider who to help first. Normally, attention should first be given to securing and supporting conscious people. Of these, non-swimmers should be given top priority because they are in danger of losing consciousness. However, it may be possible to provide early support to other people quickly and easily without significantly delaying the rescue of nonswimmers. Attention can then be given to unconscious or submerged people.

When rescuing multiple swimmers in difficulty, the following swimmers should be rescued in the order shown below (the precise order of rescues will however be determined by the nature of the emergency).

a) **Non-swimmer**
b) **Weak swimmer**
c) **Injured Swimmer**
d) **Unconscious**

5.5.1.1. Rescue team's responsibilities

In all rescue situations there is one overriding set of priorities, which is to maintain the following hierarchy of responsibility at all times.

a) Own safety

- Your safety must always come first. Ignoring this priority may place you at risk of becoming a casualty, along with your team.

- Personal safety involves working within your own capacity. It is your responsibility to relocate yourself to a position of safety if you feel you are working beyond your capacity. You must always be aware of fatigue and tiredness.
- You cannot save someone else if you can't keep yourself safe.

b) Team Safety

- Always consider the collective ability of the team to carry out the rescue task within the limits of the operational briefing.
- To function successfully as a team, communication between all team members must be clear, concise and relevant.

c) Victim safety

- When rescued the casualties become the responsibility of the team and must be provided with instruction on personal safety and where to place themselves.

d) Equipment Safety

- Equipment for rescue and transportation is a valuable asset to both the team and to any casualties when operating and carrying out rescues in a flood environment.
- Although flood rescuers go to the aid of a casualty, the primary role of our equipment is to transport us to safety or aid in self-rescue if the situation becomes too dangerous.

5.5.1.2. Child Safety during flood disaster

Floods come with alarming signs and give time to evacuate your house to go to safer areas with your children, which have low/no flood threats. Hence don't panic and try to prepare well in advance to be able to get away from floods safely. Also, being aware and pro-active can help you lead the rescue and help other parents and their children too.

a) Do these before you leave your house & teach your child as well

Here is the list of essentials you should collect and pack. Also, it's a good time to teach your child about this preparedness as well as it's a lifelong lifesaver skill.

- Dry fruits, Nuts and Packed Canned Foods. Focus more on utility and less on taste.
- Drinking Water in small containers in case you have an infant/toddler so that it's easy to sip.
- Plastic tent, disposables and plastic sealed packets to store food and essentials.
- Sticks which can help you and your children to walk through shallow waters as well as help you to test the depth of water.
- Essential Medicines and supplements for your family.
- Turn off the Electricity supply of your house. Ensure that it's switched off through Mains.
- Close the doors completely to restrict the inflow of flood water.
- Try and carry power banks to be able to remain connected or to reconnect when you need to.
- Secure outdoor furniture or other items that might float away and become a potential hazard for others.
- Move valuable items and papers/documents to upper floors. So that they have the least chances of getting wet.

b) Don'ts: Ensure that your child does not attempt this

- Try and stay away from flood water - do not attempt to swim, walk or drive through the area. Also let your children know of it in advance and keep a vigil to ensure their safety.
- Be aware of areas where flood-water has receded or will so. Roadways and tracks can weaken and could collapse. Hence follow instructions of the authorities leading rescue.
- Avoid downed power lines and muddy waters where power lines may have fallen. Essentially, let the child know not to walk bare foot in mud waters and try to remain in camps/designated area.
- Do not drink tap water until advised by the Health Advisory in your local area that the water is safe to drink.

5.5.2. TYPES OF ENTRIES

For all entries and exits remember to:

- Carefully assess the area to determine the best method of entry and exit
- Choose an entry that offers complete safety
- Always consider the depth when entering

5.5.2.1 Slide In

The depth of water and state of the bottom are unknown. This entry is controlled and safe, allowing the feet and an aid to feel for unseen obstacles below the surface.

5.5.2.1.1. Wade In

The water is shallow and the conditions are unknown. The entry is controlled and safe, allowing the feet and an aid to feel for unseen obstacles below the surface.

5.5.2.1.2. Step In

The water is clear, the depth known and the bottom free from obstacles. The entry is most appropriate for areas where the entry point is not much higher than the water level.

5.5.2.1.3. Compact Jump

An entry is required from a height of more than one meter into known deep water. A feet-first entry is safer than a head-first entry, especially when the water has debris floating on it. This entry is primarily used in emergencies.

5.5.2.1.4. Standing and Shallow Dive

The water is known to be deep and free of obstacles.

5.5.2.1.5. Stride

A rescuer needs to watch the person in difficulty and entry is to be made from a low height into water known to be free of obstacles.

5.5.2.1.6. Accidental Fall In

A fall into the water occurs unexpectedly and requires the person to protect the head.

5.5.3. SEARCH PATTERNS

5.5.3.1 Recovering a Submerged Person

- If the rescuer has observed the person in difficulty submerging either prior to or during the approach, the location of the body will be known and recovery of the body can be performed without delay. However, if the location of the body is not known, a search will be necessary.
- Lakes, dams and rivers have areas of murky water. An unconscious body that submerges in these areas maybe lost from sight. The only indication of the person's location may be bubbles, murky / disturbed water.

5.5.3.2 Parallel Patten Team Search

- One person takes charge to coordinate the rescue
- A second person is sent for help
- The remaining rescuers, including the coordinator, space themselves at a distance where they can see the rescuers either sides when underwater
- The rescuers must perform the search in parallel lines following the backing up technique. To turn the group, the end person acts as a pivot to ensure the whole search area is covered.It is important to know reference points on land from which to monitor the area that has to be searched. **During a river search remember to check the river bank first.**

5.5.3.3 Shallow Water Team Search

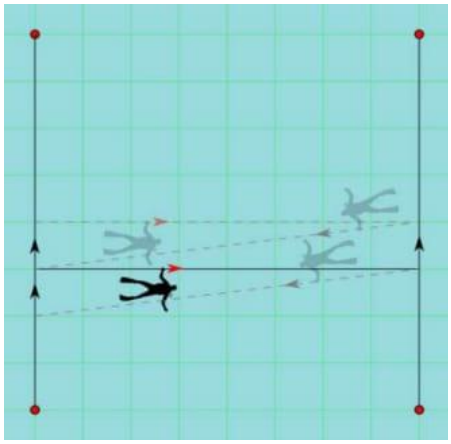
Shallow water areas are best searched using the following procedure.

- One person takes charge to coordinate the rescue
- Second person is sent for help. If the emergency occurs in a location which is difficult to find, the coordination may instruct the person.
- The remaining members, including the coordinator from a straight line. Link elbows and walk through the area carefully to perform the search.

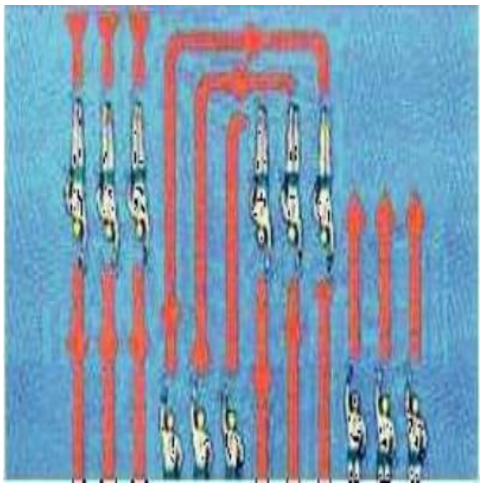
5.5.3.4 Shallow water individual Search

If a lone rescuer is required to perform a search in shallow water, the following technique should be used.

- Call for help while scanning the area from shore.
- Wade to furthest likely location.
- Walk back and forth in lines parallel to the shore, moving closer to the shore on each sweep.
- Ensure all area is covered including bank.



5.5.3.5 **Deep Water Search (**Group Searching / Parallel Pattern)



- One person takes charge to coordinate the search and rescue.
- Another person is sent for help and upon return person a search from the shore.
- They must perform the search in parallel lines, ensuring that the lines are maintained so that they can see the person on either side.

5.5.4. RECOVERY AND RESUSCITATION IN THE WATER

During the course of a rescue, it may be necessary to commence rescue breathing while still in the water. Chest compressions are not possible in the water but successful rescue breathing has been documented on many occasions. The principles of resuscitation in the water are similar to those for resuscitation on land.

- Establish a clear airway
- Ensure the head is tilted and the chin lifted.
- Check for the presence or absence of breathing.
- If breathing is absent, commence rescue breathing.
- Complete the rescue and extract the casualty from the water as soon as possible. This may mean not undertaking rescue breathing on the way to safety.
- Continue with DRSABCD action plan. (DRSABCD stands for Danger, Response, Send, Airway, Breathing, CPR and Defibrillation)

  If the person cannot be removed from the water for any reason then it is reasonable to continue rescue breathing until the casualty is rescued from the water. The rate for rescue breathing in the water is 15-20 breaths per minute (1 breath every 4 seconds) irrespective of the casualty's age.

5.5.4.1. **Shallow water resuscitation**

- If the water is moving, the casualty may need to be secured and supported by the rescuer's body and knees. The side of a pool, for example, may also be used to provide such support.
- If it is possible to perform rescue breathing successfully in the water, then it may be safe to continue there. In general, the casualty should be quickly moved to dry land, to enable CPR to be commenced as soon as possible.

5.5.4.2. Deep-water resuscitation

- When learning deep-water rescue breathing, rescuers will find that the most effective way to establish a clear airway is to allow the unconscious person's body to hang vertically in the water to open the airway. This can be done by placing one hand under the head, and the other on the face to apply a head tilt and chin support.
- To be able to perform efficient deep-water rescue breathing, rescuers need to practice using a variety of buoyant aids.
- For deep water rescue breathing at an edge, the rescuer uses the edge for support. In-water resuscitation rescue breaths should be performed mouth-to–nose. The same vertical position is required.
- All efforts should be made to remove the casualty from the water as soon as possible to commence CPR.

5.5.5. ASSISTED LIFTS AFTER RESCUEING

A successful rescue requires the person in difficulty to be removed or assisted from the water and moved to a place of safety. The removal should be carried out as quickly as possible with the minimum risk of accident to both the person in difficulty and the rescuer, and with minimum interruption to the performance of resuscitation, should this be required.

5.5.5.1. Lifting and Landing

A successful rescue requires the person in difficulty to be removed or assisted from the water and moved to a place of safety. The removed from the water should be carried out as quickly as possible with the minimum risk of accident to both the person in difficulty and lifesaver and with minimum interruption to the performance of resuscitation should this be required.

Categories of Lifting

The method of lifting can be grouped as follows

- Gentle slope – Shore, back, shallow pool.
- Walk out, assisting the person in difficulty.

5.5.5.2. Drag (Pull ashore)

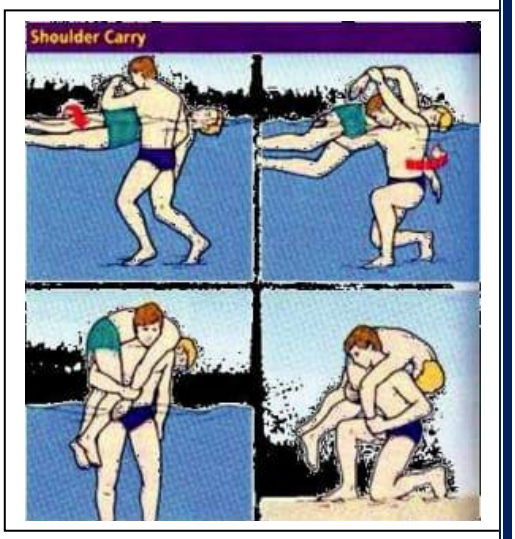
- **<u>When?</u>**

  The person in difficulty is unable to help and the shore or bank slopes gradually.

- **<u>How?</u>**
  - Float the person as close to shore as possible.

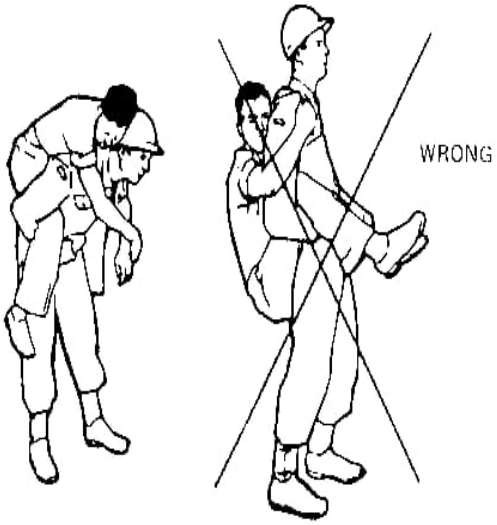
- Walk backwards, supporting person under the armpits to keep the mouth clear of the waves of wash

5.5.5.3. Shoulder carry



- **When?**
  - The rescuer is strong enough to carry the person to safety and there is a long distance.
  - Very Shallow water
  - Debris or a rough shore line or any other reason to carry the person.
  - This carry permits a speedy safe exit from the water and leaves one of the rescuers hands free for use when required.

5.5.5.4. Pick a back carry



When an alternative to shoulder carry is required. It should be noted that this technique does not leave the rescuer with free hand.How to do lifting?

- Stand in water at about chest depth.
- Float the person in front with the person's head facing the shore.
- Take a position at the wrist, facing the head of the person.
- Grasp the person's far wrist with hand further from the person and the other wrist with the nearer hand.
- Turn sharply under the far arm to face the shore and pull the person's chest on to both shoulders.
- Wade ashore leaning forward from the hips with the person's weight supported across both shoulders.

How to do lowering?

- Kneel carefully and lean forward slowly on to both elbows.
- Lower the person gently to the ground.

5.5.5.5. Recovery/Landing Position

If a person is unconscious but is breathing and has no other life-threatening conditions, they should be placed in the recovery position. Putting someone in the recovery position will keep their airway clear and open. It also ensures that any vomit or fluid won't cause them to choke.

5.5.5.6. Assisted lift

Used when help is available but the person in difficulty is unable to provide assistance. This lift can be performed by two, three or four people.

- **How?**

- One rescuer must take control and organize the lift.
- The person in difficulty should be facing the edge supported by a rescuer
- The rescuers on the edge should cross the victim's arms over and take a firm hold of the person's wrists whilst waiting for the 2nd rescuer to exit the water.
- Once the second rescuer has exited the water both rescuers should take a firm hold of the casualty's wrist and elbow slowly turning the victim so that their back is against the wall.
- On an agreed signal, the rescuers lift, raising the victim to a position where the hips are higher than the bank/edge
- Sit the person on the bank, support their back with your knee, support their head as they are lowered to the ground.
- The rescuers then move the casualty to a safe area and commence airway and breathing checks. Place them in the recovery position if breathing or start CPR and provide after care.

  While this technique can be used by a lone rescuer it is not recommended.

5.5.5.7. Stirrup Lift

Used when the person in difficulty is able to help.

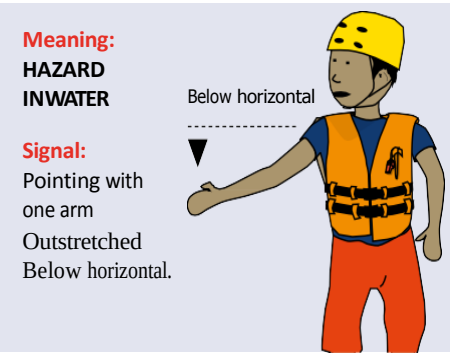
- **How?**
  - Provide support against the edge until the person in difficulty has recovered sufficiently to be assisted from the water.
  - Move to the other side or behind the person.
  - If the water is shallow, reach down and cup the hands against one knee.
  - If the water is deep, cup one hand while using the second hand to maintain a firm grip on the edge.
  - If the edge is high, it may be difficult to hold. In this case the rescuer should tread water while providing a stirrup. As the person levers their body up, the rescuer may go under water.
    Instruct the person to place one foot in the stirrup formed by the hand(s), step up and leave the water

5.6. COMMUNICATIONS

- Rescuers must be able to communicate with other team members and victims, often over long distances.
- Hand signals and whistle blasts are used to attract the attention of other team members and victims and to pass on important information.

5.6.1. Hand signals

It is important that rescuers understand hand signals to avoid confusion during an emergency. All agencies should use the same signals. The hand signals illustrated below should be used:



Meaning:
OK

Signal:
One hand
flat on head

Meaning:

NEED MEDICAL HELP

Signal:

Both arms crossed
in front of the chest.

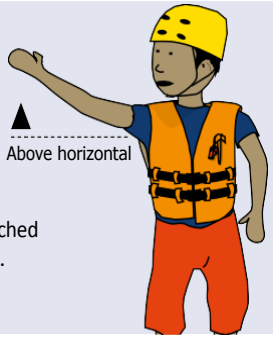
Meaning:
STOP

Signal:

One arm outstretched in
front of chest
showing an open
palm of the hand.

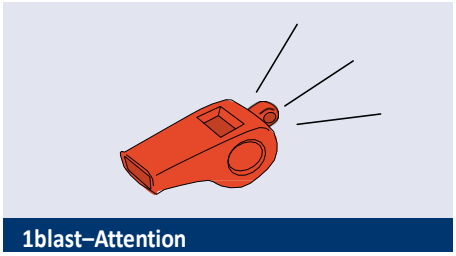
Meaning:
GO
(In that direction)
Signal :

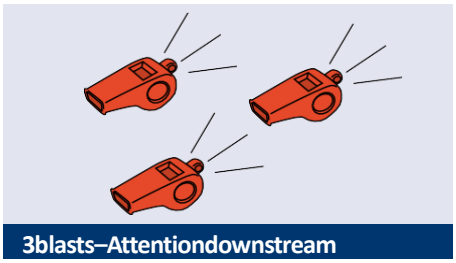
Pointing with
One arm outstretched
abovehorizontal.

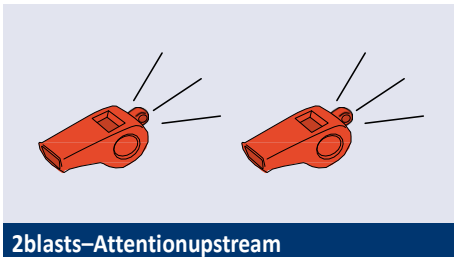


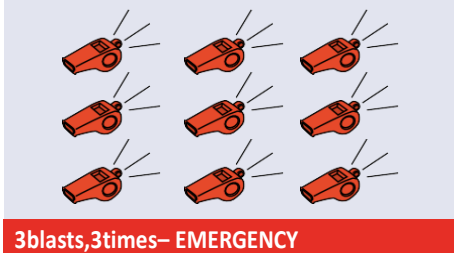
5.6.2. Whistle signals

A whistle should be carried by a rescuer at all times when at a scene. They can be heard over fairly long distances to attract the attention of both a victim and another rescuer.









5.6.3. Radios/mobile phones

Radios and mobile phones allow good communications between team members. They enable a team to give regular updates to people in charge and other groups.

The communication plan should include the following:

- **Radio channels**
- **Call signs**
- **Back-up plan**

Many things can go wrong with communications. Equipment may stop working or the signal may be lost. A communications plan should always include a back-up plan with alternative communication methods if needed.

REVIEW:-

The participants learnt about:-

5.1. Search Method Techniques
5.2. Common water emergencies and water hazards.
5.3. Shore based dry rescue methods.
5.4. Rescue techniques.
5.5. Steps for water based rescue
5.6. Communication.

LESSON-6

SWIFT WATER RESCUE

CONTENT

OBJECTIVES:

Upon completion of this lesson, you will be able to understand

6.1. Features of hilly rivers
6.2. Associated hazards
6.3. Rescue priorities
6.4. Types of rescues
6.5. Required equipment

INTRODCUTION

Swift water rescue is one of the most dangerous technical rescues. It is subcategory of technical rescue involving fast-moving water conditions. The rescue of persons from fast moving water in areas such as storm water drains, canals, rivers, creeks or flooded fords.

Difference between Swift Water Rescue and Normal Water Rescue

- **Swift water rescue** refers to rescuing someone from a rapidly moving body of water, like a river with strong currents or flood waters where the current can easily pull a person under. Swift water rescue is a more complex and high-risk form of water rescue demanding advanced skills to navigate the dynamic currents.
- Rescuers typically use specialized equipment like throw bags, ropes, helmets, wetsuits and rescue boats designed for swift water rescue.
- Performing a swift water rescue requires extensive training to understand the water dynamics, identify the hazards like strainers and under tows and execute proper rescue techniques.

- In swift water, rescuers prioritize positioning themselves strategically to avoid being swept away by current, using special equipment like throw bags and ropes to reach the victim from a safe distance and often employs a live bait technique, where they swim towards the victim while tethered to secure anchor point on land, minimising their own exposure to the dangerous water flow.
- Rescuers carefully identify and utilise calmer area of water to access to the victim and safely exit the current
- **On the other hand Normal water rescue** is rescuing someone from body of water, where the current is relatively calm like a lake or pool and where the primary danger might be drowning due to lack of swimming abilities.
- It involves direct swimming out to the victim using floatation devices or simple reaching techniques.
- Rescuers might use basic floatation devices and rescue tools depending on the situation

6.1. FEATURES OF HILLY RIVERS

6.1.1. Class I

Fast moving water with riffles and small waves. Few obstructions, all obvious and easily missed with little training. Risk to swimmers is slight; self-rescue is easy.

6.1.2. Class II

Straight forward rapids with wide, clear channels which are evident without scouting. Occasional maneuvering may be required, but rocks and medium-sized waves are easily missed by trained paddlers. Swimmers are seldom injured and group assistance, while helpful is seldom needed. Rapids that are at the upper end of this difficulty.

6.1.3. Class III

Rapids with moderate, irregular waves which may be difficult to avoid and which can swamp an open canoe. Complex maneuvers in fast current and good boat control in tight passages or around ledges are often required; large waves or strainers may be present but are easily avoided. Strong eddies and powerful current effects can be found, particularly large-volume rivers. Scouting is advisable for inexperienced parties.

Injuries while swimming are rare; self-rescue is usually easy but group assistance may be required to avoid long swims. Rapids that are at the lower or upper end of this Difficulty range are designated “Class III-” or “Class III+” respectively.

6.1.4. Class IV

Intense, powerful but predictable rapids requiring precise boat handling in turbulent water. Depending on the character of the river, it may feature large, unavoidable waves and holes or constricted passages demanding fast maneuvers under pressure. A fast, reliable eddy turn may be needed to initiate maneuvers, scout rapids, or rest. Rapids may require “must” moves above dangerous hazards. Scouting may be necessary the first time down.

Risks of injury to swimmers are moderate to high, and water conditions may make Self-rescue difficult. Group assistance for rescue is often essential but requires practiced skills. A strong skim roll is highly recommended. Rapids that are at the lower or upper end of this difficulty range are designated “Class IV-” or “Class IV+” respectively.

6.1.5. Class V

Extremely long, obstructed, or very violent rapids which expose a paddler to added risk. Drops may contain** large, unavoidable waves and holes or steep, congested chutes with complex, demanding routes. Rapids may continue for long distances between pools demanding a high level of fitness. What eddies exist may be small, turbulent, or difficult to reach. At the high end of the scale, several of these factors may be combined. Scouting is recommended but may be difficult. Swims are dangerous, and rescue is often difficult even for experts. A very reliable skimo roll, proper equipment, extensive experience, and practiced rescue skills are essential.

Because of the large range of difficulty that exists beyond Class IV, Class V is an open-ended, multiple-level scale designated by class 5.0, 5.1, 5.2, etc…each of these levels is an order of magnitude more difficult than the last. Example: increasing difficulty from Class 5.0 to Class 5.1 is a similar order of magnitude as increasing from Class IV to Class 5.0.

6.1.6. FLOW TYPE

Generally, there are two types of flow, which are given below

6.1.6.1. Laminar

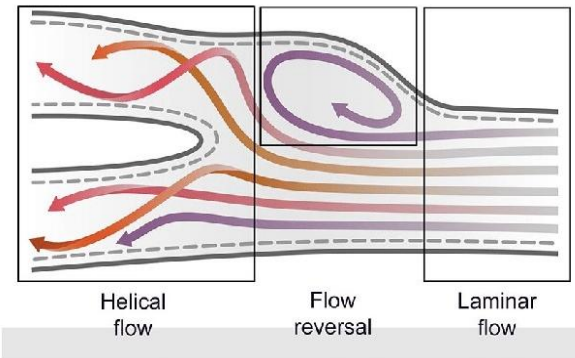
6.1.6.2. Helical

6.1.6.1. Laminar

Laminar flow is most of the water that flows downstream. Think laminator (sheets). The top most sheet is the fastest, and then it gets slower as you go down in layers. The friction of the bank and obstructions in the river slows water on the bottom and sides; so, the fastest water is in the center just below the surface of the river.

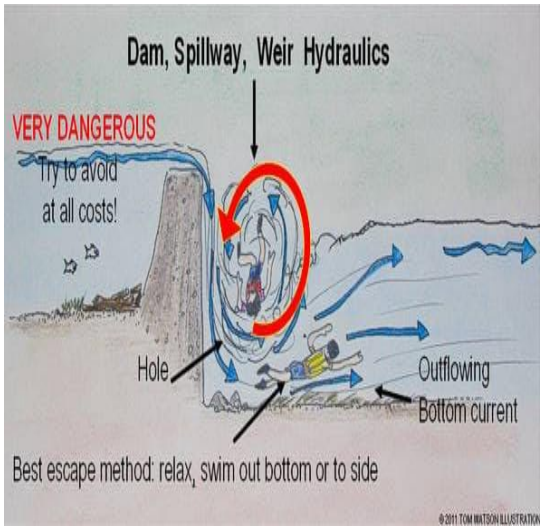
6.1.6.2. Helical

Helical flow is a corkscrew motion downstream. Friction of water against the banks causes water against it to flow in a corkscrew motion downstream between bank/ rocks/ eddies etc. and the main current.



6.2. ASSOCIATED HAZARDS

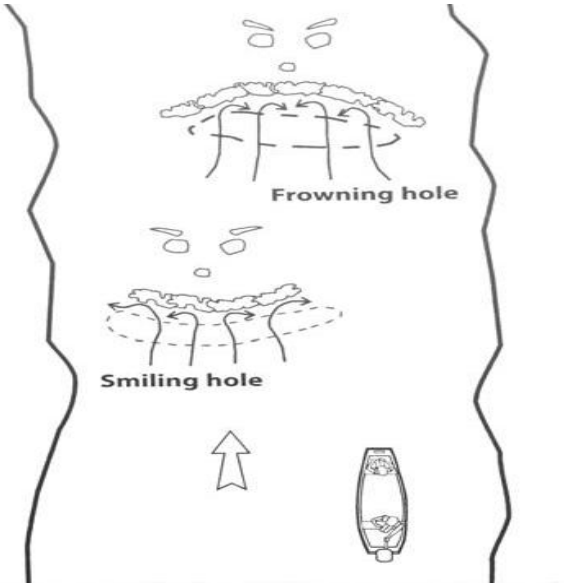
6.2.1. Hydraulics/holes



A whole forms as water flows over an obstruction that is usually near or above the surface of the water. As the water pours over that boulder/obstruction water fills the drop/area behind it causing a recirculation on the other side. This recirculation, or hole, is a frothy and aerated feature that actually, flows or pushes upstream. This means that kayaks, canoes and rafts can actually get stopped and stuck in holes.

As the river flows downstream the hole will be "holding" the paddler as it pushes them upstream and recalculates them. Holes can be fun. Hydraulics can be deadly. The distinction between holes and hydraulics is wishy-washy (Pun intended). Think of a hydraulic as a stronger, more retentive, and potentially dangerous hole.

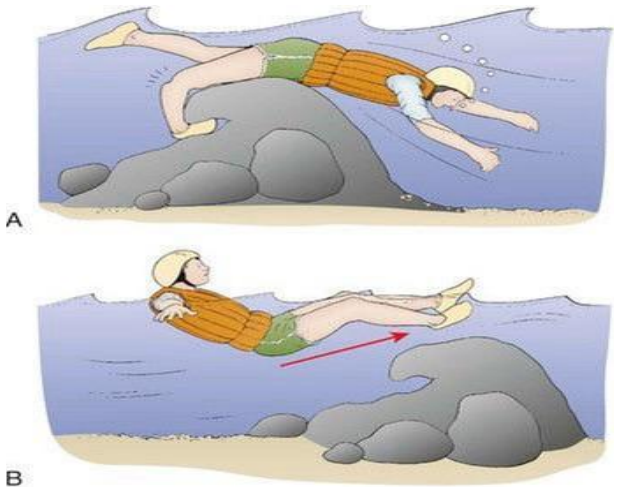
6.2.2. Smiling vs. Frowning (seen from upstream)



Smiling hole has its outer edges curving downstream – recirculation water feed OUT (edges curve downstream as you look downstream). Frowning hole has it outer edges curving back upstream- recirculation water (and you) back into the hole.

6.2.3. Foot entrapments

Foot (or other body/gear part) gets jammed into crevice, submerged object, or other under water feature. Force of current holds swimmer under. *One of the biggest killers in whitewater!



6.2.4. Undercuts

A rock or ledge in the current that is cut away under the surface. This allows water to come through but could trap objects. Usually, identifiable by the lack of an upstream pillow of water on the rocks upstream side and water rushing from the rock on the downstream side (lots of moving water in eddy or no eddy). Swimmers, boats, gear, etc. can become entrapped/ pinned if forced into it by the current.

6.2.5. Strainers

Just like straining water out of spaghetti. The noodles get trapped but the water flows through. A strainer is any object (natural or manmade) that lets water through but catches objects (you, your boat, and your gear). The force of the current can hold objects against the strainer very deadly, always avoid strainers. Strainers are usually trees/debris.

6.2.6. Sieves

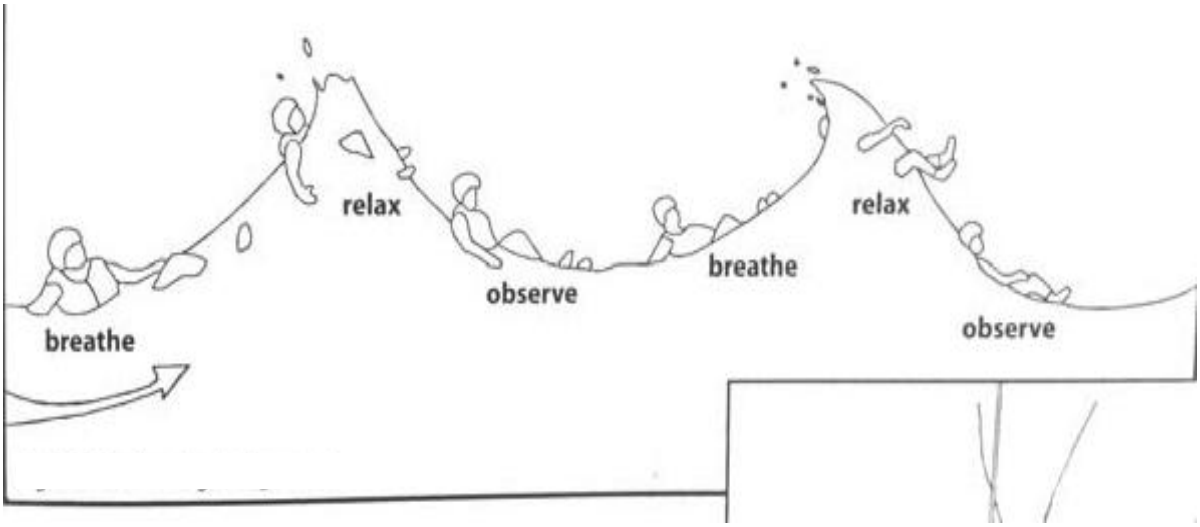
Sieves are like strainers; they filter water through but catch other objects. Usually made of boulders (Boulder sieve) as opposed to downed trees and fences which may make up strainers. Sieves and strainers can be hidden below the water's surface.

6.2.7. Cold water

Different water temperatures can make for very different experiences in numerous ways. Hypothermia, fatigue, and different rates of drowning survival are great risks at different temperatures. Always plan ahead and prepare. Cold weather is also a factor.

6.2.8. Big water

In big white water flush drowning can occur-drowning by aspiration while swimming through big water. It's often associated with a gasping reflex caused by cold water and fright, although lack of knowledge of when and where to breath is also a factor.



6.2.9. High water

The river's speed and power increase tremendously as the flow increases, raising the difficulty of most rapids. Rescue becomes progressively harder as the water rises, adding to the danger. Floating debris and strainers make even an easy rapid quite hazardous. It is often misleading to judge the river level at the put in, since a small rise in a wide, shallow place will be multiplied many times, where the river narrows. Use reliable gauge information whenever possible, and be aware that sun on snowpack, hard rain, and upstream dam releases may greatly increase the flow.

6.3. RESCUE PRIORITIES

You may want to jump right in to save your friend or participant, but always prioritize the rescue to the simplest form… (Value simplicity and speed & Minimize risk where possible) The safety of the rescuer always comes first – before that of the victim. Rescuer reminds us that "self-sacrifice in rescue services is traditional and commendable…and a useless waste. Rescue instructors would rather appear as expert witnesses to testify why nothing was done, then as to why a rescuer was injured or killed"

- **Speech**

  Can you talk to the person and coach them to self-rescue?

  Ex. "*SWIM TO SHORE! SWIM THIS WAY!"*

- **Reach**

  Can you reach the person? Can you reach them with your paddle or a tree branch?

- **Throw**

  Can you safely and successfully throw them a rope? This is third on the list because it's not the simplest tool in the box and Ropes are a huge hazard in the water.

- **Row**

  Paddle to them. Can you tow them on you bow or stern? Can you paddle to them to cut a line or assist in other ways?

- **Go**

  Can you swim to them for a contact rescue?

6.4. TYPES OF RESCUES

6.4.1. Shore-based rescues:

Any rescue where the rescuers remain on shore is safer than one in the water. Most common are when rescuers on land coach a swimmer, reach a swimmer, or throw ropes to a swimmer.

6.4.2. Boat-assisted rescues:

Risk increases when leaving shore. Boat can be used to ferry equipment, patient evacuation, etc.

6.4.3. Boat-based rescues:

Boat is used for the actual rescue. This requires more skill and creates more danger.

6.4.4. In-water contact rescue:

The rescuer may enter the water and contact the victim directly. This is a last resort option.

6.5. REQUIRED EQUIPMENT

- Boat & Paddle
- PFD
- 4 F's

  Fit (good fit)
  Flotation (adequate floatation)
  Fashion (colour, visibility, reflection)
  Function (uses, rescue, etc.)
- Helmet – white-water - composite or plastic
- Footwear – wetsuit or appropriate white
  Water shoes (we must have closed-toed shoes)

- Fox 40 whistle (mounted on PFD)
- Rescue knife (mounted on PFD)
- Thermal protection Wetsuit or dry suit, helmet liner, gloves, extra thermal protection
- Rescue rope
- Throw bags, waist belts, etc.
- Pin Kit
  4 Locking carabiner
  3 pulleys
  2 prussic
  1 length of webbing
- Leader Kit
  A leader kit includes all of the above andFirst Aid Kit
  Extra food
  Extra water
  Communication device (whistle, cell phone)
  Light source
  EAP's (w/ maps, evacuation procedures, med. info)
  Extra thermal protection (hypo bag)

REVIEW:-

The participants learnt about:-

6.1. Features of hilly rivers
6.2. Associated hazards
6.3. Rescue priorities
6.4. Types of rescues
6.5. Required equipment

LESSON-07

DIVING IN GENERAL & ITS EQUIPMENTS

CONTENT

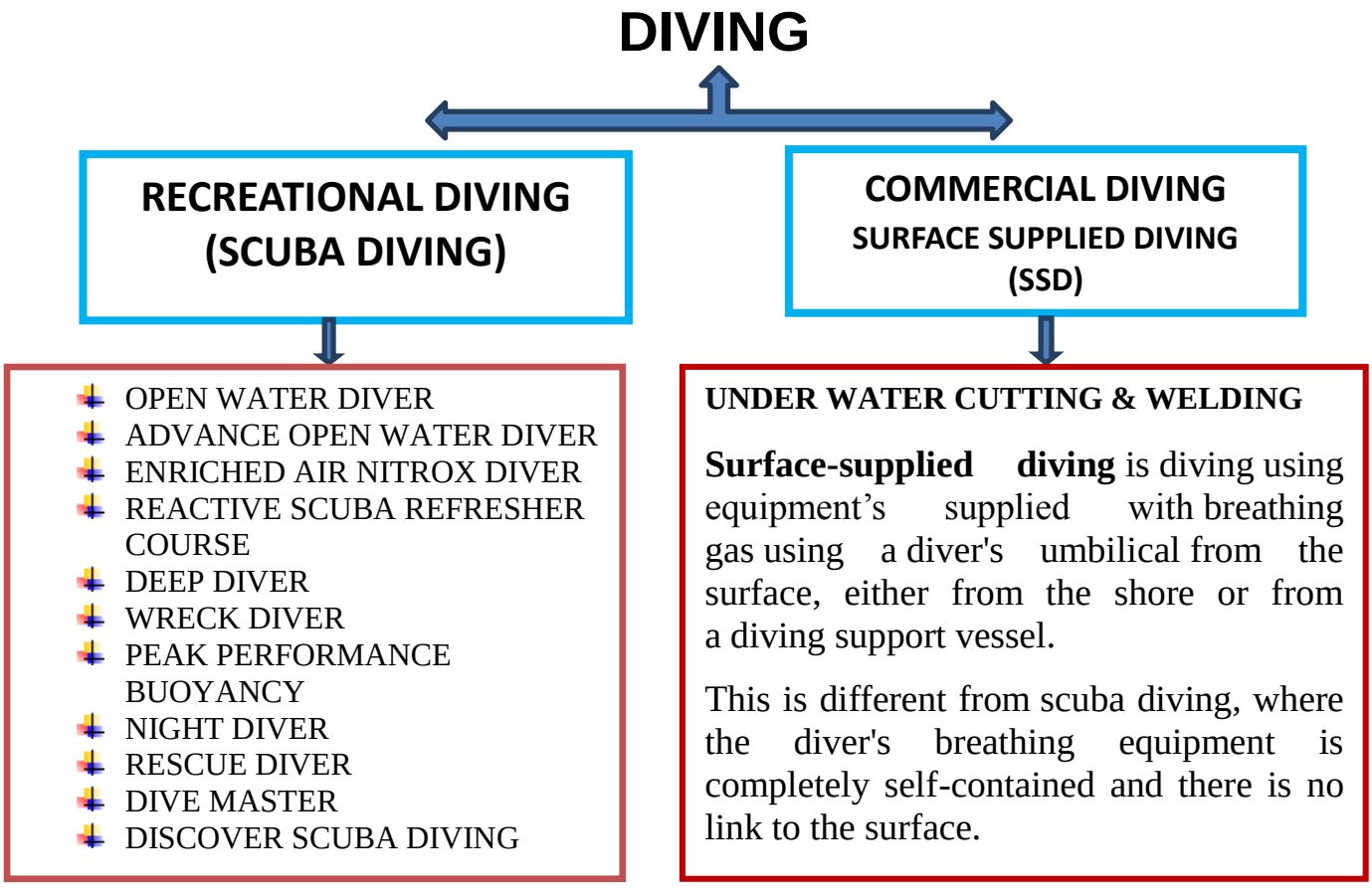
OBJECTIVES:

Upon completion of this lesson, you will be able to understand

7.1. General introduction.
7.2. Precautionary measures
7.3. Hazards associated with diving
7.4. Diving equipment
7.5. Details of SCUBA equipment

7.1. GENERAL INTRODUCTION

Diving is the sport or activity in which you jump into water head–first with your arms held straight above your head, usually from diving board. Weight is crucial in diving because the aim is to cause the smallest splash possible.



7.1.1. Types of dive entries

Diving can be divided into two large categories.

7.1.1.1. Free Diving

While free diving is done at breath-hold. Free diving – underwater diving without breathing apparatus

7.1.1.2. Scuba Diving

- **Scuba Diving** is a mode of underwater diving whereby divers use breathing equipment that is completely independent of a surface air supply.
- The name "SCUBA", an acronym for "Self-Contained Underwater Breathing Apparatus".
- SCUBA divers carry their own source of breathing gas, usually compressed air, affording them greater independence and movement than surface-supplied divers, and gives them more time underwater than free divers.
- SCUBA diving may be done recreationally or professionally in a number of applications, including scientific, military and search and rescue roles, but most commercial diving uses surface-supplied diving equipment when this is practicable.
- SCUBA divers engaged in NDRF operations may be referred to as deep divers.

7.2. PRECAUTIONARY MEASURES

- Never dive without a buddy.
- Never dive if you have a cold or are congested in your ears or nose.
- Always plan your dive and always dive your plan.
- Check your diving equipment to make sure it works. Use the right gear that can handle your planned dive.
- Do not drink alcohol or take drugs before diving.
- Ask your doctor what medicines are safe to use when diving.
- Ask your doctor how diving can affect your health. It can be dangerous if you have certain health problems.
- Become familiar with the underwater area and its dangers. Learn which fish, coral and other hazards you should avoid to prevent injury. Be aware of local tides and currents.
- Obey all diving instruction. As you descend, make sure you equalize your ears and mask. At depth, stay inside the parameters of the dive tables and computer. This information helps you avoid decompression sickness.

- Never hold your breath while ascending. Your ascent should be slow and your breathing should be normal.
- Never panic under water. If you become confused or afraid during a dive, stop, try to relax and think through the problem. Ask for help from your dive buddy or dive master.
- Cave diving is very dangerous. Only divers with proper training and equipment should attempt it.
- If you don't feel well or if you are in pain after diving, go to the nearest emergency room right away.
- Do not fly for 12 hours after a no-decompression dive, even in a pressurized airplane. If your dive required decompression stops, don't fly for at least 24 hours.

7.3. HAZARDS ASSOCIATED WITH DIVING

- How soon to fly after diving-old vas new philosophy
- DCS – Equipment or cetaceous, Muscular, Joint, Limb pain and Neurological
- Hypothermia
- Hyperthermia
- Cramps
- Overexertion
- Nitrogen Narcosis
- Carbon Monoxide Poisoning
- Gastrointestinal Barotraumas
- Heart problems
- Ear infections
- Nosebleeds
- Breathing problems
- Dehydration

7.4. DIVING EQUIPMENT

Diving equipment is equipment used by underwater divers to make diving activities possible, easier, safer and/or more comfortable. This may be equipment primarily intended for this purpose, or equipment intended for other purposes which is found to be suitable for diving use.

7.4.1. Basic Personal Equipment

- Mask
- Snorkel
- Booties
- Fins
- Gloves

7.4.2. Maintenance

- Maintaining your basic gear is simple.
- You should rinse your gear with fresh water after every diving day.
- Do not leave the gear in direct sunlight.
- Make sure your gear is dry before storing it away.
- Inspect the gear regularly, especially before a dive trip.

7.5. DETAILS OF SCUBA EQUIPMENT

7.5.1. Scuba Checklist

7.5.1.1. Essentials

- Buoyancy Control Device (BCD)
- A Regulator, like an Octopus Reg or an Air that comes with your BCD
- Mask
- Snorkel
- Wetsuit
- Defog
- Fins and booties
- Surface Marker Buoy
- Dive weight, if local diving
- Dive computer

7.5.1.2. Advanced

- Diving Knife
- Surface Marker Buoy
- Dive Light
- Tank Bangers
- Compass

7.5.1.3. Accessories

- Writing Slates
- First Aid Kit
- Dry box
- Snorkel
- Underwater Camera

7.5.2. Main Diving Equipment

- **Masks**

  The full-face diving mask is a type of diving that seals the whole of the diver's face from the water and contains a mouthpiece, demand valve or constant flow gas supply that provides the breathing.

- **Diving Exposure Suit**

  Divers wear exposure suits in almost all SCUBA activities. They reduce heat loss and help to protect from minor scrapes, stings and abrasions.

Drysuit

Wetsuit

- **Snorkel**

  It let you breathe at the surface with your face in the water without wasting air from your scuba tank.

- **SCUBA unit**

  These are the components that make your SCUBA unit. SCUBA is the acronym for Self Contained Underwater Breathing Apparatus.

- **Dive Watches**

  These are simply watches used to measure the dive time. Watch can be used for providing they have the diving dial around the outer face and are, of course, water-resistant tested.

- **Weight and belts system**

  Offsets your tendency to float so you can descend gently underwater when you want to. They usually consist of a belt designed to hold specially designed lead weights.

- **Scuba diving fins**

  Allow you to swim using your powerful leg muscles. Fantastic to allow easy movement through the water. As a beginner, the most important factors are the comfort and fit. Consider the diving environment (cold or warm water, water entry and exit, sand, pebbles, boat dive) when you choose your fins.

REVIEW:-

The participants learnt about:-

7.1. General introduction.
7.2. Precautionary measures
7.3. Hazards associated with diving
7.4. Diving equipment's
7.5. Details of SCUBA equipment

LESSON-08

UNDERWATER PHYSIOLOGY & PHT

CONTENT

OBJECTIVES:

Upon completion of this lesson, you will be able to understand

8.1. Common problems in underwater conditions
- **8.1.1.** Nitrogen Narcosis
- **8.1.2.** Oxygen Toxicity
- **8.1.3.** Ear barotraumas
- **8.1.4.** POIS
- **8.1.5.** Pneumothorax
- **8.1.6.** Hypothermia

8.2. PHT to drowning victim

8.3. PHT of snake bite

8.1. COMMON PROBLEMS IN UNDERWATER CONDITIONS

- Water is approximately 800 times denser than air. Therefore, it exerts much greater pressure on the body of a diver.Gases inhaled at high pressure to equalize the external pressure on thorax, so that adequate expansion occurs.
- These inhaled gases at high pressure dissolves in body fluids at high quantity resulting in adverse effects on the body of the diver which are as follow-

8.1.1. Nitrogen Narcosis

- It is the anesthetic effect of certain gases at high pressure.
- Nitrogen reacts with fatty acids in cell membrane of neurons and impairs the conduction like gas anesthetics.
- Inhalation of mixture of 80% Nitrogen and 20% oxygen at high pressure-
  i. At 120 feet feels joviality & careless (rapture of the deep).
  ii. At 150 to 200 feet, the diver becomes drowsy.
  iii. At 200 to 250 feet, loss of strength.
- Beyond 250 feet, one becomes unconsciousness. Nitrogen narcosis is similar to alcohol intoxication.

- Except for helium and probably neon, all gases that can be breathed have a narcotic effect.

8.1.1.1. Deep Signs And Symptoms

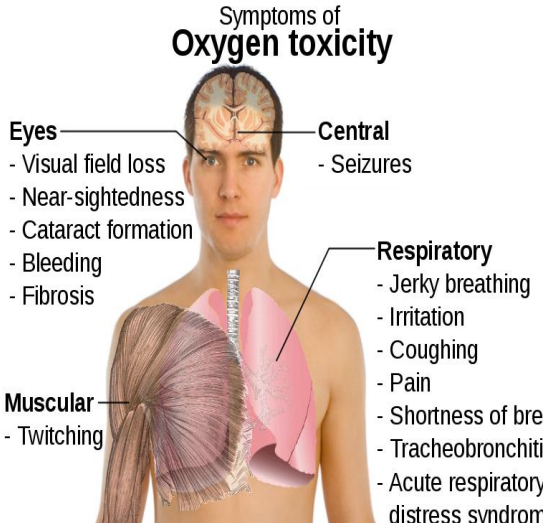
- 30M (100 FEET) –Mild impairment of performance. Mildly impaired reasoning. Mildly euphoria.
- 30-50m (100-165 feet) - delayed response to visual/auditory stimuli. Calculation errors. Wrong choices. Anxiety.
- 50-70m (165-230feet)-poor concentration. Mental confusion. Loss of memory. Further decrease in judgment.
- 90m (300 feet)-Hallucination. Manic or depressive state. Unconsciousness death.

8.1.1.2. PHT Of Nitrogen Narcosis

- The PHT of nitrogen narcosis is immediate controlled ascent to the surface.
- Administration of oxygen.
- Temporary cessation of diving.
- Prevention should be the best treatment, with no further diving below 30m (120feet).
- To avoid narcosis, the diver should breathe a gas mixture that contains helium instead of nitrogen.

8.1.2. <u>Oxygen Toxicity</u>

- It can be defined as high concentration of oxygen in a body when a body's protective systems are affected by increase in oxygen partial pressure.
- The most common cause of lung oxygen toxicity is prolonged use of pressurized oxygen cylinders in diving.
- Oxygen toxicity of the brain, commonly referred to as central nervous system (CNS) oxygen toxicity, is more serious.

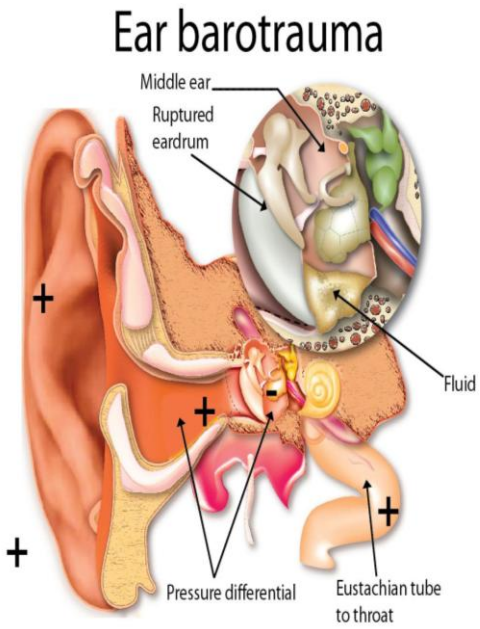


8.1.2.1. Sign & Symptom

- Flashing lights in front of your eyes
- Tunnel vision
- Loud ringing or roaring in the ears (tinnitus)
- Confusion
- Lethargy
- Nausea and vertigo
- Numbness or tingling
- Muscular twitching (especially lips)
- Grand mal convulsion

8.1.3. Ear Barotrauma

- Barotraumas is physical damage to body tissues caused by a difference in pressure between a gas spaces inside or contact with, the body and the surrounding gas or liquid. The initial damage is usually due to over-stretching the tissues in tension or shear, either directly by an expansion of the gas in the closed space or by pressure difference hydrostatically transmitted through the tissue.



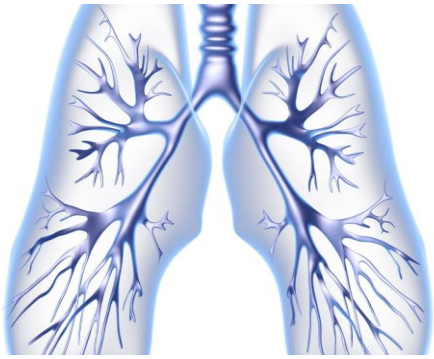
- Barotraumas can occur during both compression and decompression events.

8.1.3.1. Sign & Symptoms

- Localised pain in one or both ears while the eardrums are stretched, which may be partly relieved if the eardrum ruptures, followed by longer term dull pain in the injured ears and possible hearing loss.

8.1.4. Pulmonary Over inflation Syndrome (POIS)

- It is a group of barotraumas-related diseases caused by the expansion of gas trapped in the lung or over-pressurization of the lung with subsequent over-expansion and rupture of the alveolar air sacs.



- Pulmonary overinflating syndrome, also known as hyper inflated lungs, is a condition characterized by excessive air trapping and enlargement of the lungs.
- In this condition the lungs lose their elasticity and ability to fully exhale the air, resulting in air becoming trapped in the alveoli (air sacs) of the lungs. This leads to over inflation of the lungs and an increase in lung volume.
- This can happen due to various underlying causes including chronic obstructive pulmonary disease (COPD), asthma, cystic fibrosis or lung damage from smoking.

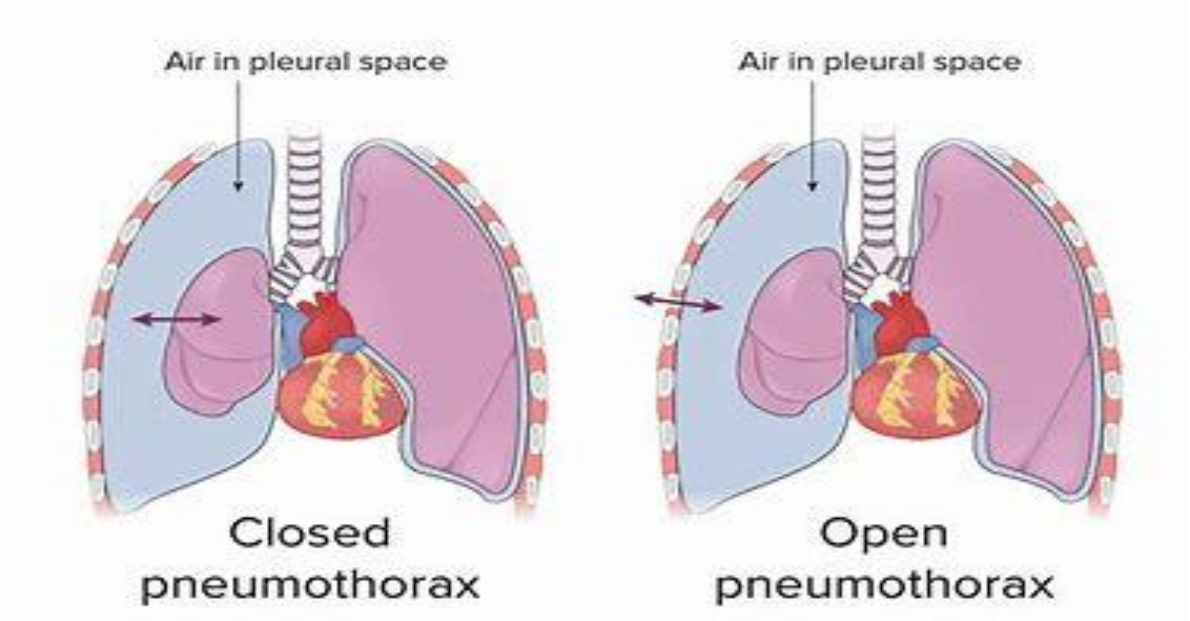
8.1.4.1. Sign & Symptoms

Some common signs and symptoms of pulmonary over inflation syndrome include:

- Shortness of breath
- Chest pain or discomfort
- Wheezing
- Chronic cough
- Reduced exercise tolerance
- Barrel chest
- Tachypnea
- Decreased breath sounds
- Cyanosis

8.1.5. Pneumothorax

Pneumothorax is a medical condition characterized by the presence of air or gas in the pleural cavity, the space between the lungs and the chest wall.



8.1.5.1. Sign & Symptoms

- Symptoms of a pneumothorax can vary depending on the size of the collapse and the underlying cause.
- Common symptoms include sudden sharp chest pain, shortness of breath, rapid breathing, shallow breathing, and decreased breath sounds on one side of the chest.

8.1.6. Hypothermia

Hypothermia occurs after exposure to cold, wet or windy conditions. Eventually, with continued exposure to cold temperatures, your body uses up its stored energy and your body temperature begins to fall. Hypothermia is a medical emergency and needs immediate treatment.

8.1.6.1. What is hypothermia?

- Hypothermia, or low body temperature, is a condition that occurs when your body's temperature drops below 95 degrees Fahrenheit (35 degrees Celsius). The average normal body temperature is 98.6 F (37 C). Hypothermia is a medical emergency.
- When your body temperate is dangerously low, your brain and body can't function properly. Left untreated, hypothermia can lead to cardiac arrest (When your heart stops beating) and death.

8.1.6.2. Sign & Symptoms

Hypothermia symptoms vary based on the severity of the condition. The stages of hypothermia include mild, moderate and severe.

8.1.6.3. What causes low body temperature (hypothermia)?

- Hypothermia occurs after exposure to cold, wet or windy conditions. When you're exposed to cold, your body expends energy to keep you warm. Eventually, with continued exposure to cold temperatures, your body uses up its stored energy and your body temperature begins to fall. You're not able to warm yourself back up. Symptoms will progress from mild to severe with prolonged exposure.

- While most cases of hypothermia occur at very cold temperatures, the condition can affect you even in cooler temperatures over 40 F (4.4 C) if you become chilled from sweat, rain or submersion in cold water. Hypothermia occurs under environmental conditions (wet, cool/cold or windy) that cause a person's body to lose more heat than it generates.

8.1.6.4. PHT Of Hypothermia

Hypothermia treatment includes the prevention of further heat loss and the process of rewarming.

- Move the person to a warm, dry location.
- Remove wet clothing and replace with dry clothing.
- Cover them up with a jacket, hat and blanket.
- Apply external heat to their skin, such as with a heat lamp or hot pack.

8.2. PHT TO DROWINIING VICTIM

- **PHT of drowning victim is as follows:**

- Check responsiveness and breathingwith the person lying in a horizontally supine position (face up).
- If the victim is unconscious, but breathing, the recovery position is appropriate.
- If the victim is not breathing, rescue ventil
- In the cases when ventilation is not enough, a complete cardiopulmonary resuscitation (CPR) should be used.
- Call to emergency medical services after 2 minutes of cardiopulmonary resuscitation (CPR).
- The cardiopulmonary resuscitation (CPR) would follow an 'airway-breathing-circulation' (ABC) sequence, starting with rescue breaths rather than with compressions as it is typical in cardiac arrest, because the problem is the lack of oxygen.
- For a not-breathing adult or child (someone bigger than a baby), it is recommended to start the cardiopulmonary resuscitation (CPR) with 5 initial rescue breaths.
- As the initial ventilation may be difficult because of water in the airways, which can interfere with effective alveolar inflation.
- Next, it is applied a continual alternation of 2 rescue breaths (in the same manner) and 30 chest compressions.
- This alternation is repeated until vital signs are re-established or advanced life support is available.

- For not-breathing babies, the procedure is the same than above but slightly modified:
- In each series of rescue breaths, the rescuer's mouth covers the baby's mouth and nose simultaneously,
- They are also applied by pressing on the lower half of the sternum, the vertical bone of the middle of the chest, but with only two fingers.
- Methods to expel water from the airway such as abdominal thrusts (Heimlich maneuver) or positioning the head downwards should be avoided.
- Treatment for hypothermia may also be necessary.

8.3. SNAKE BITE MANAGEMENT

Snakes whose habitats are destroyed and displaced in the floodwaters are likely to seek refuge in homes, sheds, and other dry places. Abandoned homes in inundated areas are their favourite locations and there are high chances of human-snake conflict in such houses. During floods, "snakes float into houses and take shelter in roofs, nooks and crannies, under debris or other belongings were hiding is possible,"

8.3.1. Signs and Symptoms:

- Pain at the bite site.
- Nausea and vomiting
- Weakness and paralysis dizziness, decreased level of consciousness
- Puncture mark
- Burning sensation around bite mark
- Blood oozing from the bite mark
- Shock

8.3.2. PHT of snake bite:

- Keep the victim clam and still, place the bite below the level of the victim's heart.
- Reassure the victim. This is extremely essential as more person die of shock, rather than venom.
- Call emergency and report what kind of snake bite the victim.
- If necessary, give CPR.
- Gently wash the bite with soap before check, that there are any broken teeth.
- Apply direct pressure over the bitten area.
- Apply a pressure immobilization bandage (PIB).
- Keep the patient awake.
- Continually monitor the patient during transfer.

REVIEW:-

The participants learnt about:-

8.1. Common problems in underwater conditions
- **8.1.1.** Nitrogen Narcosis
- **8.1.2.** Oxygen Toxicity
- **8.1.3.** Ear barotraumas
- **8.1.4.** POIS
- **8.1.5.** Pneumothorax
- **8.1.6.** Hypothermia

8.2. PHT to drowning victim

8.3. PHT of snake bite

LESSON-09

IRB TYPES, PARTS, HANDLING, OPERATIONAL TROUBLESHOOTING & MAINTENANCE

CONTENT

OBJECTIVES:

Upon completion of this lesson, you will be able to understand

9.1. Introduction
9.2. Features of IRB
9.3. Types of rescue boat, Name of parts& Accessories
9.4. Operating procedure
9.5. Troubleshooting& resolving
9.6. Maintenance

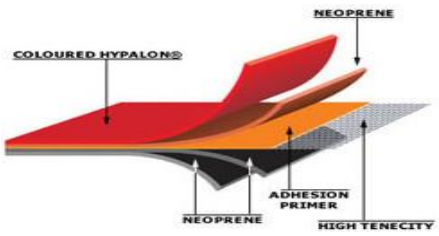
9.1. INTRODUCTION

An Inflatable Rubber Boat (IRB) is a type of small watercraft designed for use in rescue operations and water safety activities. These boats are known for their flexibility, manoeuvrability (adjustability) and ease of transport and storage, Inflatable rubber boats (IRBs) also known as inflatable boats or inflatable dinghies are typically made from a combination of materials to ensure durability, buoyancy and flexibility. The primary materials used in the construction of IRBs include:

9.2. FEATURES OF IRB

9.2.1. Hypalon or CSM (Chlorosulfonated Polyethylene):

Hypalon is a synthetic rubber material known for its excellent resistance to UV rays, chemicals and abrasion. It is common choice for the fabric used in the construction of high-quality inflatable boats. CSM is another rubber-like material with similar properties to Hypalon and is sometimes used in the manufacture of IRBs.



9.2.2. PVC (Polyvinyl Chloride):

PVC is a durable and versatile synthetic material commonly used in the construction of inflatable boats, particularly in budget-friendly models. It is less expensive than Hypalon but may not have the same level of durability in harsh conditions.

9.2.3. Neoprene:

Neoprene is a synthetic rubber material often used for inflatable boat accessories, such as inflatable collars or tubes. It is known for its flexibility, resistance to weathering and buoyancy. The craft shall be built of Buoyancy Tube made of Composite Fabric consisting of Hypalon (outer layers) and Neoprene (inner layers).

Inflatable Rubber Boats consist of one or more inflatable chambers along with various other components. These chambers are inflated to provide buoyancy and support for the boat. The number and arrangement of chambers can vary depending on the design and propose of the IRB. Here's an overview of IRBs and their chambers.

9.2.4. Inflatable Chambers:

9.2.4.1. Main Chambers:

Most IRBs have at least one or more main inflatable chambers that make up the body of the boat. These chambers provide the primary buoyancy and keep the boat afloat. The number of main chambers can vary from one to multiple, depending on the boat's size and design.

9.2.4.2. Keel:

Some IRBs have an inflatable keel running along the bottom of the boat. The keel provides better tracking and stability, especially in choppy water.

9.2.4.3. Air Deck:

Inflatable boats may also have an inflatable air deck or floor. This type of floor provides a rigid and stable platform for standing or sitting inside the boat. It's commonly found is smaller inflatable boats.

9.2.4.4. Inflatable Tubes or Collars:

The inflatable tubes or collars run around the perimeter of the boat and provide additional buoyancy and stability. They also act as fenders or bumpers to protect the boat's sides.

9.2.5. Technical Specifications

Heavy Duty Inflatable Rubber Boat for use in Rivers & Sea the boat is capable of carrying out most boating activities like Diving Operations, Transportation of men & material. These inflatable are made of impermeable, light weight polymer coated fabrics are available in a wide range of colours in capacities from 4 to 12 persons. Highest standards of safety are adhered to.

DESCRIPTION	**GMIB 12P**
Length Overall (mm)	4700
Inside Length (mm)	3300
Width Overall (mm)	2000
Inside Width (mm)	1000
Buoyancy Dia (mm)	500
Compartment	5+1
Capacity- Persons	12
Packing Weight Kg (Approx)	~82
Boat capacity	1200 Kg
Assemble boat weight	110-115 Kg

- Dimensions are nominal in meters.
- Weight of person considered: 82.5 Kg average.
- Standard accessories: Foot Pump, Repair Kit, Valiseand Paddle.
- Colours: Red, Orange, Grey Black.
- Boat Material:Rubber coated (Hypalon / Neoprene) material products.
- Denier of Tube Fabric/ Floor Fabric: 1670 Dtex Hypalon & Neoprene, 1500gms/m2.
- Boat Material: Heavy duty Nylon fabric coated with Hypalon in outer and Neoprene inner side.

9.2.6. Boat directions

- Boat directions man- Bow Man
- OBM driver man- Coxswain
- Eye of the boat- Bow Man
- In charge of the boat- Coxswain

9.2.7. Boat Sides

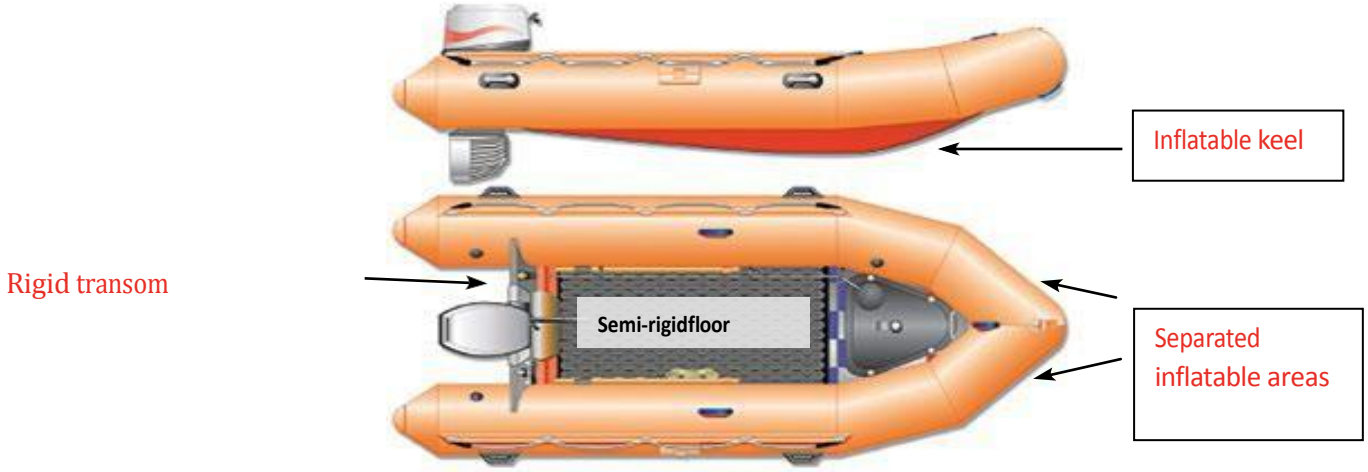
- Front Side- Bow End
- Back Side- Transom
- Right Side- Star board side
- Left Side- Port side

9.3. TYPES OF RESCUE BOAT,NAME OF PARTS& ACCESSORIES

9.3.1. TYPES OF RESCUE BOAT

9.3.1.1. Inflatable rubber boats

- **What are they?**
  - Usually with a semi-rigid floor and rigid transom.
  - The inflatable areas are separated to isolate damaged areas.
  - They sometimes have an inflatable keel fitted to aid manoeuvrability in rough water.

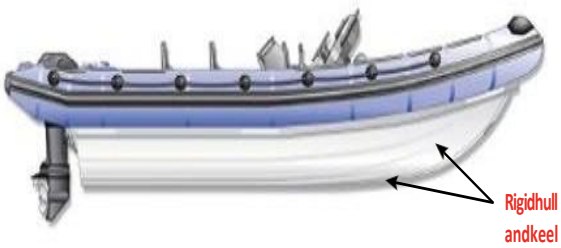


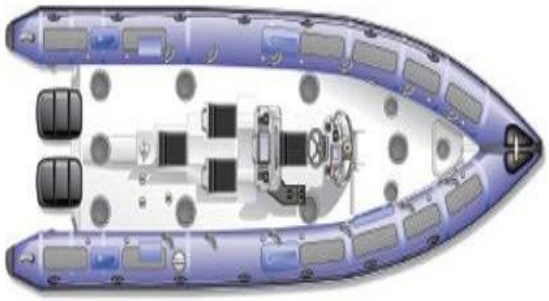
9.3.1.2. Rigid-hullboat

- **What are they?**
  - The rigid hull is the most common boat type with the greatest variety of hull shapes.
  - It can also be constructed with the greatest varietyofmaterials.
- **Advantages**
  - There are many varieties available, which means that there is probably a model available that is suitable for most rescue needs.
  - Mostcanbelaunchedfroma slipway.
- **Disadvantages**
  - Higher sides than an inflatable boat, which may make it harder to get casualties into the boat.
  - May not be asstableas an inflatable boat, especially if it has taken on water.

9.3.1.3. Rigid-inflatable boat (RIB)

- **What are they?**
  - The RIB is a combination of the inflatable and rigid hull boats, with a rigid hull and keel.
- **Advantages**
  - Tends to be larger than inflatable boats, and therefore has a larger carrying capacity.
- **Disadvantages**
  - Most RIBs are large so they need to be launched from trailers.





9.3.1.4. Surf rubber boat:

Designed for use in rough surf conditions, surf Rubber boats are specialized IRBs used by lifeguards and Rescue teams at beaches.

9.3.1.5. Swift water rubber boat:

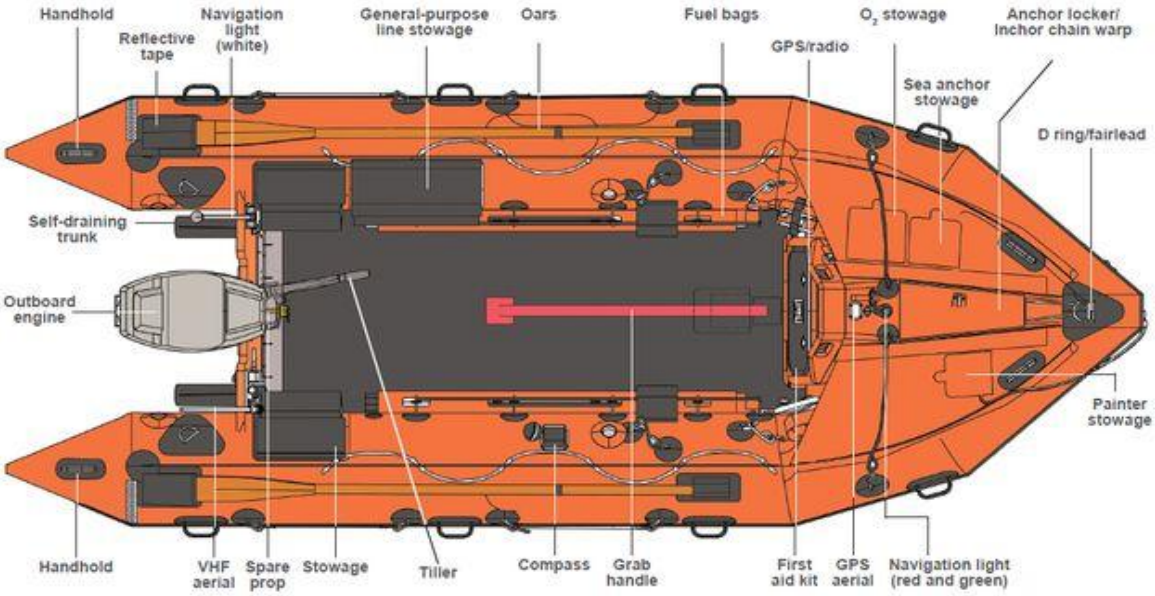
Swiftwaterrubber boats are designed for use in fast-flowing rivers and white-water conditions.

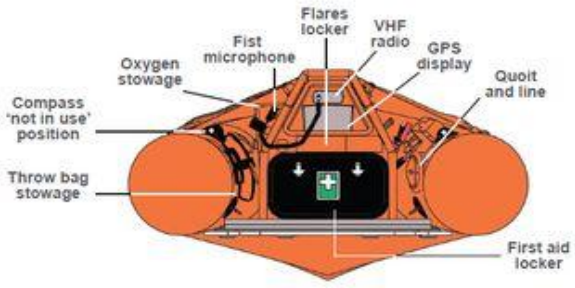
9.3.1.6. Inflatable kayak or canoe:

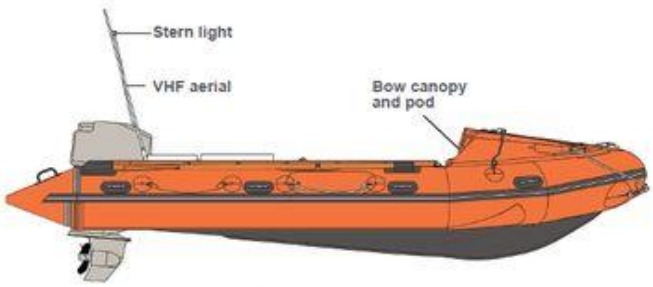
While not technically an IRB, inflatable kayaks and canoes are inflatable watercraft that can also be used for Rubber purposes due to their portability and stability.

9.3.2. Parts Of IRB

Inflatable Rubber Boats (IRBs) consist of various components that work together to create a functional and efficient watercraft. The main parts of an IRB typically include:







9.3.2.1. Inflatable Tubes: These are the inflated cylindrical chambers that surround the boat's perimeter. They provide buoyancy and stability to the IRB.

9.3.2.2. Hull: The hull is the main body of the boat that sits in the water. In some IRBs, it may be a rigid fibreglass or aluminium hull, while in others; it could be an inflatable floor that adds to the boat's buoyancy (the tendency of an object to float in fluid).

9.3.2.3. Bow (Front) and Stern (Rear): The front of the boat is called the bow, and the back is called the stern.

9.3.2.4. Handles and Grab Lines: These are usually attached to the inflatable tubes and provide a secure grip for passengers or Rubbers.

9.3.2.5. Oarlocks and Oars: Some IRBs may have oarlocks to attach oars for manual propulsion. However, many IRBs come with outboard motors for propulsion.

9.3.2.6. Transom: The transom is the vertical surface at the back of the boat, where an outboard motor can be mounted.

The transom board shall be fitted and securely bonded to the buoyancy tube and the floor so as to provide a water tight joint. The Transom shall be designed for use with 40 HP OBM. The transom shall be made of marine plywood coated with FRP/GRP of appropriate thickness and to be suitably fitted out with engine mount made of marine grade Aluminium alloy plate and chafing patch, coated fabric shall be pasted on the surface area of the transom to prevent it from damage as well as loosening from the tube body. Separate strip of suitable size shall be provided on the bottom of the transom to minimize chance of damage. Details regarding craft identification No. etc. shall be engraved on a builder's plate fitted on the inner side of the transom on starboard side. Towing rings, cleat and 'U' bracket shall be provided as per approved drawing.

9.3.2.7. Floorboards: Some IRBs have removable floorboards that provide additional rigidity to the boat's structure.

9.3.2.8. Inflation Valves: These are openings through which the IRB is inflated using an air pump or by mouth.

9.3.2.9. Drain Valves: These valves allow water to drain out of the boat to keep it dry and prevent excess weight.

9.3.2.10. Safety Lines: Some IRBs may have safety lines attached to the inflatable tubes to provide additional security for passengers or Rubbers.

9.3.2.11. Bow Line and Painter: These are ropes or lines attached to the bow of the IRB, used for towing or securing the boat.

9.3.2.12. D-Rings and Attachment Points: These are often located on the inflatable tubes and allow for the attachment of various accessories and equipment.

9.3.2.13. Inflation and Deflation

- **Inflation:**Before use, the IRB needs to be inflated. This is usually done by opening the inflation valves and pumping air into the boat using an air pump. Once fully inflated, the IRB becomes buoyant and ready for deployment.
- **Propulsion:**IRBs can be manually propelled using oars or paddles. However, many IRBs are equipped with outboard motors mounted on the transom. The outboard motor provides propulsion and allows the IRB to move swiftly and efficiently through the water.
- There are check valves; a small leak is normal before the caps are fitted.
- After inflating put cover on the valve to avoid damage.

9.3.3. Navigation:

The operator, often a trained rescuer steers the IRB using the outboard motors controls or by adjusting the oars. The boat's manoeuvrability and responsiveness enable it to navigate through different water conditions, including waves and tight spaces.

- **Navigation checklist**
  - When placing the boat in water, ensure outboard motor has been bolted to the boat properly
  - Visually check deck, hull for any physical damage, leaks etc.
  - Examine out board motor for any dirt, excessive oil etc.
  - Examine propeller for any damage. Ensure propeller is secured to OBM properly
  - Check engine oil
  - Examine condition of fuel tanks, fitting etc.

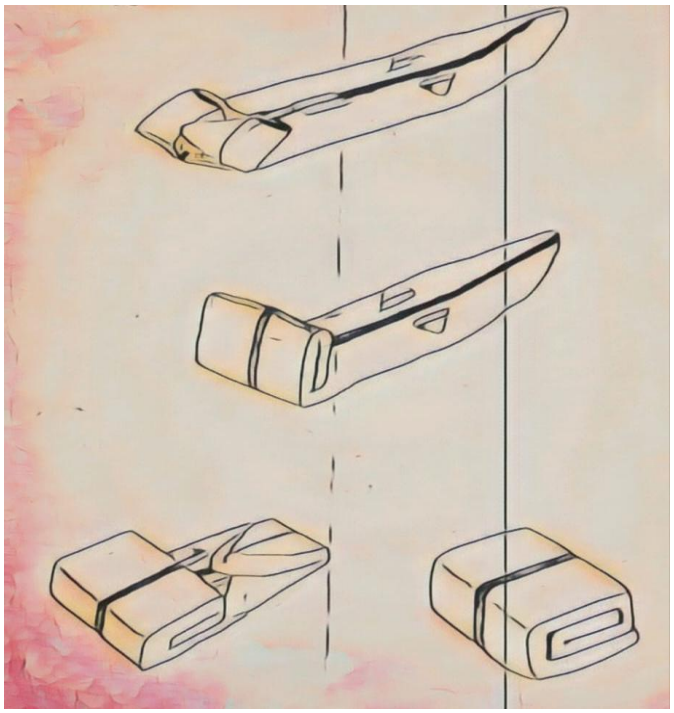
9.3.4. Accessories

- Life jackets
- Lifebuoys
- Fuel tank (25 Ltr.)
- Tool/kit

- Rope
- Oars (Chappu)
- Puncture Kit
- Foot Pump (Bellow pump)
- Air blower
- Life line

9.3.5. Deflation And Folding

- Place the boat on plane surface with the help of carrying handles.
- Clean and rinse the boat with fresh water to remove sand and other debris.
- Deflate all the chambers
- Remove floor boards
- Remove keel in case of rigid keel
- Dry the boat and powder it with starch
- Fold and pack as shown in drawing.



9.4. OPERATING PROCEDURE

9.4.1. Inflation: Ensure the boat is properly inflated to the required pressure using an appropriate air pump or inflation device.

9.4.2. Preparation (OBM): Before launching your IRB, ensure that the outboard motor is securely attached and properly fastened to the boat according to the manufacturer's instructions. Confirm that the motor is in good working condition, including checking for fuel, oil and any require maintenance.

9.4.3. Motor Start Up: Follow the manufacturer's guidelines for starting the outboard motor. Typically, this involves ensuring the motor is in neutral, the fuel line is connected and the choke (If applicable) is set correctly. Pull the starter cord or use the electric start mechanism, if available, to start the motor.

9.4.4. Throttle Control: Familiarize yourself with the throttle controls of the outboard motor. Gradually increase the throttle to reach your desired speed. Be cautious not to accelerate too quickly, as this can affect stability.

9.4.5. Steering: Use the boat's steering mechanism to navigate. Most IRBs have a tiller handle on the outboard motor for steering. Practice turning and steering at different speeds to become comfortable with the boat's handling.

9.4.6. Safety Precautions: Always wear a kill switch lanyard attached to boat handler which will shut off the motor if you fall overboard. Keep all persons seated properly while the motor is running. Ensure that everyone on board is wearing life jackets.

9.4.7. Observe Regulations: Follow local boating regulations, including speed limits, no-wake zones, and safety requirements. Respect the environment and other water users.

9.4.8. Motor Shutdown: When you are done using the IRB, follow the manufacturer's instructions to shut down the outboard motor safely. Typically, this involves reducing the throttle to idle, placing the motor in neutral, and turning off the ignition.

9.4.9. Loading: Follow the manufacturer's guidelines for the maximum weight capacity of the boat. Avoid overloading it, as this can affect stability and safety.

9.4.10. Safety Equipment: Have appropriate safety equipment on board, including life jackets, paddles and a throw able flotation device.

9.4.11. Maintenance: Regularly inspect the boat for signs of wear, punctures or damage. Repair any issues promptly.

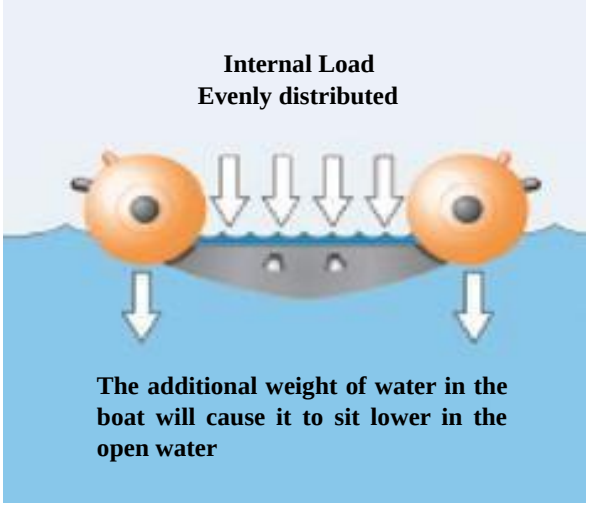
9.4.12. Rescue Boat Stability

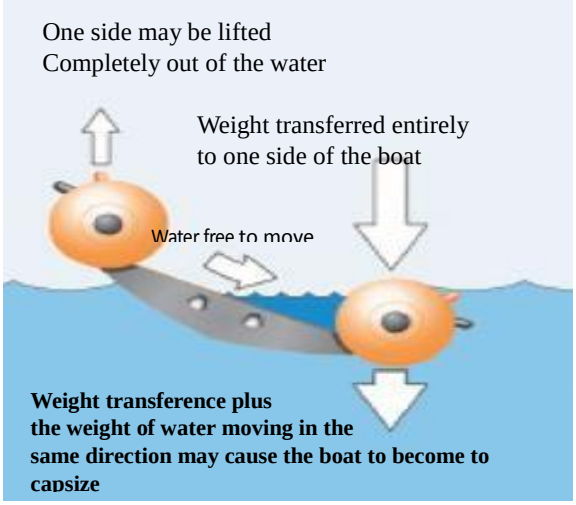
- Rescuers should be aware of the limits of the boat/raft they are operating. This will includethe maximum number of people and the maximum combined weight of people and equipment that should be carried on board.
- The rescuers are responsible for making sure the boat/raft is correctly balanced.**Don't overload the boat/raft.**

- **Uneven distribution of weight**

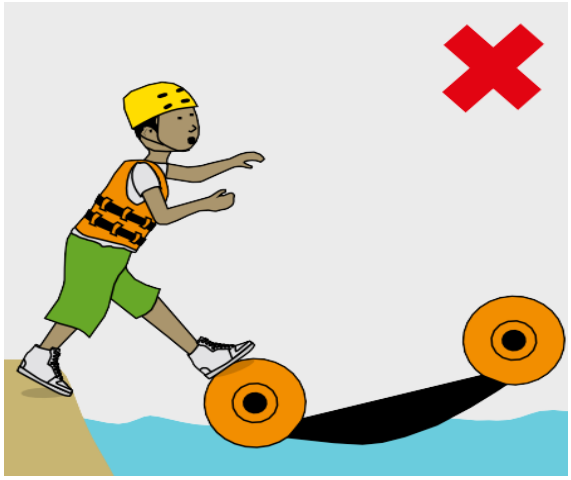
  The movement of weight around the boat will affect its stability. This weight maybe a member of crew, a passenger or load. In flowing water there may be occasions when water is moving freely inside the rescue boat. The movement creates instability, which may lead to the boat capsizing.

The rescuer should ensure that only a minimum amount of water is allowed to collect in the boat, and that load is evenly distributed.





9.4.13. Getting in and out of a boat



- **NEVER**
  - Stepontheedgeoftheboat
  - Jump/stepacrossalargewatergap.

- **ALWAYS**
  - Step into the boat
  - Check the boat remains balanced when a person steps into or out of the boat.

    If possible, ensure the boat is secured with ropes to fixed objects on the bank before getting in or out of the boat.

9.4.14. Paddling techniques

- Paddling a boat effectively means that all members of the team must work together.
- The team should select a person in charge to lead the group and give directions.
- As a rule, the person leading the group should position themselves at the back of the boat.

- The team leader should use clear commands to keep the group working together:
    - "Paddle left"
    - "Paddle right"
    - "Paddle forwards"
    - "Paddle backwards"
    - "Stop paddling"

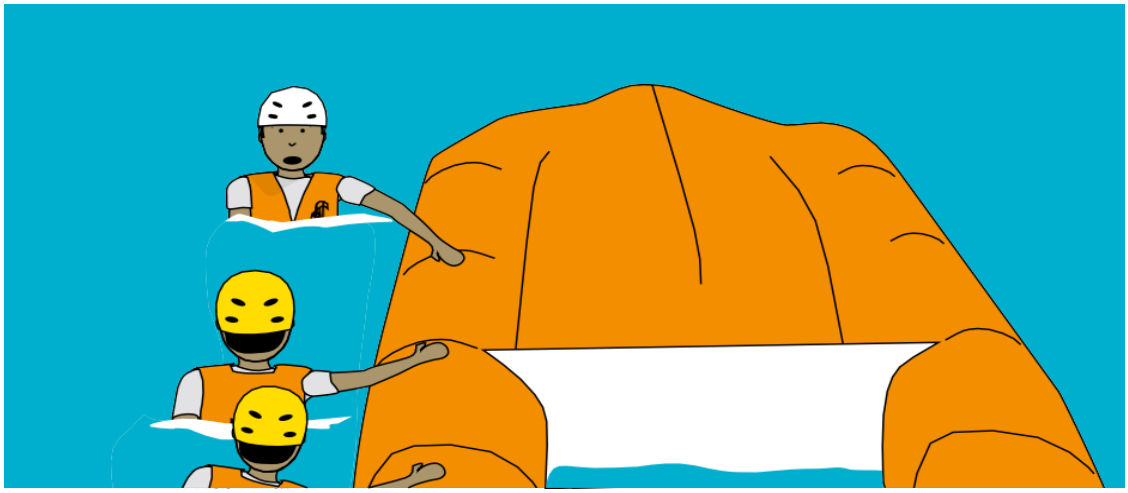
9.4.15. Capsize

If a boat capsizes, it is vital to verbally and visually check that all crew are accounted for. All crew must maintain contact with the upturned boat at all times by holding onto any lifelines. If you find yourself under the upturned hull following capsize, exit as quickly as possible while remaining in contact with the boat at all times.

- The boat team leader will then make a decision to either:
    - **Swim to safety**- if hazards are present
    - **Re-right the boat** and paddle to safety- if no hazards are present
    - **Sit on top** of the upturned boat and ride down the flow to a safer point.

9.4.16. Entrapment

- Communicate with the boat and if safe to do so wait for them to pick you up.
- If this is not possible, try and self-rescue using defensive or aggressive swimming.



9.5. TROUBLESHOOTING& RESOLVING

9.5.1. Troubleshooting

- **Leaked Detection:** If the boat is losing air then simultaneously use soapy water or a submersion test to identify leaks.

- **Valves and Seals:** Check the integrity of inflation valves and seals. Ensure they are properly fixed and sealed to prevent air loss.
- **Seam Inspection:** Inspect the seams for any signs of separation or damage. Repair any seam issues according to the manufacturer's instructions.
- **Paddle and Oar Issues:** If the paddle or oars show signs of wear or damage, replace them to maintain safe and efficient operation.
- **Safety Gear:** Ensure that life jackets and other safety equipment are in good condition and meet safety standards.

9.5.2. Resolving

Situation: If your inflatable rubber boat (IRB) gets punctured while you are sailing, it's essential to have a plan in place to address the issue promptly. Preparing a puncture in an IRB is typically straightforward if you have the right tools and materials on hand. Here's a step-by-step guide on how to repair a punctured IRB while sailing:

9.5.2.1. Assess the Situation:

- Determine the extent of the damage. Locate the puncture or hole in the boat's fabric.
- Ensure everyone on board is wearing a life jacket and remains calm.

9.5.2.2. Prepare the Repair Kit:

- Most inflatable boats come with a repair kit that includes patch material, adhesive (often specialized inflatable boat glue) and a brush or applicator.
- Ensure you have a suitable repair kit on board. It's essential to check that the adhesive is not expired as expired adhesive may not bond properly.

9.5.2.3. Locate the Puncture:

- Inflate the boat to a moderate pressure to help identify the puncture. A solution of soapy water can also be used to locate the puncture by looking for bubbles.
- Mark the location of the puncture with a pencil or marker.

9.5.2.4. Dry and Clean the Area:

- Deflate the boat and allow the area around the puncture to dry thoroughly.
- Clean the area with a cloth or rag to remove any dirt, debris or contaminants.

9.5.2.5. Apply Adhesive and Patch:

- Apply a generous amount of the adhesive (in accordance with the repair kit instruction) to both the patch material and the damaged area on the boat.
- Wait for the adhesive to become tacky (usually a few minutes) before placing the patch over the puncture.
- Press the patch firmly onto the boat, ensuring there are no air bubbles or wrinkles.

9.5.2.6. Allow Time to Cure:

- Follow the manufacturer's instructions for the adhesive's curing time. This typically involves allowing the repair to set and cure for several hours or even overnight.
- Keep the boat and patch are dry during this curing period.

9.5.2.7. Re-inflate the Boat:

- Once the adhesive has cured, carefully re inflate the boat to the recommended pressure.

9.5.2.8. Test the Repair:

- Submerge the repaired area in water to check for any air leaks or bubbles. If no leaks are detected, the repair is successful.

9.5.2.9. Continue Sailing:

- If the repair holds and the boat is no longer losing air, you can continue sailing.

  It's crucial to practice patching a puncture on your inflatable boat before heading out on the water, so you are familiar with the process. Additionally, having a well-maintained and properly equipped repair kit on board is essential for addressing punctures quickly and effectively while sailing. In some cases, you may need to return to shore if the damage is extensive or if the repair doesn't hold. Always prioritize safety when dealing with inflatable boat repairs.

9.6. MAINTENANCE

9.6.1. Cleaning: Rinse the boat with fresh water after each use to remove salt, sand or debris. Thoroughly dry it before storage to prevent mold or mildew growth.

9.6.2. Storage: Store the boat in a cool, dry place away from direct sunlight and extreme temperatures. Avoid folding or storing it in a way that could cause damage to seams or fabric

9.6.3. Inflation System: Maintain the inflation device or pump, ensuring it is in good working order and properly stored.

9.6.4. Patch Kits: Keep a patch kit on hand for quick repairs. Familiarize yourself with the repair process outlined in the manufacturer's instructions.

9.6.5. Regular Inspection: Periodically inspect all components, including valves, seams, and accessories to ensure they are in good condition.

9.6.6. Training: Ensure that operators are trained in safe boating practices and know how to respond to emergencies.

REVIEW:-

The participants learnt about:-

9.1. Introduction
9.2. Features of IRB
9.3. Types of rescue boat, Name of parts & Accessories
9.4. Operating procedure
9.5. Troubleshooting& resolving
9.6. Maintenance

LESSON-10

OBM: TYPE, PARTS & FUNCTIONING, OPERATIONAL TROUBLESHOOTING & MAINTENANCE

CONTENT

OBJECTIVES:

Upon completion of this lesson, you will be able to understand

10.1. Introduction about OBM
10.2. Parts of OBM
10.3. Technical data
10.4. How does OBM engine work
10.5. Type of engine
10.6. OBM engine operation
10.7. Maintenance of OBM
10.8. Troubleshoots and Resolving

10.1. INTRODUCTION ABOUT OUTBOARD MOTOR (OBM)

An outboard motor is a propulsion system for boats, consisting of a self-contained unit that includes engine, gearbox, and propeller or jet drive, designed to be affixed to the outside of the transom. They are the most common motorised method of Propelling small watercraft

1.1. FULL NAME OF OBM:-

- Four Stroke Outboard Motor (EFI)

E- Electronic
F- Fuel
I- Injection

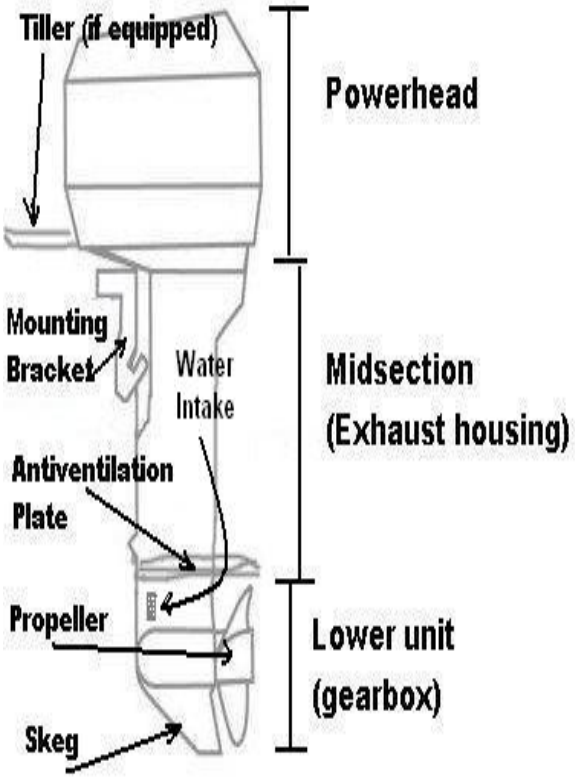
10.2. PARTS OF OBM

10.2.1. IT CAN BE DIVIDED IN THREE PARTS

a) Power unit e.g. Engine
b) Middle Unit e.g. Exhaust Housing
c) Lower unit e.g. Gear Box

10.2.2. POWER UNIT PARTS NAME

a) Top Cowl
b) Starter Assembly
c) Manual start rope
d) Low oil pressure lamp
e) Intake manifold Plenum (IMP)
f) Recoil Inter lock Cable
g) Air Vent Assembly
h) Silencer for Idle Air Control
i) Vapor Separator Tank (VST)
j) Fuel line connector
k) Lanyard Switch
l) Throttle friction Adjuster
m) Throttle Handle
n) Fuel rail
o) Electronic Control Module (ECM)
p) OIL Level dip stick
q) Fuel cooler
r) Primary Fuel Filter
s) Oil Filter
t) High pressure Fuel filter
u) Oil fill cap
v) Mechanical Fuel Pump



10.2.3. MIDDLE UNIT PARTS NAME

a) M/oil sump
b) M/oil drain plug
c) Transom bracket assembly
d) Thumb Screw
e) Thumb Screw washer
f) Thrust Rod

10.2.4. LOWER UNIT PARTS NAME

a) Gear assembly
b) Propeller
c) Propeller luck nut & washer
d) Cutter pin
e) Gear oil drain plug
f) Gear oil level plug
g) Trim Tab (Anode)
h) Water intake jacket/hole
i) Anti-Ventilation plate/ Anti Cavitations Plate

10.2.5. POSITION OF OBM

10.2.5.1. Tilt Up Position:-

- When OBM stop in running position and any mechanicalfault in machine.
- If Propeller is jam
- In parking

10.2.5.2. Tilt Middle Position:-

- If water level is 3 to 4 feet.

10.2.5.3. Tilt Down Position:-

- If water level is above 4 feet.

10.3. TECHNICAL DATA(AS PER MODEL OF OBM)

a)	Engine Type -	Four Stroke
b)	Number of Cylinder -	03 No's
c)	Firing Order -	1-3-2
d)	Idle RPM-	850 +/-30 RPM
e)	Wide open Throttle-	5000-6000 RPM
f)	RPM Over Speed-	6300 RPM
g)	Fuel Pump Pressure-	Mechanical- 4.2 PSI, Electric - 38-47 PSI
h)	Fuel System-	Electronic Fuel Injection (EFI)
i)	Spark Plug gap-	0.8-0.9 mm
j)	Cooling System –	Water cooled (Thermostat Control)
k)	M/Oil Capacity-	1.8 Ltr.
l)	Gear oil capacity-	350 ML

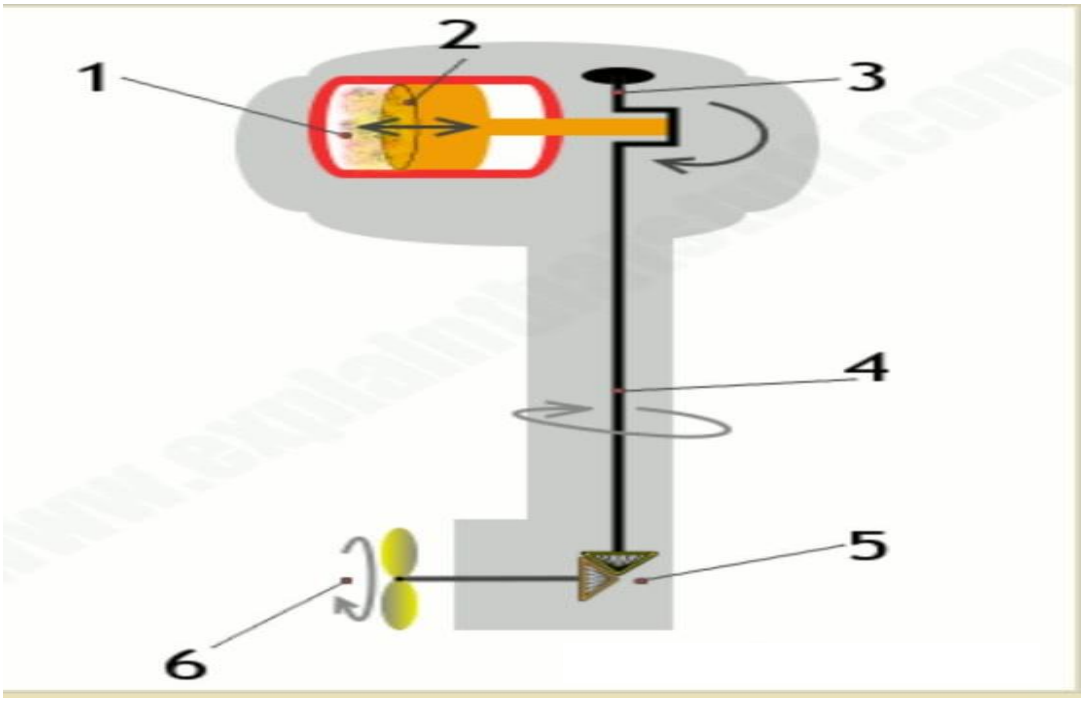
10.4. HOW DOES OBM ENGINE WORK

The OBM Engine consists of a fixed cylinder and a moving piston. The expanding combustion gases push the piston, which in turn rotates the crankshaft through a system of gears in the power train. This motion drives the propeller of OBMand then it moves forward or reverses. (Combustion meaning the basic chemical process of releasing energy from a fuel and air mixture)

10.4.1. How Outboard Motor Work

- Burns in the cylinder to make power.
- Powered by the burning and expanding fuel gases, a piston moves back and forth in the cylinder and works through the same four-step process (four stroke cycle).
- The piston rod turns the crankshaft, converting the back and forth motion of the piston into round and round (rotary) machine.

- The crankshaft turns the main driveshaft running down the long spine of the motor.
- A small gearbox at the bottom of the driveshaft converts vertical spinning motion into horizontal spinning motion.
- The propeller powered by horizontally spinning gears powers the boat through the water.



10.4.2. Type Of Combustion Engine

- **External Combustion Engine (ECE):-**

  An external combustion engine in which the heat to drive the engine cycle is provided from outside the engine.

- **Internal Combustion Engine (ICE):-**

  An internal combustion engine, the ignition and combustion of the fuel occurs within the engine itself.

10.5. TYPE OF ENGINE

- **Two Stroke Engine :-**

  Two stroke engines complete a power cycle every two strokes, which means a power cycle is completed with every crankshaft revolution. Two stroke engine commonly used in marine engines, outdoor power tools (e.g. chainsaws)

- **Four stroke Engine :-**

  Four stroke engines complete a power cycle every four strokes, which means a power cycle is completed every two crankshaft revolutions.

10.6. OBM ENGINE OPERATION

10.6.1. Pre Starting Checklist:-

- Operator knows safe navigation, boating & operating procedures.
- A ring type lifebuoy or buoyant cushion designed to be thrown to a person in the water.
- An approved personal floating device of suitable size for each person aboard and readily accessible (it is the law).
- Know your boats maximum load capacity.
- Fuel supply ok.
- Arrange passengers and load in the boat so the weight is distributed evenly and everyone is seated at a proper place.
- Tell someone where you are going and when you expect to return.
- It is illegal to operate a boat under the influence of alcohol or drugs.
- Know the waters and area you will be boating "tides, currents, sand, rocks &other hazards".
- Make inspection checks listed in maintenance schedule.

10.6.2. Pre Starting Instruction

- Connect remote fuel line to the out board. Make sure connector is snapped in to place.
- Check the engine oil level.
- Make sure the cooling water intake is submerged.

10.6.3. Operation

- Open fuel tank vent screw on manual venting type fuel tanks.
- Squeeze the fuel line primer bulb several times until it feels hard.
- Set the lanyard stop switch to run position.
- Set the tiller handle grip to neutral start position.
- Pull the starter rope slowly until you feel the starter engage, then pull rapidly to crank the engine. Allow rope to return slowly, repeat until engine starts.
- After engine starts, check for steady stream of water flowing out of the water pump indicator hole.
- Before beginning operation allow engine to warm up at ideal speed for 3minutes.
- The OBM has three gearshift positions to provide operation (Forward-F, Neutral- N, Reverse-R). Never shift out board in to gear unless engine speed is at ideal. Do not shift OBM out board in to rivers when the engine is not running.

10.7. MAINTENANCE OF OBM

10.7.1. Before Each Use:-

- Check engine oil level. Refer to checking and adding Engine oil
- Check that lanyard stop switch stops the engine.
- Visually inspect the fuel system for deterioration or leaks.
- Check propeller blades for damage.
- Check to insure the propeller mounting hardware is tight.

10.7.2. After Each Use:-

- Flush out the outboard cooling system if operating in salt or polluted water.Refer to flushing the cooling system.
- Wash of all salt deposits and flush out the exhaust out let of the propeller and gear case with fresh water if operating in salt water.

10.7.3. As Per User's Manual:-

- Lubricate all lubrication points.
- Change Engine oil and replace the oil filter.
- Replace Sparkplugs at first 100 hours or first year.
- Inspect thermostat visually for corrosion and broken spring.
- Drain fuel system
- Replace the High pressure fuel filter.
- Drain and replace gear case lubricant refer to gear case lubrication.
- Check tightness of bolts, nuts, and other fasteners.

10.8. TROUBLESHOOTING AND RESOLVING

10.8.1. Engine will not start.

- Lanyard stop switch not in RUN position
- Old or contaminated gasoline.
- Fuel is not reaching the engine.
- Fuel tank is empty.
- Fuel tank vent not open or restricted.
- Fuel line is disconnected or kinked.
- Primer bulb not squeezed.
- Primer bulb check valve is faulty.
- Fuel filter is obstructed, Refer to Maintenance Section.
- Fuel pumps failure.
- Fuel tank filter obstructed.
- Ignition system component failure.
- Spark plugs fouled or defective. Refer to MaintenanceSection.

10.8.2. Engine Runs Erratically.

- Low oil pressure. Check oil level.
- Spark plugs fouled or defective. Refer to Maintenance Section.
- Incorrect setup and adjustments.
- Fuel pumps failure.
- Ignition system component failure.
- Fuel is being restricted to the engine.
- Engine fuel filter is obstructed. Refer to Maintenance Section.
- Fuel tank filter obstructed.
- Fuel line is kinked or pinched.
- Fuel is being restricted to the engine

10.8.3. Performance Loss.

- Low oil pressure. Check oil level.
- Throttle not fully open.
- Damaged or improper size propeller.
- Boat overloaded or load improperly distributed.
- Boat bottom is dirty or damaged.
- Warning lamp or Warning buzzer "ON".
- Low engine oil level.
- Clogged oil filter
- Oil pump malfunction
- Electrical components out of range or improper or loose wiring connection.

REVIEW:-

The participants learnt about:-

10.1. Introduction about OBM
10.2. Parts of OBM
10.3. Technical data
10.4. How does OBM engine work
10.5. Type of engine
10.6. OBM engine operation
10.7. Maintenance of OBM
10.8. Troubleshooting and Resolving

LESSON-11

SONAR SYSTEM

CONTENT

OBJECTIVES:

Upon completion of this lesson, you will be able to understand

11.1. Introduction & types of SONAR
11.2. Functioning of SONAR
11.3. Installation Procedure
11.4. Dos & Don'ts

11.1. INTRODUCTION & TYPES OF SONAR

11.1.1. INTRODUCTION:

- SONAR stands for Sound Navigation and Ranging. It's simply making use of an echo. Sonar device makes a noise; it sends sound waves into water around it. Sound waves bounce off nearby objects and some of them reflect back to the object that made the echo.
- Starfish is a Side-Scan Sonar system that comprises a 'top-box' electronics module and submerged towed 'transducer head'.
- Side-Scan Sonar's are designed for survey work rather than navigation and obstacle-avoidance tasks.
- As the transducer head moves forward through the water, a continuous strip of imagery representing a swathe of seabed beneath the sonar is displayed (and recorded) on a computer.

11.1.2. TYPES OF SONAR

a) **ACTIVE SONAR:**It is emitting pulses of sound and listening the echoes.

b) **PASSIVE SONAR:** It is essentially listening for the sound made by vessels and animals.

- **Starfish 450F**
  - 450kHz Frequency
  - 100mm Transducer
  - 1.5° Horizontal Beam-width
  - 80-100m Maximum Range (per channel)

- **Starfish 452F**
  - 450 kHz Frequency
  - 200mm Transducer
  - 0.7° Horizontal Beam-width
  - 80-100m Maximum Range

- **Starfish 990F**
  - 990kHz Frequency
  - 200mm Transducer
  - 0.3° Horizontal Beam-Width
  - 25-35m Maximum Range

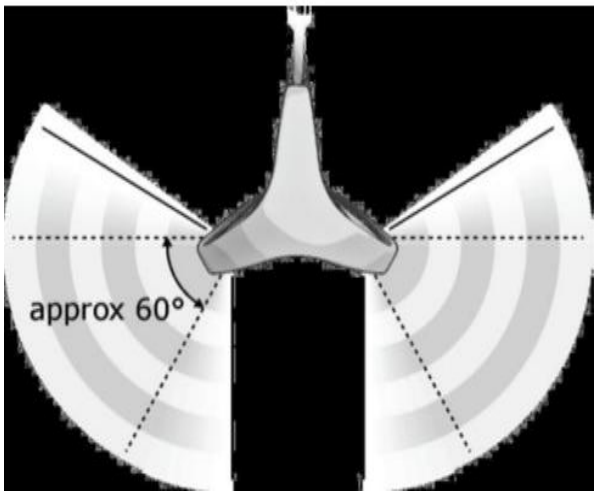
11.2. FUNCTIONING OF SONAR

Starfish is a Side-Scan Sonar system that comprises a 'top-box' electronics module and sub- merged towed transducer head. Side-Scan Sonar's are designed for survey work, navigation and obstacle- avoidance tasks.

As the transducer head moves forward through the water, a continuous strip of imagery representing a swathe of seabed beneath the sonar is displayed and recorded on a computer.

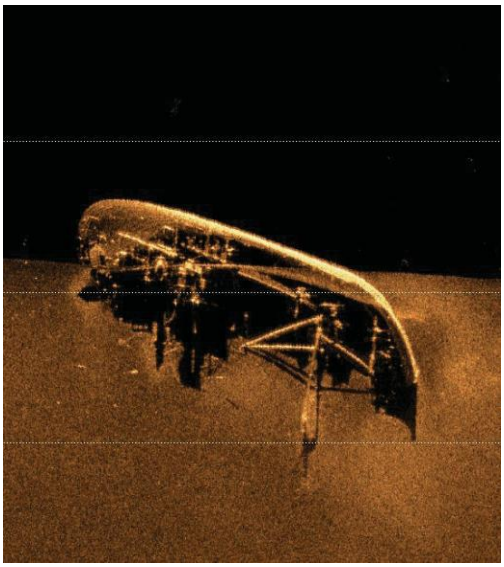
11.2.1. TRANSDUCERS

Starfish's transducers (transmitters and receivers) are mounted in its lower fins at a 30° down angle. The transducers transmit sound in a "fan beam" most of the energy confined to the centre 60° of the beam.



11.2.2. WHAT IS A SIDE-SCAN SONAR

- Sonar stands for "Sound Navigation and Ranging" and in the 1950's the first experimental Side-Scan systems were developed.
- The system has been made in U.K by Poly Urethane.
- Side-Scan Sonar's send fan- shaped pulses of acoustic energy into the water and record the echoes they receive back to produce an image representing the seabed below it.

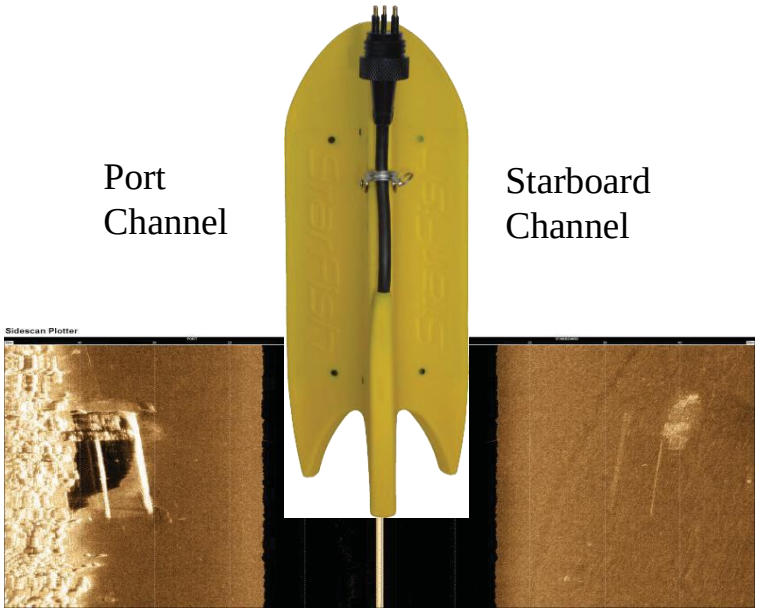


11.2.3. SIDE-SCAN SONAR OPERATION

- Depending on the objects material, the intensity of the reflected sound will vary.
- The backscatter from each object (or target) combines to form a single received signal, and these "scan lines" are sent to the PC for interpretation and display.
- The PC stitches together data from successive pulses, creating a long continuous image of the seafloor as the sonar is towed.

11.2.4. CHANNELS

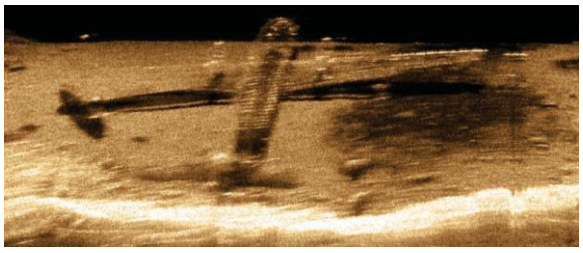
Starfish has two channels comprising transmitters and receivers (transducers) mounted inside the port and starboard fins of the Transducer Head.



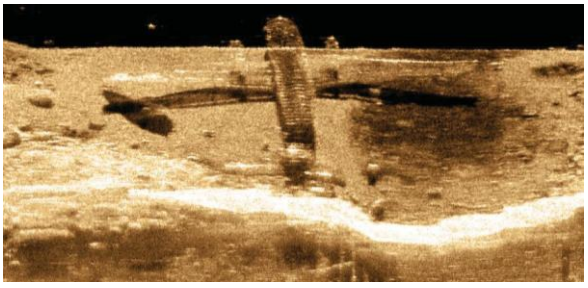
Port Image Starboard Image

11.2.5. FREQUENCY & RESOLUTION

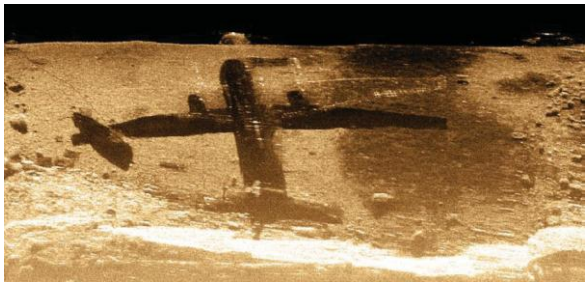
- The sound frequency the sonar transmits at, and the length of its transducers govern the resolution of its images.



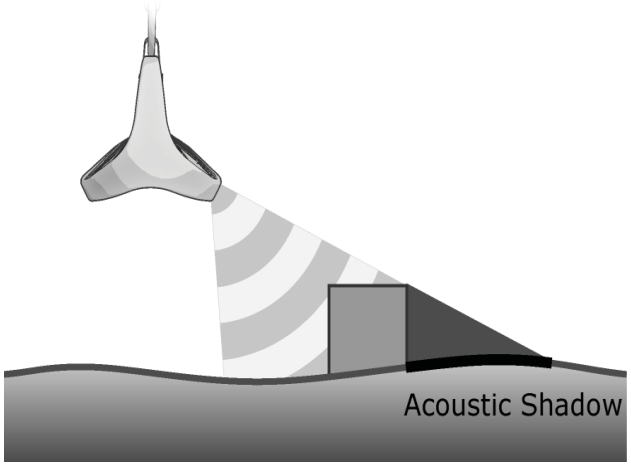
- The longer the transmitter length, the thinner (narrower) each image slice becomes and the crisper the image quality is in the direction of travel (along-track).



- The higher the frequency the sonar uses, the greater the detail in echoes received becomes, but maximum range the sonar can 'see' is reduced.



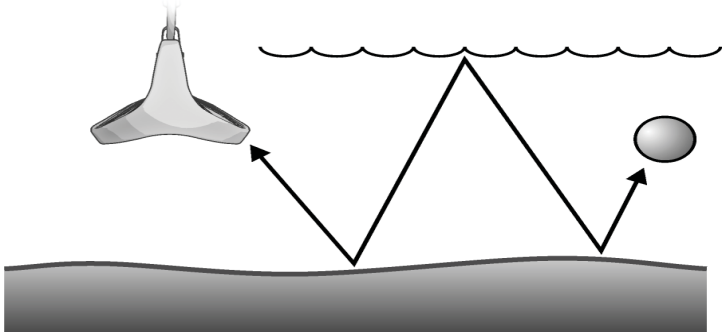
11.2.6. ACOUSTIC SHADOWS



- As sound hits a target with height above the seabed, an acoustic shadow will be cast.
- The length of the shadow can help estimate the size and height of the object.
- Imagine using a torch in a darkened room:

  If the torch points straight down on a ball, a small shadow is cast. If the torch points horizontally at the ball a longer shadow is cast.
- This same principle applies to side scan sonar where objects directly below the sonar cast smaller shadows, while objects at greater distances will cast longer shadows.

11.2.7. SHALLOW WATER & CHANNELS



- In shallow channels sound can bounce multiple times between the seabed and surface. This is called Multi-Path and can distort the image.
- Sound can bounce/reflect into the opposite channel and appear as a mirrored ‘ghost’ image of the other channel.
- Shallow sonar’s may receive echoes from the surface. Chop and waves can distort the image like water ripples.

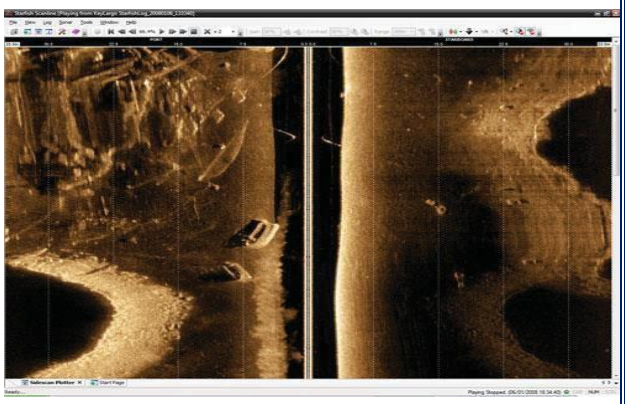
11.2.8. STARFISH 990F RANGE SETTING

- At longer ranges, the image update rate is slower than at shorter ranges. This means you should tow the sonar slower when using longer ranges. Different Water has different intensity of the sound. Starfish 990 have 30m Range each side. Only large targets with strong echoes may be seen.

- Gain and contrast control image to be adjusted and enhance details. Increasing the gain makes all areas of the display appear brighter. Decrease the gain makes all areas appear darker. Contrast sets the between dark and bright colours: A lower contrast means the image goes from dark. A higher contrast the image goes from bright, may show more subtle details.

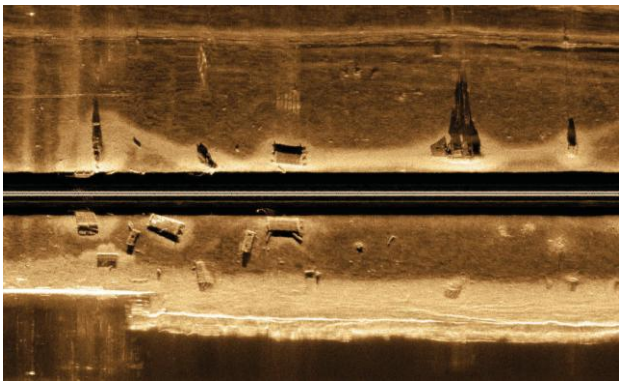
11.2.9. EXAMPLE – SUNKEN & MOORED BOATS

- 2 sunken boats
- Mooring lines visible
- Shoreline visible on both channels



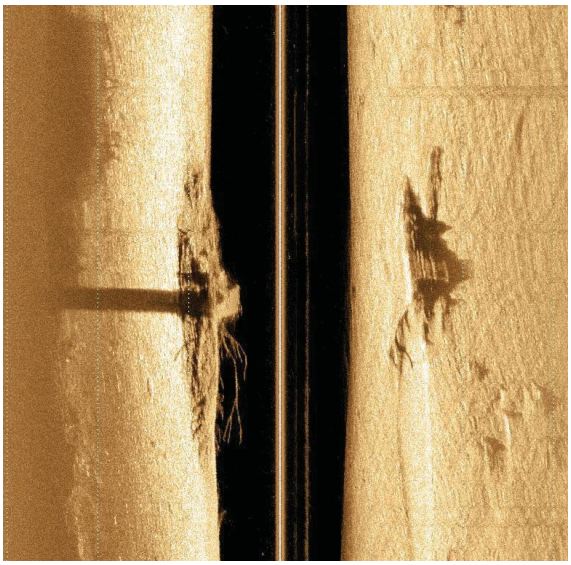
11.2.10. EXAMPLE – DIVER TRAINING CENTRE

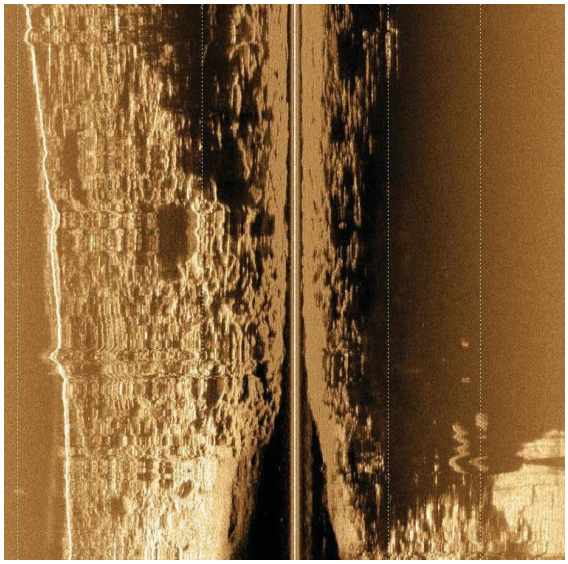
- Various training tables, sunken boat (with height) & hard concrete pilings.



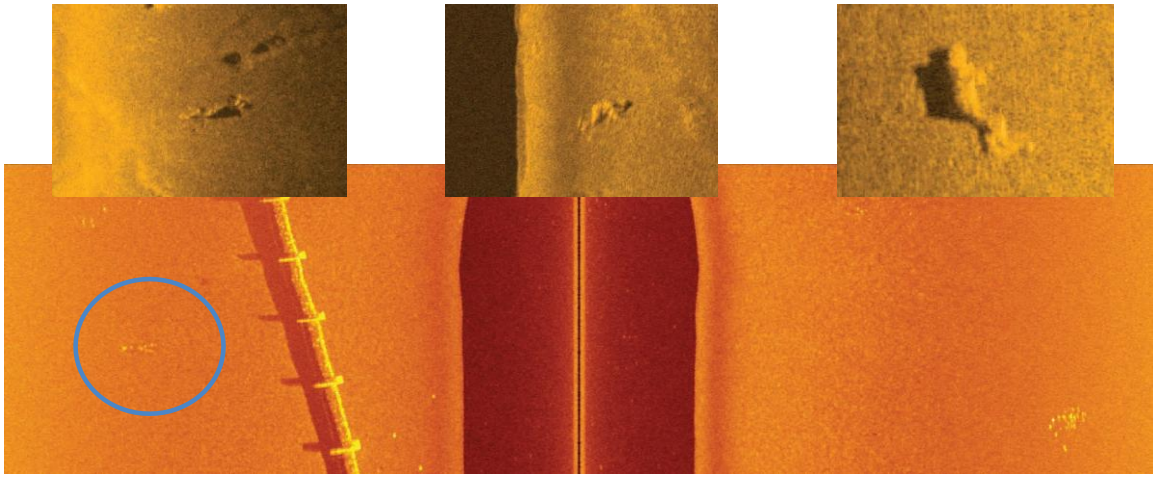
11.2.11. EXAMPLE – RIVER

Large tree, Surface echo visible, Rocky riverbed, Very shallow!





11.2.12. EXAMPLE – DROWNING VICTIMS



11.3. INSTALLATION PROCEDURE

11.3.1. SYSTEM CONTENTS

11.3.2. MAIN COMPONENTS

Top-Box

20m Tow Cable

Transducer Head

USB Cable

50m Cable Reel (*option)*

11.3.3. POWER SUPPLY

Crocodile Clips
(For batteries)

DC Power Lead

Mains Power Supply
(Indoor or deck-house use only)

11.3.4. SUNDRIES & ACCESSORIES

Transducer Rigging Shackles (x2)

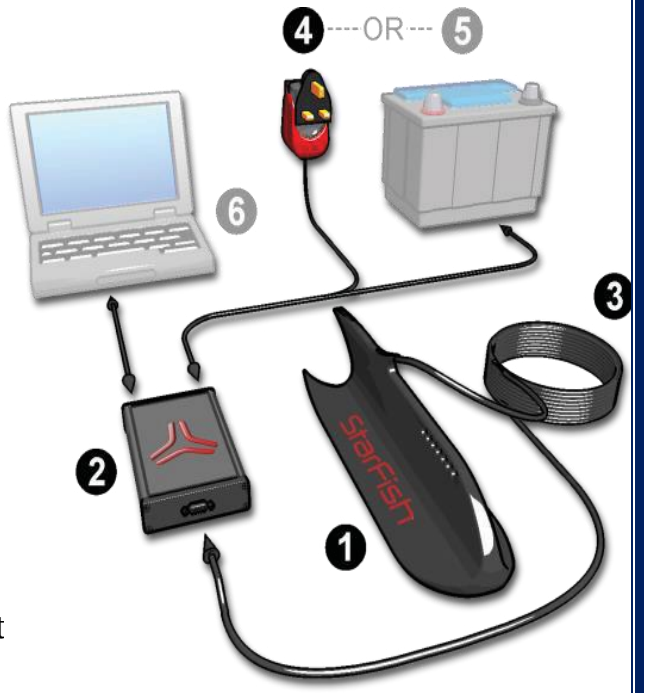
User Manuals and Quick-Start Guide

Transducer Pole Mount Bracket

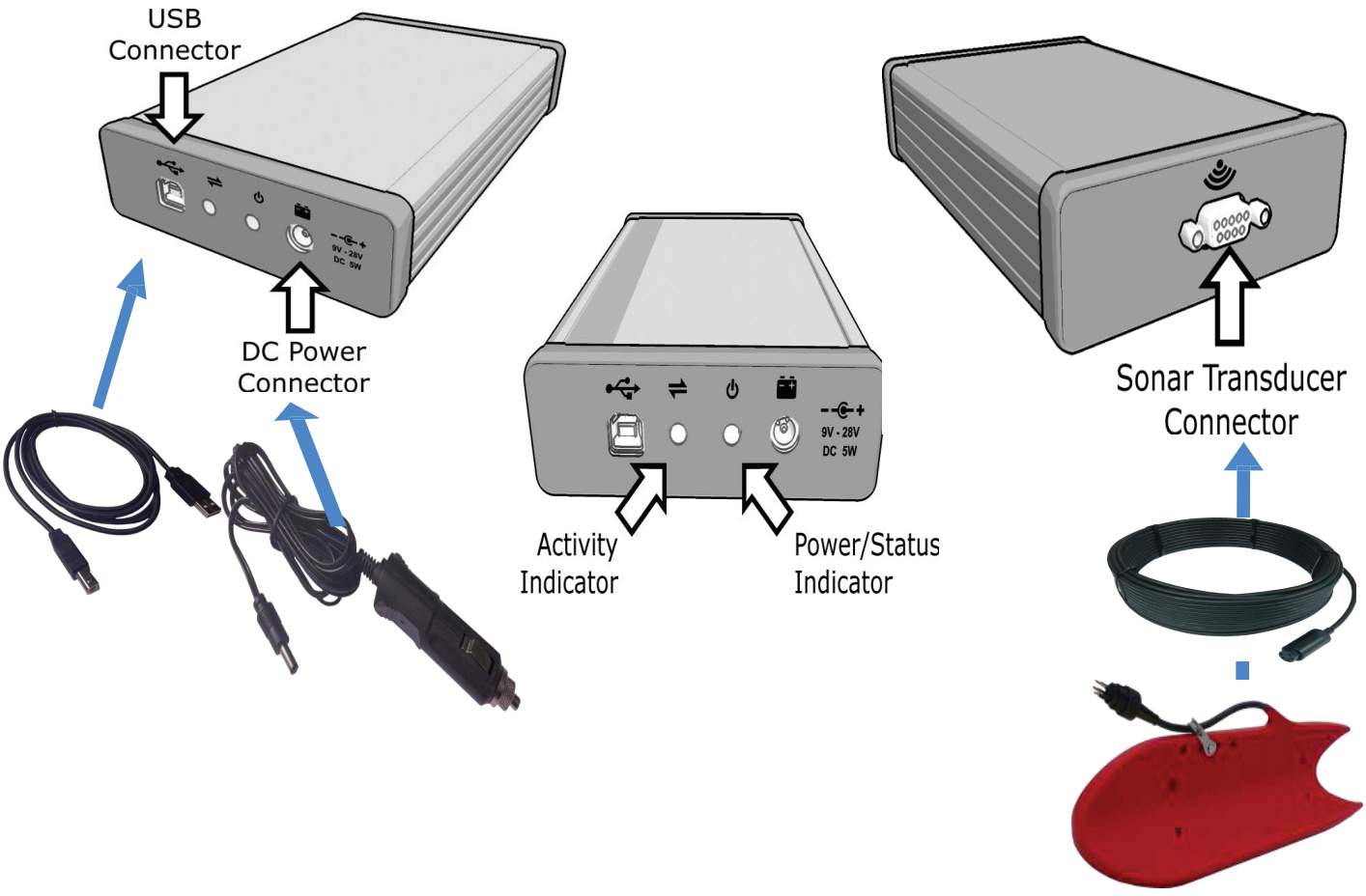
GPS Receiver

11.3.5. SYSTEM CONFIGURATION

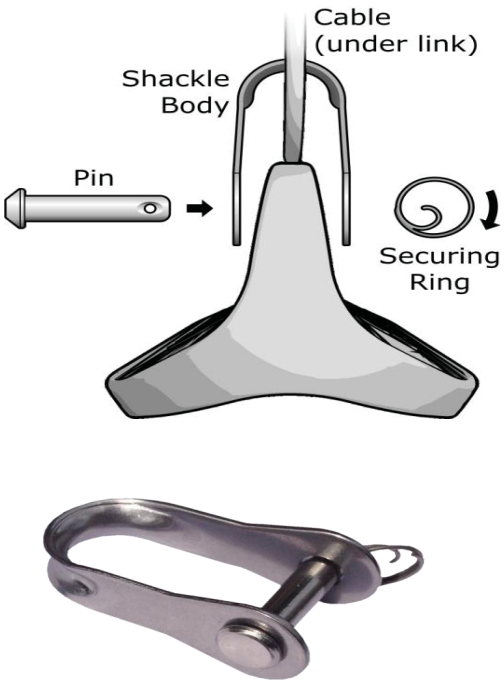
- Starfish Transducer (450/452/990)
- Starfish 450 Top Box
- Towing Cable
- AC Mains Power Adapter
  (Supports 110V and 240V)
- DC Power Supply
  (Customer supplied 9V-28V
  (i.e. battery)
- PC/Laptop (Windows)
- Customer supplied (requires USB port

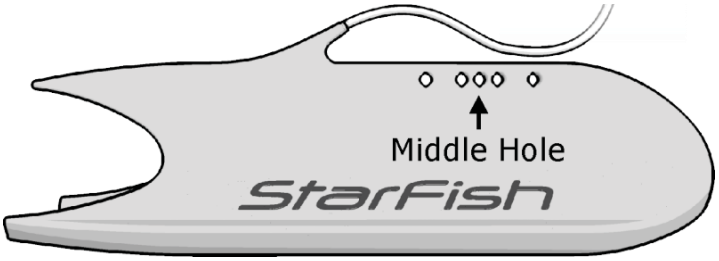


11.3.6. CONNECTING THE TOP BOX



11.3.7. RIGGING THE SONAR



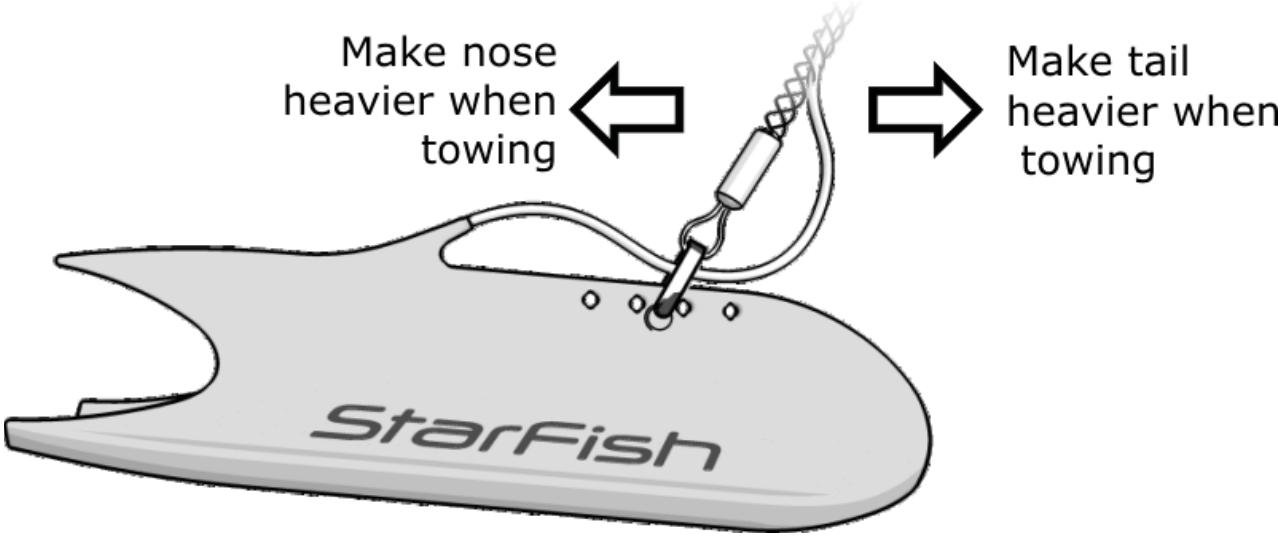


Start using the middle hole

Ensure the cable sits symmetrically under the shackle.

11.3.8. ADJUSTING THE TOWING POSITION

- Depending on towing speed and cable length you may need to adjust the towing position so the Starfish is stable in the water.
- If the sonar is too nose heavy, it will flip and drag vertically.
- If the sonar is too tail heavy, it will try to swim upwards and sideways



11.3.9. USING THE POLE MOUNT BRACKET

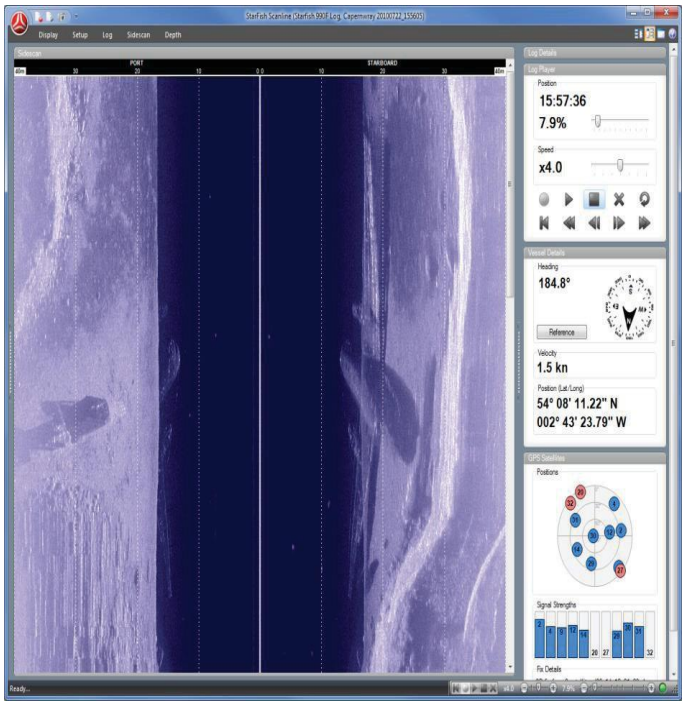
- For shallow water (rivers, canals etc.) consider using the Pole Mount Bracket.
- You will need to provide your own pole and boat fixing method.
- The bracket sits astride the sonar, and secures using the bolts through the end holes in the transducer.

11.3.10. STARFISHSCANLINE SOFTWARE

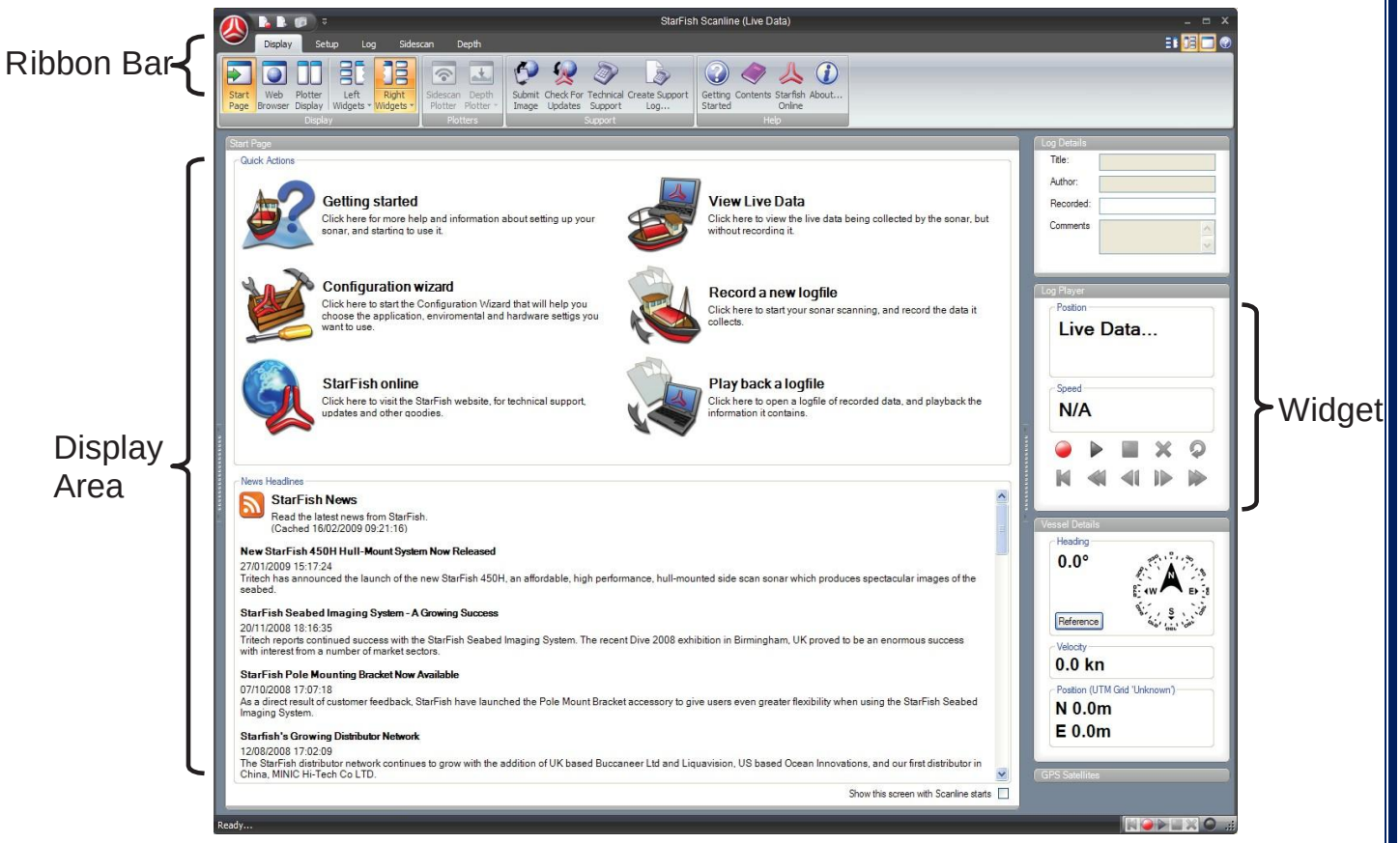
- Scanline is the Windows software application that controls the Starfish hardware and displays the data it receives.

- Scanline allows the data to be recorded into Log file and played back at a later time. Snapshot images can be created from the current display.

- A GPS can be attached to Scanline allow the position of the sonar and acoustic targets to be calculated.



11.3.11. DISPLAY LAYOUT

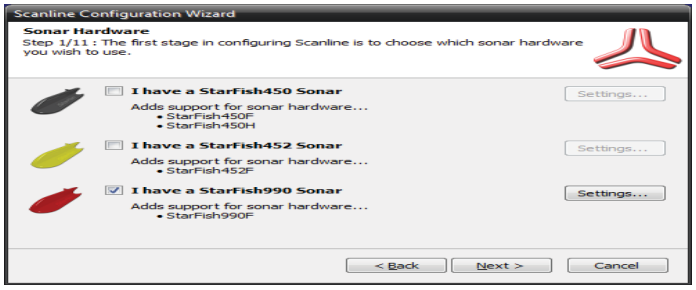


11.3.12. RIBBON BAR

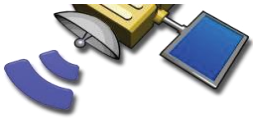
The Ribbon Bar is located along the top of the display.Tools are grouped into tabulated pages: Display, Setupand Log, Sidescanbuttons on each tab page control aspects of the program or the sonar.

11.3.13. USING FOR THE FIRST TIME

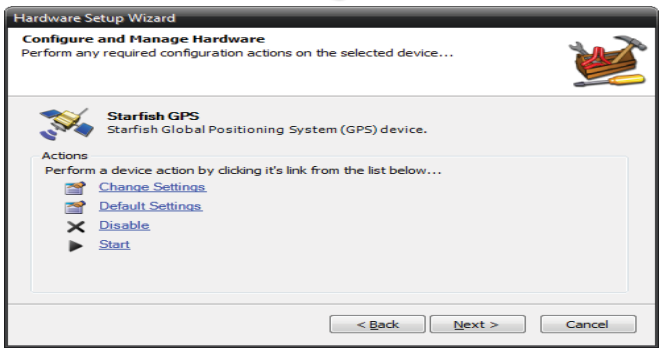
- The first time Scanline is run the "Configuration Wizard" will start.The wizard will help you:
- Choose the sonar you are using,
- Add a GPS receiver
- Choose units of measurement
- Configure the display
- The wizard can be restarted at any time using the "Config Wizard" button on the Setup Ribbon Bar tab.



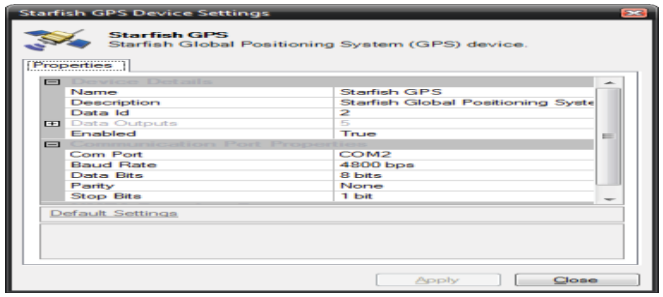
11.3.14. USING A GPS



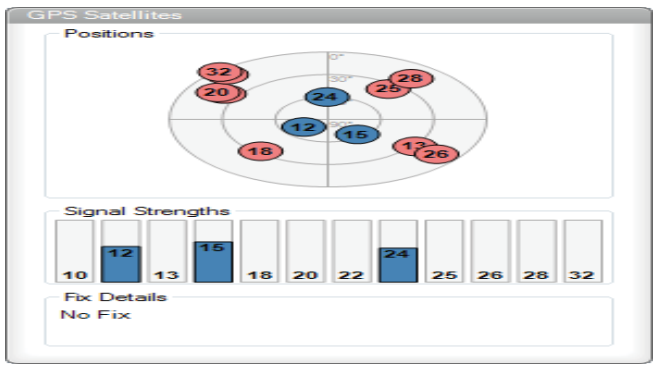
- A GPS receiver can be used with Scan line, allowing the boats position to be recorded into Log files, and an approximate position of the sonar and surrounding targets to be calculated.



- Use the Hardware Manager to add in the 'Starfish GPS' device (or generic NMEA compatible GPS receiver).



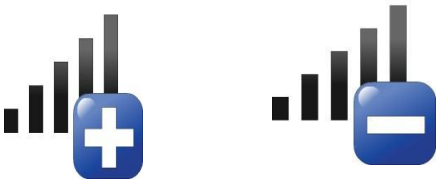
- Device properties for the GPS should be adjusted to specify the COM port the PC has attached the USB receiver to the baud rate is usually 4800baud for the Starfish GPS (or 9600baud for some other devices)



11.3.15. SONAR CONTROLS

Range 

Channel Selection 

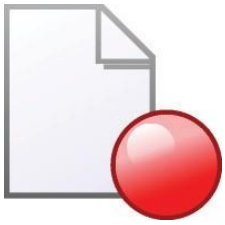
Gain 

Scrolling Direction 

Contrast 

Stretch Factor (x1, x2, x3) 

11.3.16. RECORDING LOGFILES

Record a new Log file 

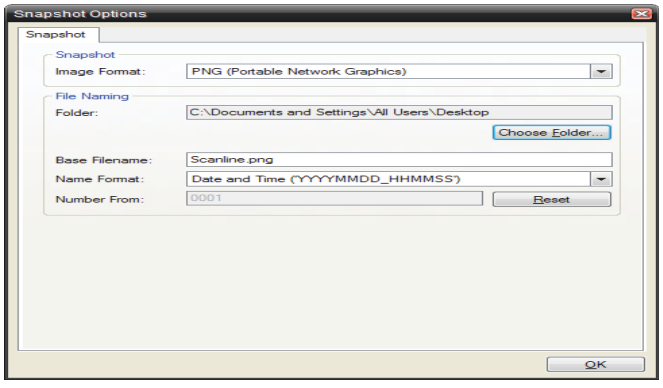
Or 

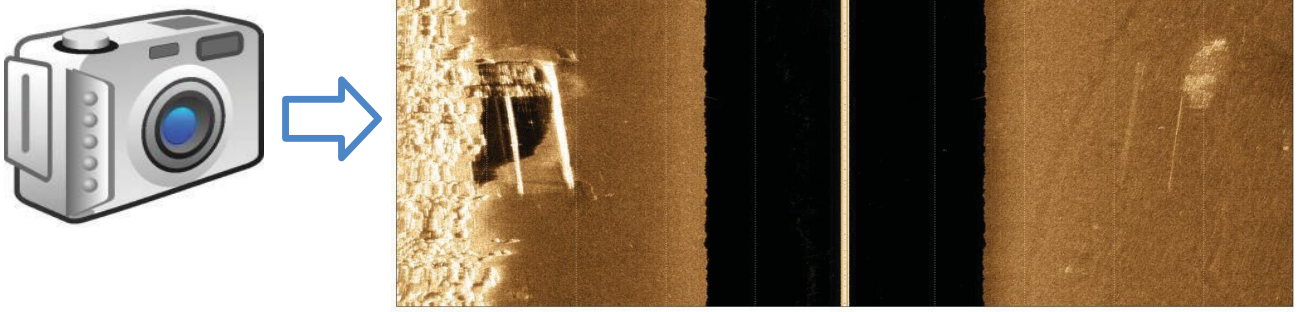
Status Bar Shows Live Data & Record Controls:

` All data is recorded in a single file and can be replayed later on.

11.3.17. SNAPSHOTTING DISPLAYS

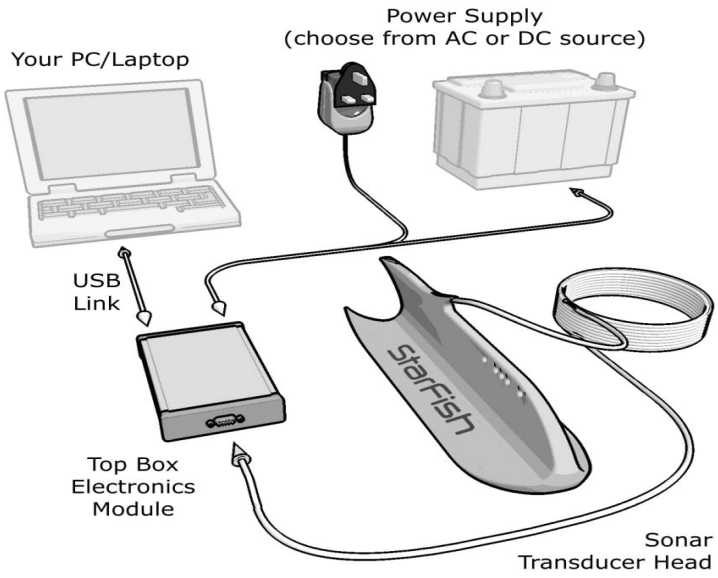
- In addition to Log files, the contents of the Sidescandisplay can be captured to an image file (JPEG, PNG etc):





11.3.18. DEPLOYING THE SONAR

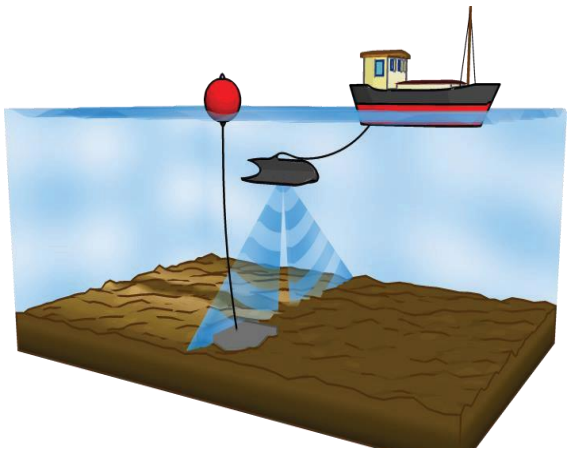
- Connect thedeck-side equipment
- Ensure that plenty of tow cable is available foruse, but not posing hazard to personnel aroundit.
- Let the boat build up speedto 1-2 knots before lowering the sonar in the water –this helps avoid snagging the cable in the propeller.

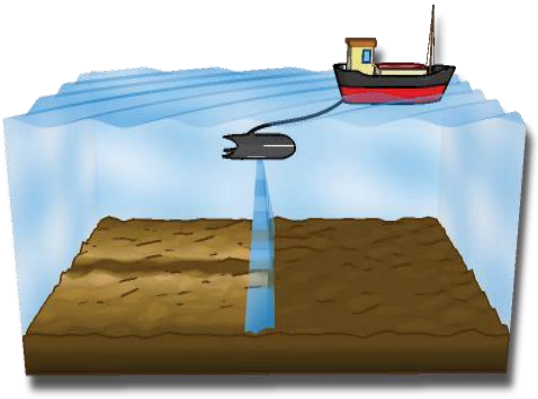


11.3.19. TOWING GUIDELINES

For best results:

- Keep the boat speed constant, ideally between 1 to 4 knots.
- The slower the boat travels, the deeper the sonar will tow.
- At slower speeds, more pings are gathered for the distance travelled, so more detail is available.
- The faster the sonar travels through the water, the more force is excerpted on the cable and sonar. The maximum speed should not exceed 8 knots.
- When towing in rivers and tidal channels, remember the speed of water current should be taken into account for the above- i.e. Towing at 3 knots into a 5 knot current is a combined speed/force of 8 knots against the sonar.





11.4. DO'S & DON'TS

- The Starfish is not a navigational aid-it will not provide information about hazards in front of it or the boat.
- Be aware of the hazards posed by loose towing cable deployed on deck-if the sonar becomes snagged on a submerged object, this may become taught or snap. It may drag attached or snagged objects over board depending on the means of attachment to the boat.
- Be aware of the distance the sonar and cable is deployed behind the boat. Always gives efficient clearance when navigating a round other boats and moored objects.
- When in a bout your own safety is paramount and should not be compromised trying to achieve good sonar imagery.
- Do not use the mains power supply in wet conditions.

o Cleaning & Storage

- Disconnect the power supply before cleaning.
- After use, wash the Starfish transducer and towing cable in fresh water to remove any salt, we adore litres due that may damage the rubber mouldings or cause corrosion.
- With a damp cloth are move any salt-water spray that may have settled on the surface of the top-box.
- Store in a ventilated area and allow the components to dry before sealing the storage case, to prevent the growth of moulder mildew.
- Avoid excessively bending the towing cable (below a 30 mm radius) when packing into its storage case.

REVIEW:-

The participants learnt about:-

11.1. Introduction & types of SONAR
11.2. Functioning of SONAR
11.3. Installation Procedure
11.4. Dos & Don'ts

LESSON-12

IMPROVISED FLOATING DEVICES (IFDs)

CONTENT

OBJECTIVES:

Upon completion of this lesson, you will be able to understand

12.1. Introduction of IFDs
12.2. Purpose
12.3. IFDs
12.4. Limitations

12.1. INTRODUCTION ABOUT IFDs

Improvised life saving devices (improvised rafts) are one of the best tools which can help the community people to come out of flood affected area and save many precious lives without much effort. These rafts can easily be made with the help of local/household materials and it can be utilized by the community people to protect themselves from loss of life in the absence of boats. For this purpose, it is important to have knowledge of preparing improvised life saving devices (rafts) and its effective use.

12.2. PURPOSE

The purpose of this IFDs is to make the NDRF personnel as well as other Govt. Officials, civil population & students familiar which the skill of preparation & use of Improvised life saving devices (improvised rafts) in order to mitigate the effects of the flood disaster.

12.3. IMPROVISED FLOATING DEVICES (IFDs)

12.3.1. Water Bottle Raft
12.3.2. Ball Raft
12.3.3. Jerrycan Raft
12.3.4. Dry Coconut Raft
12.3.5. Drum/Barrel Raft
12.3.6. Bamboo Raft
12.3.7. Aluminum Handi/Tasla Raft
12.3.8. Tube Raft

12.3.9. Banana Stem Raft
12.3.10. Tin Raft
12.3.11. Thermocol Raft

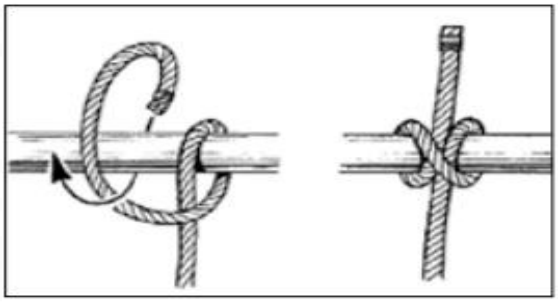
12.3.1. Water Bottle Raft:

Water Bottle Raft can be prepared from empty plastic water bottles (cold drink or water bottles) generally available in our houses. With the help of rope and five to six empty bottles (capacity 1.5/2 ltrs), this type of raft can be easily prepared. It should be ensured that the caps/covers of all the empty bottles are properly sealed. A person can tie a raft prepared in this way to cross the flooded or water logged areas from one place to another place safely. This raft can easily withstand the load of 01 person.

(a) Materials required

- 04 Meter coconut fiber rope (approx.)
- 05-06 Empty plastic bottles (cold drink or mineral water bottles) of 1.5/2 liters.

(Safety Knot)



(Clove Hitch)

(b) Method of preparation

- Ensure the empty unbroken plastic bottles are well sealed and fix the bottle cap tightly.
- Firstly, put a clove hitch knot (as shown in the picture) with the help of rope at slightly above the bottom of the empty plastic bottle so that it may not get slipped and then put a safety knot.
- Repeat this action in all the plastic bottles and tie them side by side.
- It should be noted that the ½ meter rope should be kept free before starting the knot and ½ meter rope should be left free at the end for the purpose of tying on the chest of an individual.
- Similarly repeat this action of tying the bottle now at the neck of the bottle. Here also keep ½ mtr rope from starting side for tying the bottle after finishing the out
- Thus, 04 free ends of rope are available to tie two either sides of the bottle.
- Now, the water bottle raft is ready to use.

(c) Method to use


- Tie the bottle raft on the chest of an individual properly with the help of rope attached with the bottles.
- Bottles should be placed on the chest (below the shoulder joint) by putting cross knots at the back. Considering more safety, also tie the raft with the help of rope by putting cross knot from front side to back.
- Bottle neck part of the bottle should be downward.
- Ensure the bottles are properly tied with the person's body.

(d) Occasions where it can be used

- To cross the flooded area.
- Rescue of an individual during flood (avoid to use in swift river current).
- Learning swimming techniques.
- For training purpose.

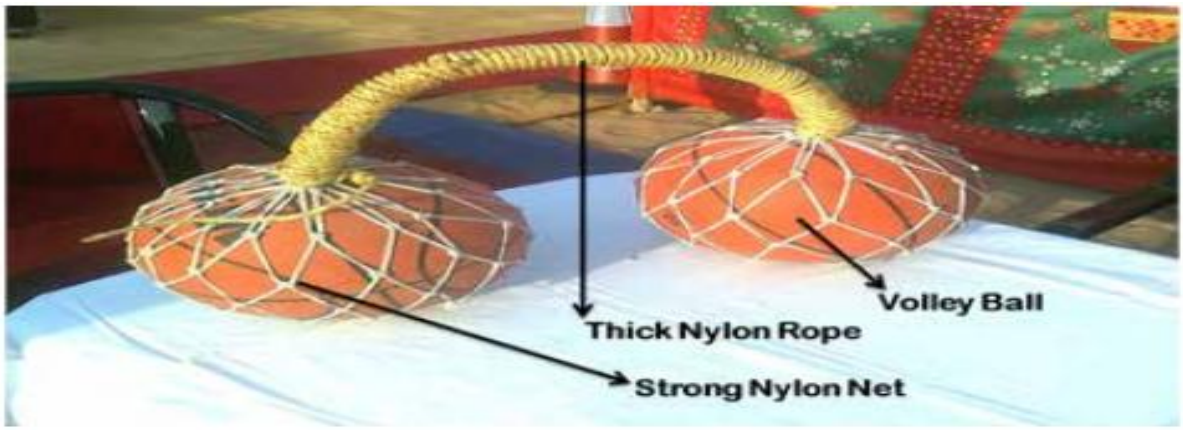
(e) Precautionary measures

- Bottle cap should be closed tightly.
- If the bottle cap is loose, don't use the bottle.
- Rope which is being used to prepare the bottle raft, must be robust/strong

12.3.2. Ball Raft:

This raft is made by fully air filled playing football / volleyball (which is not punctured). It is prepared by wrapping two balls in strong nylon net and tying them with nylon or coconut fiber rope. A person can use the raft to travel in flood water from one place to another. This raft can withstand the load of 01 person.

(a) Materials required



- Two Football / Basketball
- Two pieces of nylon nets (Preferably of good quality thick nylon rope) in which these ball should be separately wrapped easily.
- 10 meter thick (05 – 08 mm) nylon or coconut fiber rope.

(b) Method of making

- Put the ball into the net securely so that it can be tied with the help of rope.
- Keeping them about 02 feet apart and repeat the towing 10 to 12 times from one end to another, making it flock of rope thick enough to withstand the weight of the body.
- For strengthen the rope, tie the entire strand together by rolling a rope over it side by side to make this part of rope as cylindrical roll.
- Tie both the ends securely.
- The basketball raft is now ready.

(c) Method to use

- Put the rope over the chest and cross both the balls back through both armpits.
- Now, lay on the water surface keeping face down.
- Secure the rope and both of the floating balls outside the water surface by keeping them under the arm.

- Considering more safety, both these balls may be tied together with a simple rope on the back. This will not allow these balls to get separated from the body.
- This raft will keep the body floating on the water surface and prevent drowning.

(d) Occasions where it can be used

- During flood to cross water logging.
- To cross river.
- Learning swimming techniques.
- For training purpose

(e) Precautionary measures

- Ball should not be puncture.
- It should be fully filled with air.
- Rope should be carefully attached with the net.
- Net should not be broken or weak.
- Rope arm of both these balls should be securely placed under the armpit.
- Both the balls should be towed together on backside for more safety.
- Balls should be kept parallel to back side of the hand.

12.3.3. Jerrycan Raft:

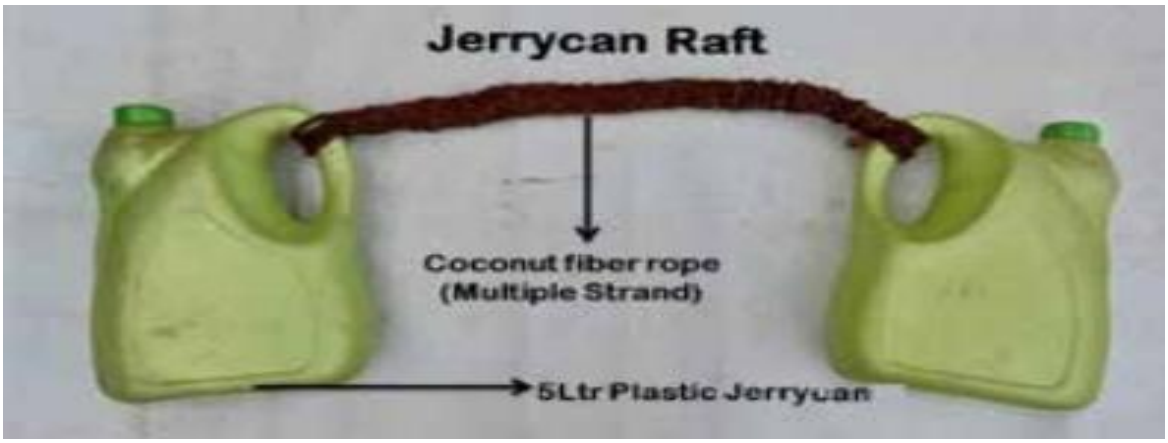
This raft is made with the help of plastic jerrycan available in the house. A person can move from one place to another in a flooded area by binding two empty plastic jerrycan (05 Ltr. capacities) with rope attaching to his chest. This raft can easily withstand the load of 01 person.

(a) Materials required

- Two Empty Plastic Jerrycan of 05 Ltrcapacity.
- 10 m coconut fiber rope (thickness of rope 05 – 08 mm)

(b) Method of making

- Take two Jerrycan of 5 Ltr capacity with its cap tightly closed and tie the rope with the handle of each jerrycan keeping them about 02 feet apart.



- Repeat the towing 7 to 8 times from one handle to another, making it flock of rope thick enough to withstand the weight of the body.
- For strengthen the rope, tie the entire strand together by rolling a rope over it side by side to make this part of rope as cylindrical roll.
- Now, Jerrycan raft is ready to use

(c) Method to use

- Put the rope over the chest and pass the jerrycan to the back through both the armpit.
- Now, lay on the water surface keeping face down.
- Secure the rope and both the floating jerrycan outside the water surface by keeping them under arm.
- For more safety both the jerrycan may be tied together with a simple rope behind the back. This will not allow the jerrycan to get free from the body.

- This raft will keep the body floating on the surface of the water and prevent one person to from drowning.

<u>Occasions where it can be used</u>

- During flood to cross water logging.
- Learning swimming techniques.
- For training purpose.

(d) Precautionary measures

- Jerrycan should be intact i.e. no crack or puncture.
- Cap of the jerrycan must be tightly closed.
- Rope arm between both the jerrycan should be securely placed under the armpit.
- Both the jerrycan should be towed together for more safety if wanted to swim while using this raft.
- Jerrycan should be kept parallel to the backside of the hand.

12.3.4. Dry Coconut Raft

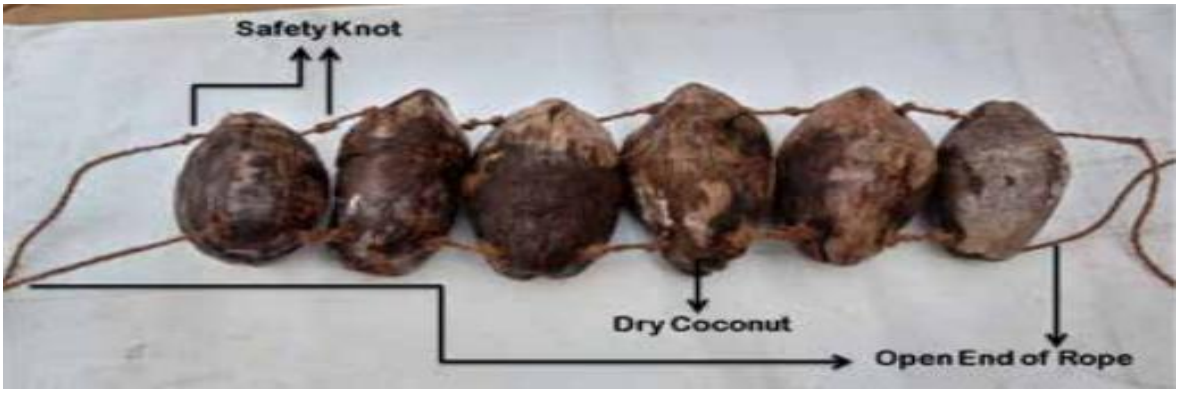
This raft is prepared with the help of the dry coconuts available in the houses / local markets. It is made by attaching 06 - 08 dry coconuts with the help of rope. A person can move from one place to another in floodwater by applying such a well prepared raft to his chest.

(a) Materials required

- 06 dry coconuts
- 03 mtr coconut fiber rope

(b) Method of making

- Make two holes by piercing through big needle or 08 to 10 inch nail at the upper and lower part of the coconut so that coconut rope may go through the hole.



- Pierce one end of the rope into the dry coconut keeping about ½ mtr rope free outside the first coconut.
- Put two knots on either side of coconut besides the hole so that coconut could be fixed between the knots.

- Similarly tie all the coconuts one by one alongside each other to make it like a belt of coconut.
- Repeat this process with the lower hole of the coconut also.
- After the last coconut, put the knot to secure the coconut at its place.
- Keep about ½ mtr of the rope free at the end.
- Now, a belt of dry coconuts is ready with two ends of the free rope on each side of the rope.
- Now, the dry coconut raft is ready.

(c) Method to use

- Tie the coconut raft on the chest of an individual properly with the help of rope attached with the coconut.
- Coconut should be placed on the chest (below the shoulder joint) by putting cross knots at the back. Considering more safety, also tie the raft with the help of rope by putting cross knot from front side to back.
- Keep the upper parts of the coconut upward while tying the raft along the chest?

- If coconuts are placed on the back and end of the rope are tied at chest then user can also easily float or swim on the water surface keeping face down.
- If raft is tied in front of the chest, individual can float on the back or keep floating while standing in deep water.

(d) Occasions where it can be used

- During flood to cross water logging.
- To cross the river with mild stream.
- Learning swimming techniques.
- For training purpose.

(e) Precautionary measures

- All the coconut must be dried.
- Dry Coconuts must be tied properly and be secured with knots to each other so that it could not be displaced.
- Tie the free end of the rope in cross manner to avoid the slipping out of the body.

12.3.5. Drum/Barrel Raft

It is prepared by tying two or more empty PVC barrels with the bamboo/ wooden planks with the help of rope. With the help of this raft, 02-04 persons can easily go from one place to another during the flood. The empty barrels should be sealed well before use.

(a) Materials required

- Two plastic drums/barrels of 220 ltr capacity.
- Approx 50 mtr coconut fiber rope (05 to 08 mm).
- 04 dry bamboo logs or wooden planks approx 02 feet more than the total diameter of the drums in use. 12 – 15 pieces of bamboo or wooden planks (approx. 04 feet length for making platform)

(b) Method of making

- Place two bamboo logs or wooden planks parallel to each other on a plane surface at a distance about one foot less than the length of the drum.
- Place the drums side by side on laying position across both the bamboo so that the edge of drum is 6" outside the bamboo.
- Seal the caps of the drums.
- Now, place another set of Bamboo or planks over the drum vertically opposite on the drum.
- Tie both the bamboo logs / wooden planks tightly together keeping the drum between them.
- Ensure that the entire drum is secured properly between the bamboo and wooden planks.

- Make small platform with the help of bamboo pieces as shown in picture.
- Now, the drum raft is ready.
- This raft can withstand the load/weight of 02 - 04 persons. Establishing balance on the raft is important.

(c) Method to use

- Place the drum raft on the surface of water and either sit on it comfortably or make some platform on the drum raft to carry load.
- Use a long bamboo log for balancing and giving direction to the raft.
- Wooden planks may also be used to make platform over the drum/barrel and tie it safely with the bamboo sticks of the raft. In this way, drum raft may also be used to carry household goods, kids or livestock like- goats, sheep, dogs etc. from one place to another in flooded or water logging area.

(d) Occasions where it can be used

- To cross the water logging during flood.
- It can also be used to shift household goods, grains, children or small cattle like goats, sheep or dogs through water-logged areas.
- To cross the river with mild stream.
- For the training purpose.

(e) Precautionary measures

- All the drums must be tied with bamboo or wooden planks tightly and securely.
- While sitting on raft use bamboo log for directing and balancing the raft in the water.
- Do not move on this raft in standing position. Always make smallest posture while moving on this raft (Sitting position is recommended).
- It would be more safe putting on bottle raft or coconut raft while moving on this raft.

12.3.6. Bamboo Raft

Bamboo raft is made with the help of bamboos & rope as per the need. It can be used to move from one place to another in a flooded area easily.

(a) Material required

- 10 to 12 Nos. of dry bamboos of at least 4" diameter and 05 mtr long.
- 05 mtr strong coconut fiber rope to tie the bamboo.

(b) Method of making

- Split a bamboo into two pieces along the longer axis and place two of it on plane surface about 4' foot apart.
- Place the remaining bamboo side by side perpendicular and over these two bamboos.
- Now, tie these bamboos with coconut fiber rope along with the support of half part of bamboo as shown in the figure.

- This raft will be formed as platform.
- This raft can withstand the load of single person.
- If we increase the size of the bamboo then load bearing capacity will increase.

(c) Method to use

- For using this bamboo raft place this raft on the surface of the water and place this raft under the chest by laying over it keeping face down.
- Hold the other edge of the raft strongly with hand and keep all the body part floating in the water.
- This raft can also be used to row in swift water while sitting on it.
- This raft may also use to shift house hold goods, grain, children or small cattle like goat, sheep etc. from one place to another through water logging areas.

(d) Occasions where it can be used

- During flood to cross the water logging.
- May use to shift house hold goods, grains, children or small cattle like goats, sheep or dogs through water logged areas.
- To cross the river with mild stream.
- For the training purpose.

(e) Precautionary measures

- All the bamboos must be tied and lashes to each other with support, very tightly and securely.
- Use this raft to shift the load only in water logged area for more safety.

12.3.7. AluminumHandi/Tasla Raft

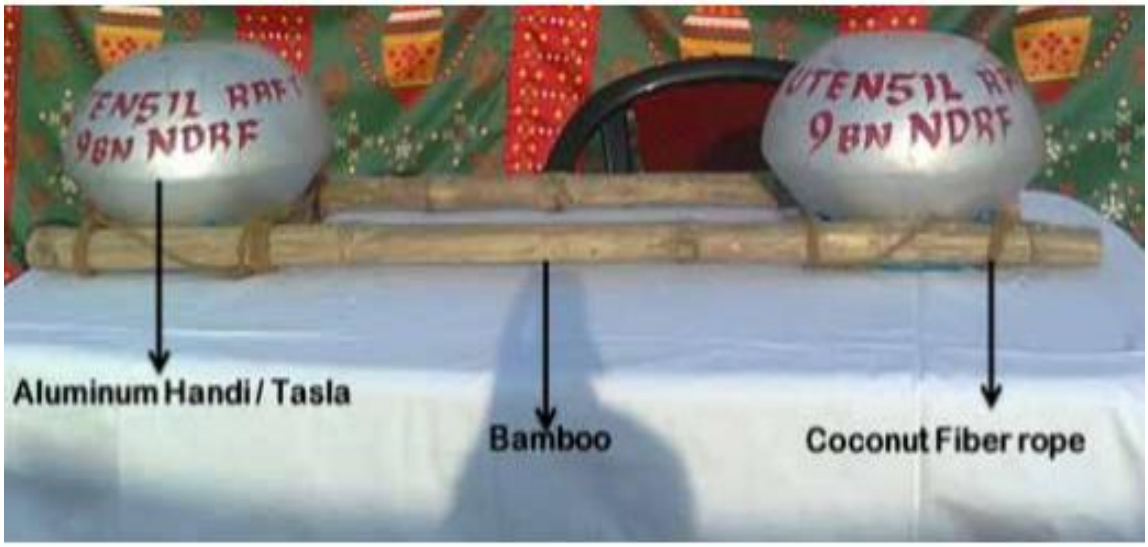
Handi/Tasla raft is prepared with the help of two numbers of Aluminum Handi/Tasla being used in home cooking. First, the mouth of the Tasla is tightly sealed with the help of plastic and rope. This raft is then made by connecting two Aluminum Handi/ Tasla with rope & bamboo sticks. A person can move from one place to another in flood water by applying such a well prepared raft to his chest.

(a) Materials required

- 02 Aluminum Handi / Tasla (minimum having capacity of 5 liters each)
- Approx 05 mtr coconut fiber rope (approx.)
- 02 Bamboo Sticks (03-04 feet each)
- Plastic Sheet : 01 mtr x 01 mtr

(b) Method of preparation

- Sealed open mouths of both Aluminum Handi / Tasla tightly with the help of plastic sheet & rope.
- Attach both Handi/Tasla at the ends of bamboo sticks properly with the help of rope.
- Ensure both Aluminum Handi/Tasla are tied properly with bamboo sticks.
- Now, the Aluminum Handi/Tasla raft is ready to use.



(c) Method to use

- Keep parts of the closed mouth of Aluminum Handi/Tasla towards downward.
- Put user's chest on bamboo sticks between the both Handi/ Tasla & hold the sticks.
- Now, lie flat on the stomach (Prone position) in water by holding the raft on chest.

(d) Occasions where it can be used

- To cross the flooded area.
- Rescue of an individual during flood (avoid to use in the sharp river current).
- Learning swimming techniques.
- For the training purpose.

(e) Precautionary measures

- Open mouth of the Aluminum Handi/Tasla should be tightly closed with the help of plastic sheet.
- Rope which is being used to prepare the bottle raft must be robust/strong.
- Avoid using this raft in sharp river current.

12.3.8. Tube Raft

Rubber Tube of a medium or heavy vehicle can be used as an improvised life saving device / raft for shifting one person from one place to another in flood water.

(a) Materials required

- 01 Rubber Tube of medium / heavy vehicle.

(b) Method of preparation

- Rubber Tube should be filled up with air properly.
- Now, the Tube raft is ready to use.

(c) Method to use

- Place the rubber tube on the water surface.
- Place your body in the centre of the tube. Keep the tube around the chest.
- With the help of both hands / shoulder joints, place the tube well in your body. Under arm the tube.
- Now, 01 person can float in the water with the help of this raft.

(d) Occasions where it can be used

- To cross the flooded area.
- Rescue of an individual from water surface.
- Learning swimming techniques.
- For training purpose.

(e) Precautionary measures

- Prior to using the rubber tube as an improvised life saving device, it should be ensured that the tube is not puncture.
- Avoid using use this raft in swift river current.

12.3.9. Banana Stem Raft

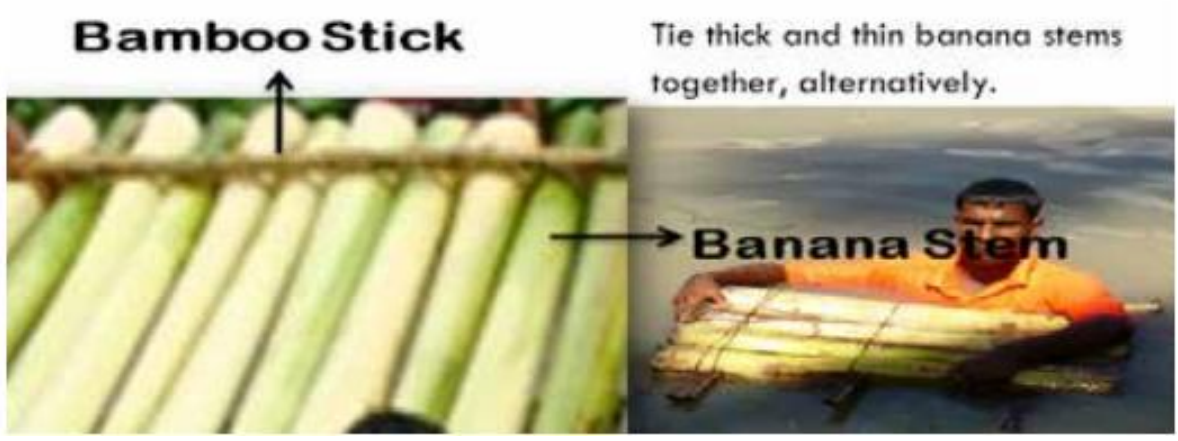
Banana Stem raft is prepared with the help of banana stems and rope. It can be used to move safer place during the flood.

(a) Materials required

- 06 -08 bananas stems about 4-5 feet long.
- About 30 mtr coconut fiber rope.
- 04 bamboo sticks about 5 feet long.

(b) Method of preparation

- Place two bamboo sticks on plane surface parallel to each other and about 4 feet apart.



- Place the banana stems side-by-side perpendicular and over these two bamboos stick.
- Place the remaining bamboo stick over these stick keeping banana stem in between them for more safety.
- While placing these bananas, diameters of banana stem is keep in mind.
- At one end, thick side (i.e. root side part) of banana should be followed by thin side (i.e. top side part) so that finally the edges of assembly may become as parallel as possible.

- Now, tie and lash these bamboos together with banana stems using coconut fiber rope.
- Now, banana stem raft is ready to use.
- This raft can withstand the weight of two-three persons depending upon the size and length of the banana stems.

(c) Method to use

- Place the banana stem raft on the water surface.
- Allow to Sit two or three persons on this raft and start rowing it, using long bamboo log from one side to another side of the river.


- This raft may also be used to shift household goods, grain, children or small cattle like goat, sheep etc. from one place to another through water logged areas.

(d) Occasions where it can be used

- To cross the flooded area.
- Rescue of an individual from water surface.
- In shifting household goods, grain, children or small cattle like goat, sheep etc. from one place to another through water logging or flooded areas.
- For the training purpose.

(e) Precautionary measures

- Tie all the banana stems and bamboo sticks safely and tightly.
- Avoid using this raft in standing position.
- Keep long stick or log for rowing and giving the raft direction.
- Avoid using this raft in swift water current.
- Use this raft in waterlogged area and mild stream of water in flooded area.

12.3.10. Tin Raft

Tin raft is made with empty tin can available in the houses. Ensure the mouth of empty tin cans should be sealed properly before using this raft.

(a) Material required

- 03 - 04 No's of 15 ltr empty tin can of oil.
- 04 bamboo sticks of approx. 04 foot long.
- About 10 mtr coconut fiber rope (05 – 08 mm).

(b) Method of preparation

- Seal the open mouth of the tin can properly.
- Place all the tin cans side by side.
- Use two bamboo sticks to hold all the tin together and tie both the stick so that tins are tightly closed in between.
- Now, roll this tin assembly to another side and again by putting two sticks on opposite side of tin assembly and tie them together properly.
- At both of the end, tie the stick in cross manner for more safety.
- In this way, now all the tins are kept and fixed among 04 stick of bamboo as shown in figure.
- Now, Tin raft is ready to use.

- This raft can withstand the weight of two persons if we use it for crossing the water logging or mild stream flooded river while holding it.

(c) Method to use

- Place the Tin raft on the water surface.
- Hold this tin assembly under the chest and keep body weight on the tin assembly or hold the bamboo part of this floating raft tightly keeping your body flat and face down. This way body will float on the water surface with the help of Raft.

(d) Occasions where it can be used

- To cross the flooded area.
- Crossing the river with mild stream of water.
- For the training purpose.

(e) Precautionary measures

- Tie all the Tin cans and bamboo sticks safely and tightly.
- Avoid using this raft to row while sitting on it.
- Ensure all the tin cans are properly sealed by putting it into water and observing any bubbles coming out of water through the tin.
- Hold the raft tightly while floating with it.
- Avoid using this raft in swift water current.
- Use this raft in waterlogged area and mild stream of water in flooded area.

12.3.11. Thermocol Raft

Thermocol is one of the common materials found in our houses. It has property to float on the water surface. By using pieces of thermocol, a life saving device / improvised raft for 01 person can be easily prepared.

(a) Materials required

- Pieces of thermocol (1.5’’- 2’’ thickness)
- T-Shirt or Shirt (optional)

(b) Method of preparation

- Tie the lower part of T-shirt or Shirt (wear by a person) with the help of some strong string around the waist so that thermocol place under the cloth must not get away from the body.

- Pieces of thermocol can also be properly tied & secured on the chest & back side of a person without using T-Shirt or Shirt as shown in the figure.
- Place the thermocol pieces inside the T-Shirt / Shirt up to the chest level (front & back side both).
- Tie the T-shirt or Shirt with string around chest below the under arm also to keep the pieces of thermocol in place.

(c) Method of use

- Tie the upper and lower part of the T-Shirt or Shirt while filling it with the thermocol. Then, go inside the water logging area.
- Pieces of thermocol can also be properly tied on the chest & back side of a person.
- In this way, 01 person can easily float on the water surface in standing position.

(d) Occasions where it can be used

- To cross the flooded area.
- Crossing the river with mild stream of water.
- For the training purpose.
- Ensure thermocol should be properly secure inside the T-Shirt or Shirt so that it can’t get away from the individual’s body.

- If pieces of thermocol is used without cover of T-Shirt of Shirt, then it should properly be tied & secure on the individual's upper part of body.
- This raft is suggested to use for few hours only.

12.4. LIMITATIONS

This IFDs lesson has been prepared with the objective to generate awareness about improvised life saving devices (improvised rafts) and preparation by the community people as well as Govt. Officials engaged in managing disasters. This Lesson will also be served as guideline to prepare various improvised life saving devices (improvised rafts) using household goods which are easily available.

REVIEW:-

The participants learnt about:-

12.1. Introduction of IFDs
12.2. Purpose
12.3. IFDs
12.4. Limitations

LESSON-13

PPE AND RESCUE EQUIPMENTS

CONTENT

OBJECTIVES:

Upon completion of this lesson, you will be able to understand

13.1. General introduction of PPE & Life saving devices
13.2. Life jackets
13.3. Life Buoy

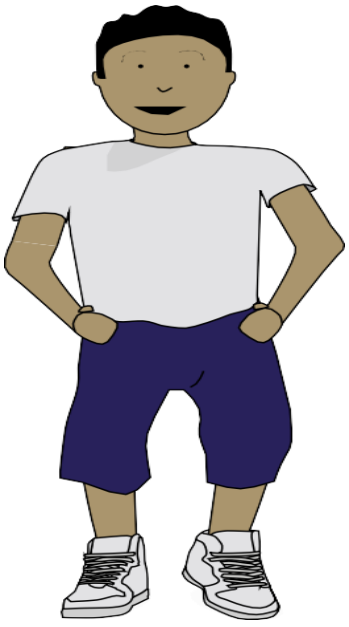
13.1. GENERAL INTRODUCTION OF PPE &LIFE SAVING DEVICES

13.1.1. Personal protective equipment (PPE)

What is PPE?

- Personal protective equipment (PPE) will protect the rescuer against health and safety risks. Due to the large number of hazards in the flood environment, it is important that are secure wears appropriate PPE.
- To be effective, it is important that all PPE is the correct size and adjusted to the individual wearing it.
- Heavy clothing that absorbs or catches water should not be worn.

Rescuer not near the water:



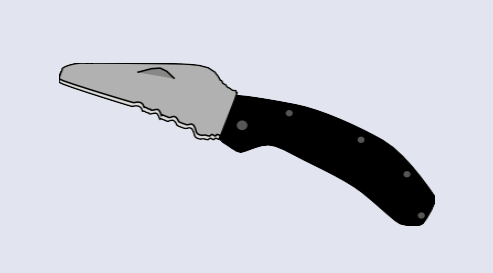
Rescuer wearing the correct PPE nears the water:

DO NOT GO BARE FOOT

13.1.2. Buoyancyaid

- A buoyancy aid will help keep the rescuer afloat but will not keep their head out of the water if they become unconscious.
- Buoyancy aids are the preferred and most suitable option for rescuers as they allow for easy movement in and out of the water.

13.1.3. Knife



- A sharp knife can be used to free the rescuers and others from entanglement.
- It should be stowed in a sheath to avoid personal injury or damage to equipment.

13.1.4. Helmet

A helmet protects the rescuer's head against:

- Striking against stationary objects such as rocks
- Falling or moving objects such as boats.
- Water rescue helmets are specially designed to allow water to pass through.
- You should always use a helmet if it is available to you.
- Do not use fire or motorbike helmets as they are heavy and do not allow water to pass through them.
- Different colour helmets can be used to identify key personnel when operating in a flood environment.
- These colors should be standardized between all the different agencies that might respond to a flood.

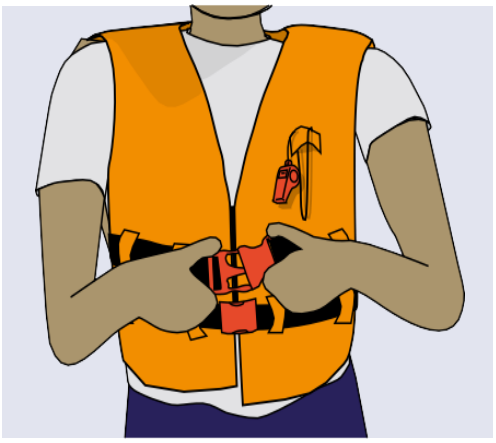
13.1.5. Wearing a Helmet

- When wearing a helmet make sure it is a comfortable fit around the head. Helmets come in different sizes and they should be adjusted to fit properly. Ensure the chin strap on your helmet is done up securely.
- Never use motorcycle or fire helmets to operate in floodwater.

13.1.6. Cow's tail

- Some buoyancy aids and lifejackets, also known as personal flotation devices or PFDs, come with a 'cow's tail'.
- This allows rescuers to be attached to a rope. The cow's tail must be able to be released quickly if necessary.

13.1.7. Putting on PPE Buoyancy aid

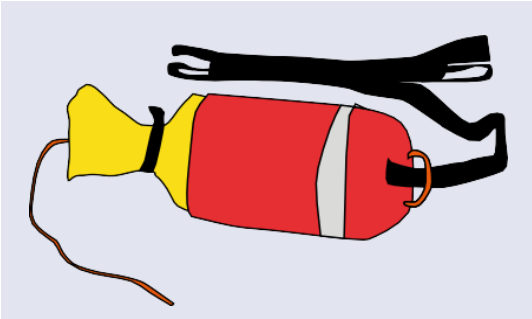


- Buoyancy aids come in a wide variety of designs. Some can be put on like a jacket while others are put on over the head and adjusted at the side.
- The most important features of any buoyancy aid are that it fits comfortably, allows freedom of movement and gives you floatation, especially if you enter the water.
- Make sure that any buckles are done upend straps are pulled tight so that the buoyancy aid fits properly.

13.1.8. Rescue Equipment

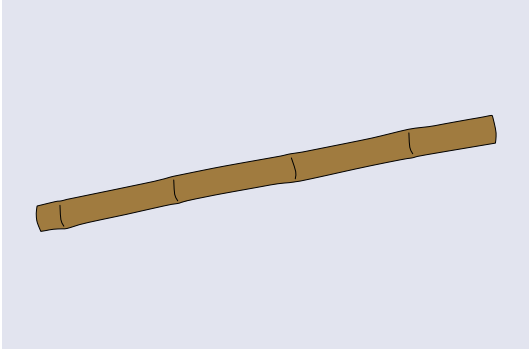
- You may have to help someone who has fallen into the water. The casualty will have the best chance of being rescued if you use the right equipment.
- Specialist rescue equipment can be very expensive, but equipment can be made locally out of low-cost materials.

13.1.9. Throw Bag



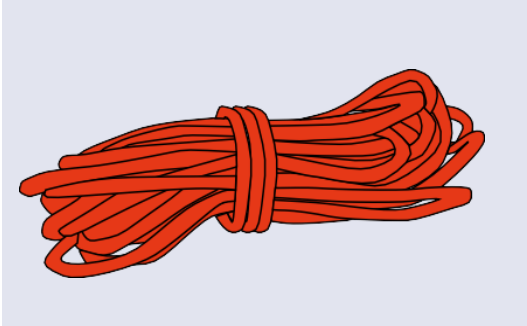
- A throw bag consists of a length of rope(a throw line) stored inside a quick-release bag.
- It is used to rescue casualties in moving water.
- It is recommended that anybody working in the flood environment has access to a throw bag.

13.1.10. Wading Pole



- Wading poles can be made out of natural or man-made materials. They are used to check for water depth and underwater hazards while wading.
- They can also be used for reach rescues from thewater.
- A raft paddle or bamboo pole can be used as a wading pole.

13.1.11. Rope

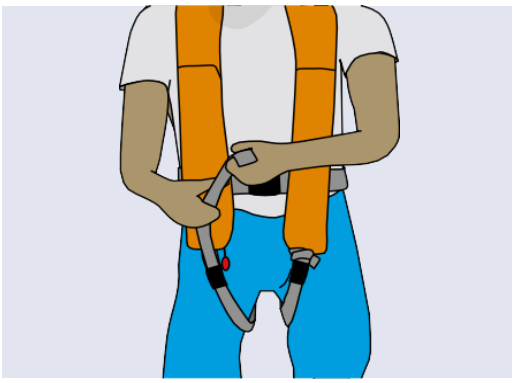


- Try to use brightly coloured rope that will float as this will help the casualty and rescuer see the rope on the surface of the water.

13.2. LIFE JACKET

- There are many different types of life jackets, including those with manual and automatic inflation. There are also foam life jackets.
- A life jacket is designed so that if you become unconscious it should keep your head above the water and maintain a clear airway.
- Life jackets are sometimes larger than buoyancy aids and can be difficult to move in. Because of this, they are not recommended for rescuers.
- Ensure that all straps and buckles are done up tightly and minimize the amount of loose ends.

13.2.1. Wearing a Life jacket



- When wearing a lifejacket it is vital that you fit it correctly, otherwise there is a danger that it may come off if you enter the water
- Ensure that any buckles are done up and any webbing straps are tightened.
- Tuck away any excess webbing, so it does not become a snag hazard.

13.2.2. Life Jackets uses and safety tips

- Make sure everyone on your boat has a life jacket that is in good shape with no holes or tears. Check the life jackets each time before use.
- The life jackets should be worn at all times while on a boat.
- Choose a life jacket that fits properly according to the person's height and weight. If the life jacket is too big, you can slip through. To test it, put it on, raise your hands over your head, have someone pull up on its shoulders. If it goes over your chin, it's too big.
- Make sure everyone knows how to properly put on and secure their life jackets, including children.
- All straps should be belted in the right buckle and loose straps should be securely tucked in.
- Test the buoyancy of the life jacket in shallow waters. Do this by relaxing your body and tilting your head back to see if it keeps your chin above water and you can easily breathe.
- Inflatable toys or water wings are not approved safety devices and should not be used in place of life jackets in emergency situations.
- Don't use harsh detergents to clean your life jacket as it can weaken the fabric and make the life jacket lose its effectiveness.
- When storing, make sure the life jacket is dry, but do not leave it in the sun for a long time because heat can weaken the fabric and decrease its buoyancy. Do not dry it in a dryer or by a radiator, as this will also decrease buoyancy. Store in a dry location with good ventilation so that it does not get mildew.

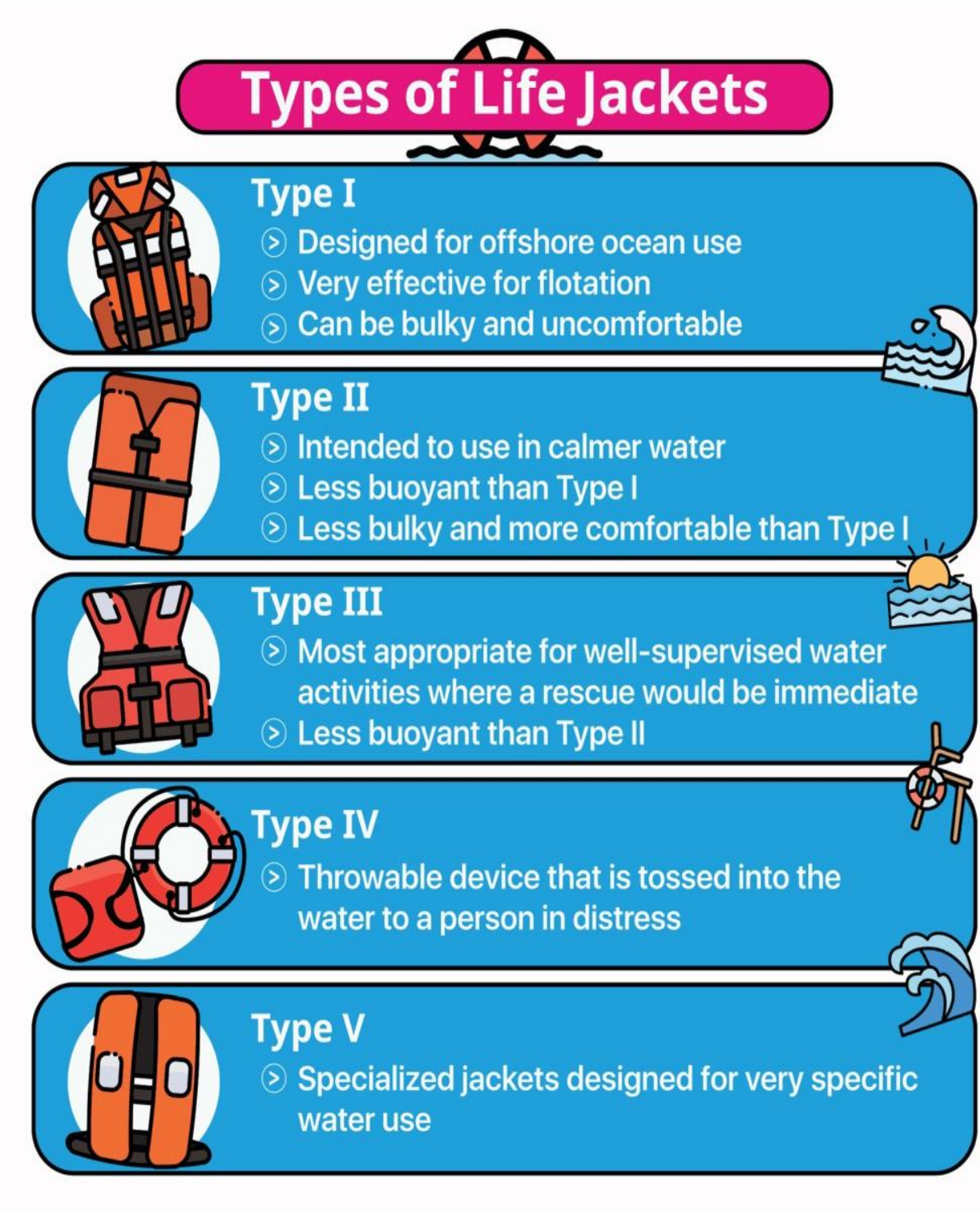
13.2.3. Life Jackets safety tips for Kids

What else do the kids need to know?

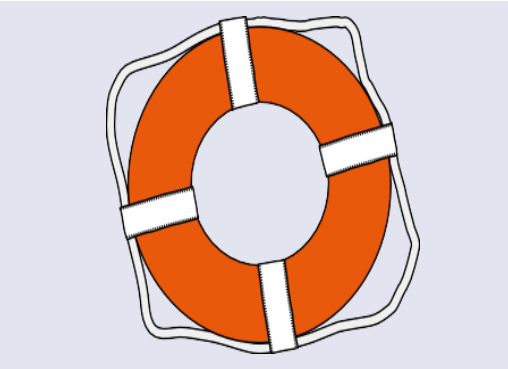
- Fasten all straps, zippers and ties for best protection.
- Check jackets each year for fit, wear and tear. Throw them away if you find air leakage, mildew or rot.
- If a child were to panic in the water and thrash about, they may turn onto their face. Take time with your child to practice wearing a life jacket and leaning back in the water.
- As your child grows, make sure the life jacket fits and appeals to them.

- Never make changes to a life jacket, like taking off or adding parts. It will not be as safe if you do.
- Water wings, rafts or plastic rings are not designed to keep swimmers safe. Never use them in place of a life jacket.
- Life jackets that self-inflate are an option for adults or teens that are at least 16 years old.

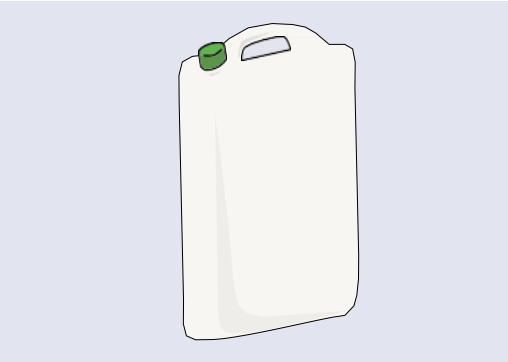
  Remember, life jackets only work when they are worn, and do not take the place of adult supervision. It's also important for your child or teen to learn swimming, water survival and water safety skills.



13.3. LIFE BUOY (FLOATING OBJECTS)



- Floating objects can be used to keep both the casualty and rescuer afloat during a rescue.
- In some countries, specialist floating objects have been developed that are specifically designed for rescue. However, in areas where specialist equipment is not available, alternative locally sourced equipment may be used.



A floating object should be:

- Easy to hold on to
- Easy to move through the water.
- Capable of keeping a personal float.

An empty water container (at least 5 litres) can easily hold the weigh to fan adult. Most containers have a handle that a casualty can hold on to in the water.

REVIEW:-

The participants learnt about:-

13.1. General introduction of PPE & Life saving devices
13.2. Life jackets
13.3. Life Buoy

LESSON-14

COURSE REVIEW

CONTENT

OBJECTIVES:

Upon completion of this lesson, you will be able to understand

14.1. Introduction
14.2. Summary of Content
14.3. Strengths
14.4. Weaknesses
14.5. Overall Value

14.1. INTRODUCTION

"Flood Water Rescue: Techniques and Strategies" is a comprehensive book that delves into the various aspects of flood water rescue operations. Authored by experts in the field, this book aims to provide readers with valuable insights, techniques, and strategies to effectively respond to flood emergencies and save lives. In this review, we will explore the key features, strengths, weaknesses, and overall value of this book.

14.2. SUMMARY OF CONTENT

The book begins by providing an overview of floodwater rescue operations, including the challenges faced by rescuers and the importance of proper training. It then delves into the different types of floods and their characteristics, enabling readers to understand the unique risks associated with eachtype.

One of the notable strengths of this book is its emphasis on safety protocols and risk assessment. The authors stress the importance of prioritizing rescuer safety while executing rescue operations. They provide detailed guidelines on assessing hazards, conducting swift water rescues, and utilizing appropriate equipment.

Furthermore, "Flood Water Rescue" covers a wide range of topics related to flood response, including search and rescue techniques, boat operations, helicopter rescues, communication systems, medical considerations, and psychological support for victims. The book also addresses post-rescue procedures such as debriefing and recovery efforts.

14.3. STRENGTHS

- Comprehensive Coverage: This book offers a comprehensive overview of floodwater rescue operations from start to finish. It covers various scenarios and provides practical advice for different stages of a rescue operation.
- Expertise: The authors are experienced professionals in the field of floodwater rescue. Their expertise shines through in the detailed explanations and practical examples provided throughout the book.
- Safety Focus: The emphasis on safety protocols and risk assessment is commendable. Rescuer safety should always be a top priority during floodwater rescue operations, and this book ensures that readers understand this crucial aspect.

14.4. WEAKNESSES

- Lack of Visuals: While the book contains detailed descriptions and explanations, it could benefit from more visual aids such as diagrams, illustrations, or photographs. Visuals can enhance understanding, especially for complex techniques or equipment.
- Limited Case Studies: Although the book provides theoretical knowledge and general guidelines, it would be valuable to include more real-life case studies to illustrate the practical application of the techniques and strategies discussed.
- Technical Jargon: Some sections of the book may contain technical jargon that could be challenging for readers without prior knowledge or experience in floodwater rescue operations. A glossary or simplified explanations could help mitigate this issue.

14.5. OVERALL VALUE

"Flood Water Rescue: Techniques and Strategies" is a valuable resource for individuals involved in floodwater rescue operations, including emergency responders, search and rescue teams, and disaster management professionals. The book's comprehensive coverage, emphasis on safety, and expert insights make it a worthwhile addition to any professional library in this field.

REVIEW:-

The participants learn about:-

14.1. Introduction
14.2. Summary of Content
14.3. Strengths
14.4. Weaknesses
14.5. Overall Value

LESSON-15

EVALUATION

CONTENT

OBJECTIVES:

15.1. Evaluation (100 Marks)

15.1. Marking system (100 Marks)

i. Written Test (20 Marks)

MCQ, Fill in the blanks, True & False, Abbreviation

ii. Swimming skills practical test (50 Marks)

a) 300 Mtr. free style swimming at Lake/ Swimming pool/ River (25 Marks)

i. Up to 09 Minutes- 25 Marks
ii. Up to 10 Minutes- 20 Marks
iii. Up to 11 Minutes- 15 Marks
iv. Up to 12 Minutes- 10 Marks
v. Above 12 Minutes- 00 Marks
(02 minutes extra for rescuers above 40 years age)

Note: 02 Minutes extra time shall be provided to Female rescuers.

b) Swimming Techniques; 25 Mtr. Each (08 Marks)

- Butter fly (02 Marks)
- Back stroke (03 Marks)
- Breast Stroke (03 Marks)

c) Water entry; (07 Marks)

- Slide in (01 Marks)
- Slide out (01 Marks)
- Step in (01 Marks)
- Compact jump (02 Marks)
- Stride in (02 Marks)

d) Under water Swimming 25Mtr. (05 Marks)

i. Up to 25 Mtr.- 05 Marks
ii. Up to 20 Mtr- 04 Marks
iii. Up to 15 Mtr- 03 Marks
iv. Up to 10 Mtr- 02 Marks
v. Below 10 Mtr- 00 Marks

e) Face immersion 90 sec. (05 Marks)

i. Up to 90 Sec.- 05 Marks
ii. Up to 80 Sec.- 04 Marks
iii. Up to 70 Sec.- 03 Marks
iv. Up to 60 Sec.- 02 Marks
v. Below 60 Sec.- 00 Marks

iii. Boat handling practical test (15 Marks)

a) Boat assembling test (05 Marks)

b) Boat dissembling test (05 Marks)

c) Boat forward & reverse with Paddle (05 Marks)

iv. Rescue techniques practical test (15 Marks)

a) Wet rescue (10 Marks)

i. Tow (Chin tow, Armpit tow, Head tow, Cross chest tow etc.) (05 Marks)
ii. Lift and Carry (05 Marks)

b) Dry rescue (05 Marks)

i. Reach, Throw, Wade & Row

Note:-

i. **Aggregate 70 % Marks is mandatory to qualify the ADRC Module.**
ii. **300 Mtr. Free style event in swimming is mandatory to qualify the ADRC Module.**

Glossary

- **Backwater Water**
  Level upstream from an obstruction which is deeper than it would normally be without the obstruction.
- **Best Management Practices**
  A structure or practice designed in storm water management to prevent the discharge of one or more pollutants to the land surface thus minimising the chance of wash-off by storm water. It can also be referred to a structure or practice to temporarily store or treat urban storm water runoff to reduce flooding, remove pollutants, and provide other amenities (such as recreation, fishing spots, etc.).
- **Catchment**
  A topographically defined area, draining surface water to a single outlet point. It may frequently include an area of tributary streams and flow paths as well as the main stream.
- **Channel**
  The bed and banks of a stream or constructed drain that carries all flows.
- **Conveyance System**
  The drainage facilities, both natural and manmade, which collect, contain, and provide for the flow of surface and storm water from the highest points on the land down to receiving water. The natural elements of the conveyance system include swales and small drainage courses, streams, rivers, lakes, and wetlands. The man-made elements of the conveyance system include gutters, ditches, pipes, channels, and most retention/detention facilities.
- **Design Storm**
  A selected rainfall event of specified amount, intensity, duration and frequency used as the basis of design.
- **Detention Facility**
  An above or below ground facility, such as a pond or tank, that temporarily stores storm water runoff and subsequently releases it at a slower rate than it is collected by the drainage facility system. There is little or no infiltration of stored storm water.
- **Detention**
  The release of storm water runoff from the site at a slower rate than it is collected by the storm water facility system, the difference being held in temporary storage.
- **Drain**
  A buried pipe or other conduit (closed drain). A ditch (open drain) for carrying off surplus surface water or ground water. (To) Drain to provide channels, such as open ditches or closed drains, so that excess water can be removed by surface flow or by internal flow. To lose water (from the soil) by percolation.

- **Drainage Basin**
  A geographic and hydrologic subunit of a watershed.
- **Drainage Channel**
  A drainage pathway with a well-defined bed and banks indicating frequent conveyance of surface and storm water runoff.
- **Drainage Inlets**
  The receptors for surface water collected in ditches and gutters, which serve as a mechanism whereby surface water enters storm drains and this refers to all types of inlets (such as grate inlets, curb inlets, slotted inlets, etc.).
- **Embankment**
  A structure of earth, gravel, or similar material raised to form a pond bank or foundation for a road.
- **Estuary**
  An area where fresh water meets salt water or where the tide meets the river current (e.g., bays, mouths of rivers, salt marshes and lagoons). Estuaries serve as nurseries and spawning and feeding grounds for large groups of marine life and provide shelter and food for birds and wildlife.
- **Flood Zoning**
  Definition of areas, based on flood risk, within flood plain appropriate for different land uses.
- **Floodplain Regulation**
  Laws defining acceptable use of land in defined areas, thus controlling the extent and type of future development
- **Floodplain**
  Area susceptible to inundation by a base flood including areas where drainage is or may be restricted by man-made structures which have been or may be covered partially or wholly by flood water from the base flood.
- **Groundwater Table**
  The free surface of the underground water that is frequently subjected to conditions such as fluctuating atmospheric pressure with the season, withdrawal rates and restoration rates. Therefore, the groundwater table is seldom static.
- **Hydraulics**
  The study of water flow; in particular the evaluation of flow parameters such as stage and velocity in a river or stream.
- **Hydrograph**
  A graph showing stage, flow, velocity or other characteristics of water with respect to time. A stream hydrograph commonly shows rate of flow; a groundwater hydrograph shows the water level or head.

- **Hydrology**
  The science of the behaviour of water in the atmosphere, on the surface of the earth and within the soil and underlying rocks. This includes the relationship between rainfall, runoff, infiltration and evaporation.
- **Infiltration**
  The downward movement of water from the soil surface at ground level into the underlying subsoil. Water infiltrates into the soil profile and percolates through it. The infiltration capacity is expressed in terms of mm/hr. Infiltration depends heavily on the vegetative cover of the soil surface, while permeability depends on the soil texture and compactness.
- **Inlet**
  A form of connection between the surface of a ground and a drain or sewer for the admission of surface and storm water runoff.
- **Local Network**
  A network of Automatic Rain Gauges set by at a high density within urban areas.
- **Rain Gardens**
  Rain gardens are part of the Low Impact Development (LID) paradigm for storm water management. Rain gardens consist of a porous soil covered with a thin layer of mulch into which the storm water runoff.
- **Runoff**
  The flow of water across the ground or an artificial surface generated by rain falling on it.
- **Sediment**
  Sediment is naturally-occurring material that is broken down by processes of weathering and erosion, and is subsequently transported by the action of fluids such as wind, water, or ice, and/ or by the force of gravity acting on the particle itself.
- **Storm water**
  That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

  Drain a particular storm drainage system component that receives runoff from inlets and conveys the runoff to some point. They are either closed conduits or open channels connecting two or more inlets.
- **Storm water Drainage System**
  Constructed and natural features which function together as a system to collect, convey, channel, hold, inhibit, retain, detain, infiltrate, divert, treat or filter storm water.

- **Water Bodies**
  Waterways, wetlands, coastal marine areas and shallow ground water aquifers.
- **Watershed**
  A geographic region within which water drains into a particular river, stream, or body of water. The watershed may be composed of several sub-watersheds and catchments and/or sub catchments.
- **Dam**
  (Also barrage; barrier; weir) barrier constructed across a valley for Impounding water or creating a reservoir.
- **Development**
  The responses to the disaster of sufficient magnitude to render thefunctional status of the component above the pre-event state. Development occurs when the pre-event status of a basic component of society is raised to levels greater than in the pre-event conditions.
- **Disaster**
  A serious disruption of the functioning of society, causing widespread human, material or environmental losses which exceed the ability of affected society to cope using only its own resources; The result of a vast ecological breakdown in the relations between man and his environment, a serious andsudden event (or slow as in drought) on such a scale that the stricken community needs extraordinary efforts to cope with it, often with outside help or international aid. A disaster results when the absorbing capacity of the affected society is unable to maintain the functionality of an essential element above a threshold.
- **Disaster management**
  The aggregate of all measures taken to reduce the likelihood of damage that will occur related to a hazard(s) and to minimize the damage once an event is occurring or has occurred and to direct recoveryfrom the damage; the body of policy and administrative decisions andoperational activities that pertain to the various stages of a disaster atall levels.
- **Disaster preparedness**
  The aggregate of all measures and policies taken byhumans before the event for reduction of the damage that otherwise would have resulted from the event, and coping with the damage sustained.
- **Disaster prevention**
  The aggregate of approaches and measures taken to ensure that the hazard does not cause a disaster, either by preventing the event or by mitigating activities, or by activities/structure that is able to absorb the event.
- **Disaster reduction**
  All actions taken to reduce the consequences of an event (measures of prevention, mitigation, preparedness, response and research).

- **Droughts**
  Period of deficiency of moisture in the soil such that there is inadequate water required for plants, animals, and human beings.
- **Early warning**
  Some timely form of either written or verbal indication of an impending event; advance notification of a problem in time for appropriate possible actions.
- **Earthquake**
  A sudden break within the upper layers of the earth, sometimes breaking the surface, resulting in the vibration of the ground.
- **Emergency**
  A situation that is out of control and requires immediate attention.
- **Emergency management**
  A range of measures to manage risks to communitiesand the environment; the organization and management of resources for dealing with all aspects of emergencies. Emergency management involves the plans, structures and arrangements which are established to bring together the normal endeavors of government, voluntary and private agencies in a comprehensive and coordinated way to deal with the whole spectrum of emergency needs including prevention, response, and recovery.
- **Environment**
  The total infrastructure of the affected society including the existence, condition, of the nature as well as social factors such as population densities, topography, culture and existing social and governmental structures, as well as living conditions and known hazards and the risks associated with each hazard.
- **Evacuation**
  Moving persons and supplies from an unsafe to safe area.
- **Floods**
  Too much water in the wrong place; overflows of areas not normally submerged with water.
- **Flood plains**
  An area adjacent to a river, formed by the repeated overflow of the natural channel bed. The land which may be covered by water when the river overflows its banks during floods.
- **Food**
  Edible substance containing nutrients that,on ingestion, maintain the vital functions of a person or other living organism. Part of the Basic Societal Function Food and Nutrition.

- **Hazard**
  Anything that may pose a danger; it is used in this discussion to mean a natural or human-made phenomenon or a mixture of both, that has the potential to adversely affect human health, property, activity, and/or the environment. Hazards are specific as to type, and as a general rule contain

  Natural hazard: Natural phenomena which occur in proximity to and pose a threat to people, structures or economic assets and may cause disaster. They are caused by biological, geological, seismic, hydrological, or meteorological conditions or processes in natural environment.
  Human-made hazard: A condition created by humans that have in-built properties that may have disastrous consequences for a society.

- **Hazard assessment**
  Identification and scaling of latent conditions that represent a threat.
- **Hazard identification**
  The detection and identification of hazards.
- **Hazard mapping**
  The process of establishing geographically where and to what extent particular phenomena are likely to pose a threat to people, property, infrastructure, and economic activities. Hazard mapping represents the result of hazard assessment on a map, showing the frequency/probability of occurrences of various magnitudes or duration. Hazard mapping comprises the cartographic depiction of possible future events accompanied by qualitative and quantitative analysis; it is not only the mapping of past events.
- **Incident Response system (IRS)**
  A system of command and control used in the management of incidents.
- **Information**
  The interpretation and processing of available and new data for a specific context, giving the data a purposeful meaning.
- **Infrastructure**
  The built environment; encompasses all societal structures including buildings, bridges, roads, sanitary facilities, railroads, waterways, water facilities, and other essential societal structures and functions.
- **Medical care**
  The Basic Societal Function that relates to the system that provides medical treatment to individual patients. The Medical System provides for the detection of signs and symptoms, and the diagnosis and treatment of patients. It includes primary, secondary, and tertiary care. It also includes psychological support and treatment.

- **Methodologies**
  a system of methods used in a particular field; A body of practices, procedures, and rules used by those who work in a discipline or engage in an inquiry; a set of working methods.
- **Mitigate**
  To lessen or decrease the seriousness of the process to which the word is applied.
- **Mitigation (disaster mitigation)**
  Alterations that are achieved before an event occurs that decrease vulnerability.
- **Outcome**
  The result of a specific intervention(s) or project(s) relative to their pre-established goals and objectives.
- **Output**
  The product of a process.
- **Quantitative techniques**
  Collection of data using measurements expressed as numerical values.
- **Public authorities**
  Government officials, or officially designated authorities at any level of government responsibility, entrusted with either policy, administrative or technical/sectoral functions.
- **Public awareness**
  The state of the community of having knowledge and being well-informed.
- **Public health**
  The Basic Societal Function that is concerned with the health of groups of people or a population.
- **Relief**
  Efforts directed at the alleviation of pain or distress.
- **Shelter and Clothing**
  The Basic Societal Function that encompasses the provision of protection against harmful environmental elements.
- **Stabilization**
  To stabilize means to achieve a stable state. To bring a situation, a function or a structure to stay functionally or statically between defined lines or limits.

Abbreviations

AOR	Area Of Responsibility
ADRC	Aquatic Disaster Response Course
BP	Blood Pressure
BLS	Basic Life Support
BMS	Base Medical Station
BoO	Base of Operation
CP	Command Post
CPR	Cardio Pulmonary Resuscitation
CSSR	Collapsed Structure Search
DC	Deputy Collector
DM	District magistrate
DDMA	District Disaster Management Authority
DEOC	District Emergency Operation Centre
EOC	Emergency Operation Centre
IC	Incident Commander
IMO	Information and Media Officer
IRS	Incident Response System
FWR	Flood Water Rescue
GPS	Global Positioning System
MHA	Ministry of Home Affairs
NCMC	National Crisis Management Committee
NEC	National Executive Committee
NDRF	National Disaster Response Force
NDMA	National Disaster Management Authority
OBM	Out Board Motor
OPS	Operation
PPE	Personal Protective Equipment
MFR	Medical First Responder
PTSD	Post Traumatic Stress Disorder
QDA	Quick Deploy Antenna
RDC	Reception & Departure Centre
SAR	Search and Rescue
SOP	Standing Operating Procedure
SDMA	State Disaster Management Authority
SEOC	State Emergency Operation Centre
TEA	Tool Equipment & Accessories
UHF	Ultra High Frequency
VHF	Very High Frequency

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